Friday, 08:00 AM - 09:30 AM

1 Friday, 08:00 AM - 09:30 AM, Tuscan 1 *Track:* HOM, 1 *Chair:* Roberto Revetria
Session: Systems Dynamics in Healthcare

020-0252 Strategy Deployment in UK Healthcare

Shulian Zhang, University of Manchester, United Kingdom
Claire Moxham, University of Manchester, United Kingdom
David Bamford, University of Manchester, United Kingdom
Ben Dehe, University of Manchester, United Kingdom

April 2009 was an important period for all National Health Service (NHS) Community Health Services (CHS) organisations as they were formally separated from the commissioning service in the Primary Care Trust (PCT). This had many implications, including the need to establish individual board, develop independent strategy, and set-up autonomous governance. The host organisation was keen to investigate the effectiveness of the current strategy deployment (SD) process and subsequently identify areas for improvement. Our investigation looked into adapting strategy deployment systems such as the Closed-Loop Management Systems (Kaplan and Norton 2008) at NHS CHS organisations which can facilitate organisational needs in the area of strategy deployment. As human capital with the suitable skills is required for any successful implementation of a management system, the researchers expanded the scope by including an assessment of the organisation's readiness for adapting formal strategy deployment systems in terms of management skills levels.

020-0357 A Systems Dynamics General Model for Supporting Transition to Lean Healthcare

Roberto Revetria, University of Genoa, Italy

Lean Healthcare, Kaizen and Six Sigma are rapidly transforming healthcare operations from 'new ideas' to a 'way of life.' At the same time, while the concepts of Lean are fairly straightforward, applying the tools to daily work can be counter-intuitive and thus require a credible model to be effectively applied. In a traditional lean approach, consultants take advantages from Value Stream Mapping, the adoption of 5-S and Visual Controls as well as batch reduction and cellular flow. Often these activities have taken a very long time to be adopted mostly due to internal change resistance, and lean implementation projects struggle for achieving their goals. The authors presents an innovative approach based on a reusable high-level model able to capture the relationship among costs, level of services and risks encountered in the transition from classical healthcare to lean health care organization. The paper proposes both methodology and a case study.

020-0702 Improving Patient Safety: How to Use Service Modularity in Healthcare Processes to Manage Systemic Errors

Maria Kapsali, Imperial College Business School, United Kingdom
John Bessant, University of Exeter Business School, United Kingdom

Complexity in healthcare processes stems from the diversity of the components of the service in terms of activities, personnel, resources needed, organizational practices, patient complications and types of services. Current organizational practices have not tackled complexity adequately, allowing for unacceptable levels of errors leading to patient harm. This study suggests firstly at study processes as complex adaptive systems by using the Healthcare Error Proliferation Model, and secondly by using the concept of service modularity in this model in order to redesign the architecture of the processes. For this purpose, 5 healthcare processes from the surgical ward of a UK hospital are analysed through FMEAs, Root Cause Analysis and expert interviews; and their defence layers are used as interfaces where the process components can be reconfigured. The study also uses 5 industrial examples (rail, marine, chemicals, construction, and animal hospital) to show how this is applicable in other settings.

020-0747 Mapping the Brazilian Healthcare Supply Chain: Elements and Their Relationships

Andrew Finger, Centro Universitário Metodista, do IPA, Brazil
Carlos Lencini, Centro Universitário Metodista, do IPA, Brazil

This paper describes aspects of Brazilian healthcare supply chain (HCSC) design and management and provides advances in the existing knowledge about the HCSC, especially for emerging countries. The HCSC in Brazil is a complex supply chain and a very important issue for the country. The research adopts a qualitative approach, with data collected through process mapping, secondary data and interviews with several managers of the key elements of the HCSC. Interviews are used to identify the main SC issues and the different perspectives across the SC. The research identified the elements that form the HSCS, the relationship between these elements and the governance of the SC. The conclusions identify different views and interpretations from the members of the HCSC and develop interesting questions for future research.

020-1026 Managing Emergency Room Crowding: Workplace Constraints vs. Human Capabilities

Brad Morrison, Brandeis International Business School, United States
Robert Wears, University of Florida, United States

Over the past several decades, growth in the demands on the United States emergency care system have outpaced adjustments in the capacity of the system. The result is a widespread phenomenon of crowded emergency rooms, especially in urban hospitals, with associated decreases in receiving timely care and increases in adverse medical outcomes. Motivated by experience and observation of a level 1 trauma center in a busy urban setting, this paper develops a stylized system dynamics model to examine the dynamics of patient flow. Simulation results show that increased ED resilience can come from relaxing bed constraints or from more human capability to cope with increasing workloads. The vulnerability of this system is rooted in the critical interaction between physical constraints imposed by the environment and the human capability of the staff to work at high performance levels under conditions of worsening workload pressure.

3 Friday, 08:00 AM - 09:30 AM, Tuscan 3 *Track:* SCH, 1 *Chair:* Zhixin Liu
Session: Scheduling with Uncertainty

020-0690 Price Quotation for Uncertain Order Inquiries with Scheduling Cost

Zhixin Liu, University of Michigan - Dearborn, United States
Liang Lu, The Hong Kong University of Science and Technology, Hong Kong
Xiangtong Qi, The Hong Kong University of Science and Technology, Hong Kong

We study the coordination between pricing and production scheduling decisions of a manufacturer. Two types of price quotations, simultaneous and sequential, both in coordination with production scheduling, are investigated. A simultaneous quotation quotes all order inquiries simultaneously. When both the price and scheduling cost functions are linear, a unique optimal price quotation can be found efficiently. It is further shown that when all the order inquiries share the same cost weight, volume discount should be provided. However, when the cost weight is proportional to order size, a larger order should be charged a higher price. A

sequential quotation quotes order inquiries one at a time. We develop optimal solution approaches for sequential quotation using implicit enumerations and design efficient heuristic algorithms.

020-0068 Measuring Agility Index Using System Flexibility and Response

Emad Abouel Nasr, Faculty of Engineering, Industrial Eng. Dept., King Saud University, Saudi Arabia
Soha Abd Elatty, Mechanical Eng. Dept., Helwan University, Cairo, Egypt, Egypt
Mohammed Osman, Mechanical Eng. Dept., Helwan University, Egypt

The purpose of this paper is to measure system agility and to propose an agility index which is used to show how agile the system is. The agility index is measured according to the operational perspective and its level which is concerned with two types of dimensions. The first dimension is the flexibility concerning three types: volume flexibility, variety flexibility, and delivery flexibility. The second is the response of the scheduling process applied in the system concerning the schedule stability and the frequency of rescheduling. A simulation model is used to measure agility dimensions and to demonstrate how the level of disruption and initial system conditions affect agility levels.

020-0754 Single Machine Scheduling with Uncertain Processing Times for Completion Time-related Performance Measures

Umar Al-Turki, King Fahd University of Petroleum & Minerals, Saudi Arabia
Khalid Al-Shareef, King Fahd University of Petroleum & Minerals, Saudi Arabia

In this study we consider scheduling n jobs on a single machine such that various completion times related objective functions are minimized in the existence of uncertainty. At the time of scheduling Job Processing times are bounded, i.e. known only by their upper and lower bounds. The two bounds represent the most optimistic and the most pessimistic estimates of processing times. As such, schedules that minimize the maximum, minimum and range of total completion times are identified. Also, expected values of mean job completion times are minimized under the two boundary values of processing times as well as when a third point, the most likely, is known.

020-0347 Integrating Workforce Planning with Equipment Purchasing Decisions for Service Companies

Hong-xun Jiang, Renmin University of China, China
Tian He, Renmin University of China, China
Gang Li, Bentley University, United States

We address a capacity expansion problem facing many service companies that entails selecting the purchasing timing, quantity and technological level of equipment, determining the hiring timing, quantity and skill levels of employees to operate the machines, and coordinating the service scheduling with the workforce training decisions to satisfy volatile customer demand while minimizing the total material and human resource costs. We developed an optimization-based decision support model to capture the key tradeoffs of the problem and designed an effective solution strategy to generate the optimal capacity expansion plan.

020-0408 Container Scheduling: Complexity, Algorithms, and Heuristics

Kangbok Lee, Rutgers University, United States
Joseph Leung, New Jersey Institute of Technology, United States
Michael Pinedo, New York University, United States

We consider the problem of transporting containers from one port to another using a fleet of ships. Each ship has a capacity constraint and calls on a specific set of ports. Each ship follows a fixed route and has a fixed arrival and departure time at each port on its route. Each container has a release date and a committed delivery date when it is expected to arrive at its destination port. We consider the problem of minimizing the maximum tardiness over all containers.We analyze various different scenarios and special cases within our framework. We also discuss the relationship of our problems with other scheduling problems; through our results we can solve various important special cases of open scheduling problems that have been discussed in the literature.

4 Friday, 08:00 AM - 09:30 AM, Tuscan 4 *Track:* ESO, 1 *Chair:* Armagan Bayram
Session: Miscellaneous Topics in Sustainability

020-0228 Cascade Reuse Hybrid Manufacturing/Remanufacturing System

Yasutaka Kainuma, Tokyo Metropolitan University, Japan

Japan is facing environmental problems such as resource constraints and depletion of mineral resources. Many companies tend to carry out remanufacturing systems due to these issues. As a result, reusing products or parts of them is an important business strategy. In this paper, we propose an optimal ordering policy of parts in a Closed-Loop Supply Chain. The manufacturer in the supply chain decides the order quantity of new and reused parts to minimize their total cost. The total cost in manufacturing includes ordering cost of parts, holding cost of products and opportunity loss cost. In the case study, comparing the proposal policy with the real policy of Company-A, we confirmed the effectiveness of the proposal policy. Consequently, if we can know the distribution demand, cost and stock quantity, we showed the optimal ordering policy is more efficient.

020-0941 Managing Foreclosed Housing Portfolios for Improved Social Outcomes

Armagan Bayram, University of Massachusetts Amherst, United States
Senay Solak, University of Massachusetts Amherst, United States

Over the past three years, increased rates of mortgage foreclosures in the U.S. have had devastating impacts on individuals, communities, organizations and government. In this paper we develop dynamic and stochastic programming models to assist community-based organizations in the allocation of resources to foreclosed properties for acquisition and redevelopment, taking into account uncertain market conditions that change over time. We model the multiple stake holder multiple social outcome structure in the problem and provide several analytical results.

020-0960 Balancing Sustainable Operations and Economic Development

Simon Veronneau, Quinnipiac University, United States

Given the population's growing concern for the environment, many policies are enacted to regulate various industries' operations. Hence this paper looks at the current dilemmas faced by many regions trying to ensure environmental sustainability while fostering economic development. This paper is based on a currently ongoing research program about the State of Alaska and the cruise industry. It looks at the current dilemma faced by the state and possible conciliatory policy considerations.

020-0342 Fair and Efficient Implementation of Collective Extended Producer Responsibility Legislation

Luyi Gui, School of Industrial and Systems Engineering, Georgia Tech, United States

Atalay Atasu, College of Management, Georgia Tech, United States
Ozlem Ergun, School of Industrial and Systems Engineering, Georgia Tech, United States
L. Beril Toktay, College of Management, Georgia Tech, United States

Extended Producer Responsibility (EPR) is a policy tool that holds producers financially responsible for the post-use processing of their products. EPR implementations are typically collective - one collection and recycling network (CRN) handles multiple producers' products. Total cost is allocated to producers proportional to a producer specific metric, typically by return shares. Return share is often criticized in practice for not accounting for the heterogeneity in the cost that producers impose on the CRN. The consequence is that some producers may not participate in the collective system, resulting in a fragmented system with higher cost. We develop three adjustments to return share that induce all producers to join the collective system. We show that the former two allocation mechanisms can achieve fairness and guarantee system-wide cost efficiency under mild conditions, while fairness is always guaranteed under the latter. Our theoretical results are then validated using Washington state EPR implementation data.

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5 Friday, 08:00 AM - 09:30 AM, Tuscan 5 *Track:* OEE, 1 *Chair:* Ricardo Martins Washington Luiz Soares
Session: Operations Strategy, Governance, and Sustainability

020-0556 Sustained Continuous Improvement Capability through Operational Routines

Chen Yen-Tsang, EAESP/FGV, Brazil
João Mario Csillag, EAESP/FGV, Brazil

Under the perspective of Resource Based View concepts, the routines of continuous improvement (CI) in a firm can be considered a capability when they can improve constantly, frequently, intentionally and aligned to the organization purpose. However, the high failure rate of the CI initiatives has made this capability difficult to achieve. This study has adopted two case studies to investigate the set of operational routines that compose a sustained CI capability. The data were collected through on-site observations and deep multi-hierarchical interview. The sample is composed by a representative sustained CI capability firm and the other one is developing its CI capability.This study found that, in addition to organizational learning, leadership and standard problem detecting/solving routines, the sustained CI capability depends on the behavioral aspect of the firm. The practical implication of this study brings insights to managers to develop their routines as source of competitive advantages.

020-0417 Innovation in Supply Chain Planning and Sugarcane Theory Izobretatelskih Zadátchi Rechen-TRIZ

Getulio Akabane, FATEC, Brazil
Washington Luiz Soares, Unisanta, Brazil
Camila Lopes, Unisantos, Brazil

We present a methodology for use of the "Theory Izobretatelskih Zadátchi Rechen-TRIZ" (theory of inventive problem solving) of Genrich S. Altshuller, seeking to increase the visibility of the supply chain, also affecting its strategic planning. Based on recent concepts of strategic planning and supply chain management, the methodology was evaluated by a feasibility study of the chain of ethanol in the central-south. The study, in addition to contributing to the development of Western Russian methodology, presents innovative and alternative solutions to the challenges of this chain. Heuristic analysis of business management has assessed the sustainability of the proposed chain strategic initiatives.

020-0040 Alignment of Collaborative Practices between Tiers of the Brazilian Automotive Chain

Ricardo Martins, School of Business Administration/Federal University of Minas Gerais (UFMG), Brazil
Osmar Souza Filho, Interdisciplinary Center for Logistics Research and Extension (NIPELOG/UFMG)., Brazil
Susana Pereira, São Paulo School of Company Management - Getúlio Vargas Foundation - FGV-EAESP, Brazil
Luiz Di Serio, São Paulo School of Company Management - Getúlio Vargas Foundation - FGV-EAESP, Brazil

This study analyzed management models used in the supply chains of the Brazilian automotive industry, and was based on the collaborative relationship practices existing between the tiers (between automakers and the 1st tier and between the 1st tier and the 2nd tier), with a view to identifying alignments in these practices. The measure of alignment was based on ten performance criteria. It was found that the strength of the link does not have any impact on the alignment of practices in the chains that were analyzed. The main conclusion of this study was that, irrespective of the strength of the link, in the case of suppliers beyond the first tier, performance criteria of a collaborative nature are not widely used in the automotive chain.

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6 Friday, 08:00 AM - 09:30 AM, Tuscan 6 *Track:* TEC, 1 *Chair:* Jason Lee
Session: Technology Transfer

020-1007 Structuring and Financing International Technology Transfer Projects

Jason Lee, Mount Royal University, Canada
Kalinga Jagoda, Mount Royal University, Canada

International Technology Transfer (ITT) has become an essential part of the business strategy of the modern business enterprise. If a firm structures the financing of its technology transfer projects effectively, they will be able to capitalize on the differences in tax laws and regulations in various jurisdictions which may lead to substantial cost savings. In order to effectively manage this process, the companies must clearly identify the treaty negotiations of the transferee country, the best time to transfer the technology and the methods of upgrading the technology once it has been transferred. This paper seeks to introduce a typical project financing structure and compare international technology transfer projects to other projects which are competing for private and public investments. It also looks at industry-based practices and discusses options available to corporations by using case studies from Canada.

020-0555 Technology Transference from R&D Public Institutions to the Productive Sector: Embrapa Case on Technology Transfer to the Seed Segment

Ana Lucia Atrasas, UNIP/ Embrapa, Brazil
José Sacomano, UNIP, Brazil
José Paulo Fusco, UNIP, Brazil

Competition and the factors which contribute to a company's success in a volatile global and economic environment depend on many different aspects. One of them pertains to the relationship established between companies, with the goal of attaining a uniform level of development with effective integration and coordination. A relationship between companies creates a network, and a positive integration can be attained with the removal of obstacles so as to facilitate the flow of information, goods and services. This study seeks to understand how the relationship of technology transfers from the external environment with Embrapa. We analyzed the evolution and subsequent transformation of vision that the company has undergone since its creation until today. At the end you can see the network cohesion and the convergence of the interests of its participants require the achievement of a balanced relationship and the establishment of governance principles.

020-0665 Exploring the Impact of Computer-Based Technologies for Foresight

Cinzia Battistella, University of Udine, Italy
Alberto De Toni, University of Udine, Italy

The present paper focuses on computer-based technologies supporting Corporate Foresight (CF): how organisations use software tools to scan the horizon, detect weak signals and anticipate future trends. The research focuses on a multiple case-study in different industries. Through a comparison of twenty projects in companies clustered in four industries that perform CF, the paper highlights more than 50 tools and deeply describes them, subdividing them in knowledge management technologies, semantic technologies and network technologies.The different tools have been related to the phases of the process of CF, to the amount of resources needed to implement them and, taking a contingent approach, to the different needs in terms of turbulence of the project environment (in terms of rapidity and unpredictability).Finally, the research relates the different clusters of technologies to CF performance measures and draws a hypothesis on their influence on CF performances.

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7 Friday, 08:00 AM - 09:30 AM, Tuscan 7 *Track:* PDI, 1 *Chair:* Masaharu Ota
Session: Models of Innovation

020-0016 Modeling Japanese Innovation Processes

Masaharu Ota, Osaka City University, Japan
Yohsuke Hazama, Fujitsu Limited, Japan
Danny Samson, University of Melbourne,, Australia

The objective of this study is to propose and test a model of Innovation Process (IP) management and to clarify the managerial strategies required to achieve it in Japanese enterprises. First, we reconsidered IP concepts, particularly in the idea creation stage, using existing theoretical studies about IPs and dynamic capability theory, and proposed a revised IP model. Secondly, we conducted empirical tests of our model using the data from the questionnaire surveys of Japanese companies. Using this method, we found that there was a high likelihood that the IP of Japanese companies thought to have had success with innovation matched the proposed model. The support for our model from the Japanese data is sufficiently strong so as to suggest that certain managerial factors should generally be implemented in order to succeed with innovation.

020-0974 Innovation Process: An Evaluation of Scientific Production from 2000 to 2009

Luciano Carvalho, Fundação Getúlio Vargas - FGV, Brazil
Luiz Carlos Di Serio, Fundação Getúlio Vargas - FGV, Brazil
Marcos Augusto Vasconcelos, Fundação Getúlio Vargas - FGV, Brazil

This article aims to review the scientific literature on Innovation Process from journals listed in the databases EBSCO and ISI KNOWLEDGE in the period 2000 to 2009. We identified 457 articles that were classified in twenty categories of analysis clustered into five major groups: Input Factors, Environmental Factors, Procedural Factors, Output Factors and Managerial Factors. It was found that the Input Factors were studied more during the decade, especially for Innovation Networks, which proved to be a subject of growing interest since 2003. The journal Research Policy had the second highest number of publications, was the most cited journal and addressed four of the ten most influential articles on the innovation process. It may be noted that studies of process innovation are more related to factors that may influence it (79%) than the structures and methodologies of a process manageable (21%).

020-0925 Technological Innovation Diagnosis of the TICS Cluster in Jalisco, Mexico

Luis Antonio Delgadillo Gutierrez, Universidad de Guadalajara, Mexico
Cesar Francisco Sollano Garcia, Universidad de Guadalajara, Mexico
Exiquio Alejandro Nava Gomez, Universidad de Guadalajara, Mexico

We discusses the impact of innovation in the development of local production systems on the territory, particularly it is analyzed those explanatory variables of local innovation. In addition to reducing costs, quality assurance and the arrival time to the market emerge as important issues; innovation of product, process or organization as a driver of competitiveness. Using as framework the OSLO manual for the evaluation of innovation activities we applied 65 questionnaire to high tech cluster computing and telecommunications companies in the State of Jalisco. We will show the correlation found between territorial development, innovation and intellectual property services of a high-tech cluster of computing and telecommunications in Jalisco.

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8 Friday, 08:00 AM - 09:30 AM, Tuscan 8 *Track:* ERS, 1 *Chair:* Christoph Bode Inga-Lena Darkow
Session: Empirical Research in OM 1

020-0275 An Empirical Study of Supply Chain Management Functions in Corporate Upper Echelons

Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland
René Kemmerling, Swiss Federal Institute of Technology Zurich, Switzerland

Supply chain strategies and their implementation have been recognized as a source of competitive advantage. Based on the principle “structure follows strategy,” we expect that firms increasingly have SCM functions in their top management team (TMT). However, little is known about the degree to which executives responsible for SCM functions are present or absent in TMTs. To shed light on the presence/absence of supply chain executives, we study the TMTs of 214 large US corporations from various industries in a 5-year time window. Upper echelon theory (Hambrick & Mason, 1984) and contingency theory are used as a theoretical backdrop for this research.Our research contributes to the literature since it is the first (1) to empirically examine if and to what extent SCM functions are represented by executives in TMTs, (2) to unveil possible antecedents associated with having a “Chief Supply Chain Officer” and (3) to analyze the corresponding performance implications.

020-0758 Routine and Original Response Behavior to Supply Chain Disruptions

Christoph Bode, Swiss Federal Institute of Technology Zurich, Switzerland
Kenneth Petersen, Colorado State University, United States
Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland

The open systems perspective suggests that a firm develops a response to an external threat by either of two behaviors: routine response behavior or original response behavior. In this paper, we study these two behaviors in the context of supply chain disruptions. Specifically, we are interested in understanding the inter-firm and intra-firm factors that are decisive for the type and magnitude of the final response within each of the two modes of behavior. To this end, we identify the repertoire of strategic responses to supply chain disruptions and develop a proposed theoretical model which is grounded in the cybernetic system and information-processing system literature. Our empirical results suggest that in routine-response mode, a firm’s response is largely determined by the impact of the experienced supply chain disruption, whereas in original-response mode, the firm develops the response based on the characteristics of the supply chain relationships involved in the disruption.

020-0794 Diffusion of New Technology in Interfirm Networks: Network Analysis of Knowledge Transfer

Daeheon Choi, University of Washington, United States
Apurva Jain, University of Washington, United States

To examine the effects of interfirm network structures on the technology adoption, we propose a model whereby a firm's adoption decision is influenced by information and knowledge from prior adopters though network ties as well as its own attributes. The levels of influence by prior adopters are different by physical and social proximity with them. We tested a model by examining which network participants can become aware of information by prior adopters well and how relationships between firms affect the transferability and the quality of information on adoption decisions. Using the adoption data of Radio Frequency Identification (RFID) technology of consumer packaged goods industry in the U.S., we show that a potential adopter's decision is largely influenced by the proximity with prior adopters in a network over time, while a likelihood of adoption at the initial period is mainly determined by its own attributes.

020-0880 Supply Chain Performance and Its Impact on Company Performance

Gernot Kaiser, EBS Business School, Germany
Inga-Lena Darkow, EBS Business School, Germany

As the Handbook of Metrics for Research in OM by Aleda Roth et al. imposingly shows, metrics on supply chain performance (SCP) are being redeveloped over and over again and different dimensions of SCP use subsets of the same items. Our research brings more semantic clarity to the dimensions of SCP. We decomposed SCP into accuracy, adaptability, alignment, flexibility, costs, and anchor SCP within company performance, measured by market and economic dimensions.Our empirical results indicate valid and reliable measures for all different dimensions of performance. In sum, almost three quarters of the variation in market performance is due to the variations in the SCP dimensions. In addition, nearly the half of variations in economic performance is due to variations in SCP and market performance. Furthermore it is clearly shown that the dimensions of SCP differ tremendously concerning their impact on company performance.

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9 Friday, 08:00 AM - 09:30 AM, Tuscan 9 *Track:* BOM, 1 *Chair:* Charles Teplitz David Hall
Session: Behavioral Operations 1

020-0977 Canadian Oil Sands: Rethinking Operations Strategy

Adam Bloomer, Mount Royal University, Canada
Kalinga Jagoda, Mount Royal University, Canada

Development of Canada's non-conventional oil reserves requires an in-depth understanding of the petroleum industry's rigid regulatory requirements, market competitiveness, and management of its diverse range of production methods. Managers and operations strategists who work within this industry engage in a unique and complex decision making process. Current literature provides limited insights on the decision making process and patterns in the Canadian oil sands industry. This study builds upon existing operations strategy models to examine the influence of organizational contextual factors on the relationship between operations strategy processes and operations performance. The main objective is to understand the linkages between different forms of operations strategy processes and operations performance with casual understanding, while improving the predictability of existing models. Understanding the dynamics of strategy processes will help firms develop capabilities that support competitive objectives towards enhancing their competitive position and increasing operational effectiveness.

020-0294 Managing End-user Resistance in ERP Installations

Holly Betros, University of San Diego, United States
Charles Teplitz, University of San Diego, United States

Enterprise Resource Planning (ERP) systems offer significant benefits to the implementing organization, but the high failure rate of ERP installations reflects management tendencies to disregard or mismanage individual users' attitudes toward the new system. Researchers have explained that end-user fear and resentment is transformed into resistance which can doom a new system to failure. They consistently recommend that to reduce such resistance, training programs should focus on easing employee fears regarding potential job loss, increased workloads and increased accountability. This paper will posit that to ease resistance, successful training programs need to tailor instruction to the individual needs of the participants with attention to such issues as: how the end-users will do their current work under the new regime, how future training would provide ample guidance in the new collaborative work environment, etc. These and other suggestions will be described to demonstrate development of effective training programs.

020-0828 Information Systems Supporting the Management of the Risk of Supplier Bankruptcy and Their Impact on Mitigation Action - A Field Study

Volker Groetsch, EBS Business School, Germany
Constantin Blome, EBS Business School, Germany
Martin Schleper, EBS Business School, Germany
Michael Henke, EBS Business School, Germany

During the last economic crisis, many suppliers of integrated supply chains experienced significant problems or even filled for bankruptcy. The regular consequences are supply chain disruptions, for which literature suggests proactive mitigation action from decision makers. However, in reality buyers often do not act until the supplier actually collapses. By then, quickly looking for alternatives often remains the only option. Our paper strives to explain such behavior by uncovering the underlying factors of mitigating action in the context of supplier bankruptcy. To do so, we conducted a multi-tier field study in the German automotive industry and analyzed how the specific characteristics of information systems which support the management of the risk of supplier bankruptcy determine the decision makers' mitigation actions. By deriving propositions on how to get to more proactive mitigation action, we aim to decrease the gap between scientific recommendation and industrial practice on this problem.

020-0536 A Behavioral Study of Buyer Judgments of Supplier Capabilities

David Hall, Clemson University, United States
Aleda Roth, Clemson University, United States
M. Johnny Rungtusanatham, University of Minnesota - Twin Cities, United States

Decision theory differentiates between judgments based on comparisons of plausible alternatives versus those based on comparisons of specific attributes. In supply chain management, the prevailing assumption is that sourcing managers (hereafter buyers) can readily evaluate supplier attributes to facilitate decision-making. Little is known about how buyers judge supplier operational capabilities when this information is relatively inaccessible or not fully transparent. In these situations, theory of attribute substitution indicates that buyers may replace one easily accessible and representative capability (e.g., supplier cost) for another less accessible capability (e.g., supplier quality). Using samples of ISM members, we employ a behavioral study to empirically investigate how make-buy decisions, supplier development, and supplier selection are influenced by the ability of buyers to evaluate less transparent supplier capabilities. We tentatively find that attribute substitution does occur when managers evaluate supplier capabilities. More interesting is the direction of the substitution.

10 Friday, 08:00 AM - 09:30 AM, Tuscan 10 *Track:* ICM, 1 *Chair:* Long Gao
Session: Inventory Planning with Information Update

020-0118 Replacement Decisions with Imperfect Condition Information

Jennifer Ryan, RPI, United States
Xi Kan, RPI, United States

We consider the problem of replacement and inventory management for an operating device that is subject to degradation. We develop a threshold-based replacement policy using real-time sensor information obtained through condition monitoring. To do so, we model device degradation using a two-dimensional Wiener process, in which one component represents the degradation signal obtained through condition monitoring, while the other component represents the true, but unobserved, degradation process. These two processes are assumed to be correlated with each other. This model captures the reality that the observed degradation signal may not perfectly represent the true degradation of the functioning device. In our replacement policy, failure occurs when the unobserved process reaches a fixed failure threshold and replacement is performed when the observed process reaches a predetermined replacement threshold. We develop a method for determining the replacement threshold to minimize the long run average costs associated with failure and replacement.

020-0664 Planning Target Inventory Levels under Advance Supply Information

Refik Gullu, Bogazici University, Turkey
Esra Cinar, Bogazici University, Turkey

In this talk we consider an inventory system for an item with stationary stochastic demand and supply uncertainty. The manufacturer of the item receives information from the supplier on the status of the supply availability for the current and the next period. Based on this information, the manufacturer decides on the quantity to be ordered from the supplier. If the realization of the supply is not sufficient to raise the inventory level of the manufacturer to the target level, then the manufacturer fulfills the shortfall from a spot market at a higher cost. Consequently, the customer demand is realized and corresponding inventory holding and backorder costs are incurred. In order to obtain the optimal target inventory levels that minimize the long-run average cost of this system, we employ the renewal reward theorem, and define renewal cycles based on the system inventory level and the supply information.

020-0725 Managing Supply Disruptions: Procurement Diversification, Demand Rationing and Dynamic Forecast

Long Gao, UC Riverside, United States
Nan Yang, Washington University, St. Louis, United States

We study a multiperiod procurement planning and order acceptance problem in the presence of supply disruptions, where multiclass supply and demand information is forecasted dynamically via a Markov model. We characterize the structure of both procurement policy and order acceptance policy by a sequence of thresholds. Our characterization provides a simple policy form for efficient computation. We also characterize the effects of short-term forecasts on the policy parameters and system performance. We numerically compare the performance of several widely used policies with that of the optimal policy under different scenarios, and provide recommendations for managing supply disruption risk.

11 Friday, 08:00 AM - 09:30 AM, Tuscan 11 *Track:* SOM, 1 *Chair:* Chris Voss
Session: Service Supply Chains

020-0307 Strategic Repositioning in the Service Supply Chain for Long-term Profitability

Amelia Carr, Bowling Green State University, United States
Senthil Muthusamy, Bowling Green State University, United States
Charles Owens, Consultant, United States

Recent trends in the movie rental industry have caused a once dominant player to suffer market share loss and file for bankrupcy. Effort to survive in the face of fierce competition is discussed in this paper. We examine the Blockbuster service supply chain from a strategic management perspective. A theoretical framework is presented and five propositions are developed based on the literature and theory. Specific attention is given to technology innovation, strategic repositioning, strategic alliances, organizational change, customer relationships and organizational effectiveness, efficiency and long-term profitability. Our research design includes a number of in-depth interviews with the management and staff at Blockbuster as well as a survey of customers. Implications for management and directions for future research are given.

020-0902 The Moderating Role of Supply Chain Performance on New Service Development

Gernot Kaiser, EBS Business School, Germany
Kai Foestl, Fraunhofer SCS, Germany
Carsten Reuter, Fraunhofer SCS, Germany
David Liebig, AT Kearney, Germany

Contrary to new product development, the process of new service development (NSD) is less investigated. In practice industrial services are oftentimes not managed but created sequentially ad hoc and added "once the product deal is landed." While product developments require more initial investment and are heavily concerned with technology and related processes, NSD rather focuses on customer involvement and internal alignments. Also, information technology has an important strategic impact on the development of new services, often regarded as an innovation itself. Our research investigates the role of (service) supply chain performance as a moderator for the new service development's success. As more and more parts of the service fulfillment are outsourced and done offshore, service supply chain design and the resulting supplier integration enable "good" NSD to be a successfully NSD. Thereby, supplier integration especially contributes to a superior and differentiated service offering and cycle time reduction.

020-0306 Technological Intermediaries as 3PL Providers in Global Supply Chains

Berit Helgheim, Molde University College, Norway
Bjørn Jæger, Molde University College, Norway

The increased global competition is mainly driven by the technology evolution, harmonization of national and international laws and regulations, and the economic forces whereby companies realize the potential for more efficient business operations. In this paper we explore the role of technological intermediaries as service providers on information flow in business-to-business relationships. The utilization of technological opportunity seems to be premature in business-business relations. One factor may be the lack of knowledge about what kind of activities or services these providers may offer and the knowledge according to risk assessment by technological integration. Another may be that 3PIP providers have not seen the business opportunity and commercialized the opportunity for such business arrangement and do not have a proactive approach for marketing the service activities.

020-0980 Managing the Link between Manufacturing and Logistics Service

Yong Lin, University of Greenwich, United Kingdom

Jing Luo, University of Greenwich, United Kingdom
Li Zhou, University of Greenwich, United Kingdom

As the product variety increased in the automotive manufacturers, the boundaries of manufacturing and its correspondent logistics services become increasingly complex and vague over time. This paper aims to develop a framework to effectively design and manage the manufacturing-logistics service links between the automotive manufacturer and its logistics provider. The results identified and categorized the links into three layers, including product-services links, manufacturing process-service delivering process links, and manufacturing information system - logistics information system links. Enabling approaches and mechanisms to coordinate and manage the links to facilitate the interactions between manufacturer and logistics provider are summarized to provide practical directions to operations managers. A case study is conducted within the context of Chinese automotive industry. Data are mainly collected through semi-structured in-depth interviews; field visit and other secondary documentations are used as well.

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12 Friday, 08:00 AM - 09:30 AM, Roma 1,2 *Track:* NCC, 1 *Chair:* Anssi Kaki
Session: Session 1

020-0576 Supply Chain Supernetworks with Suppliers Risk Management

June Dong, State University of New York at Oswego, United States
Jun Ma, SUNY Oswego, United States

We present a supply chain supernetwork model that includes four tiers of participants. Each tier has multiple competitive players; each participant makes decentralized multicriteria decisions. We particularly emphasize the risk management aspect from the suppliers' perspective in the model. We derive equilibrium conditions that govern the system and develop variational inequality formulations to solve the problem. Computational results are presented as well.

020-0741 Impacts of the Shape of the Demand Distribution on Procurement Risk Mitigation

Anssi Kaki, Aalto University, Finland
Ahti Salo, Aalto University, Finland

Uncertainties about product demand involve risks that can be mitigated through approaches such as risk-sharing contracts or dual sourcing. Also, the shape of the demand distribution can differ considerably from one planning situation to another: for instance, the demand distribution can exhibit strong positive skewness if there is a significant potential upside demand, or it may have two peaks if there is a possibility that a substitute product is introduced to the market. Yet many models for procurement risk management do not explicitly consider the shape of the demand distribution. Here, we extend the contract model of Cachon & Lariviere (Management Science 2001, 47/5) and illustrate that the effectiveness of procurement strategies can be crucially dependent on what assumptions are made about the shape of the demand distribution. Specifically, we offer numerical results for different stylized planning situations and illustrate the impacts of alternative demand assumptions.

020-1028 Optimizing Purchasing Power in a Competitive Market under Transmission Congestion Risk

Cigdem Gurgur, Purdue University, United States

Power suppliers aim to optimize the transmission of their purchased electricity from the power source to its customers. Companies may integrate contracting and market structure with operational decisions, given their respective risk management preferences. The contribution of this research is to help companies not only hedge the risk of unknown power prices but also hedge unknown transmission congestion. We aim to maximize profits by determining the optimal way to purchase power at the beginning of the cycle. The stochastic nonlinear mixed-integer model shows that transmission constraints and fixed transmission rights can have a significant effect on the choices a utility will make when dealing with power procurement. It is demonstrated that their inclusion drastically decreases the value of the objective function.

020-0619 Coordinating a Chain of Dynamic Manufacturing and Transportation Systems by Negotiation

Bernd Scholz-Reiter, BIBA at the University of Bremen, Germany
Christoph Schwindt, Clausthal University of Technology / Institute of Management and Economics, Germany
Enzo Frazzon, Federal University of Santa Catarina UFSC / Department of Industrial Engineering, Brazil
Thomas Makuschewitz, BIBA at the University of Bremen, Germany

The integrated production and transportation scheduling problem holds a great potential for improving the effectiveness of operations of an original equipment manufacturer and subsequent distribution. Nevertheless, a supply chain usually consists of several levels of manufacturing, linked by transportation, which should be considered as well. In particular, expected and unexpected perturbations on the operational level require well-balanced decisions taken by the local stakeholders of the underlying systems. To this end, a supply chain is grouped into a chain of operational planning entities, where each entity performs an integrated scheduling of one production and one transportation system. In this paper we present a negotiation-based mechanism for the coordination of these planning entities. The iterative and collaborative approach enables an alignment of planning entities arranged in a linear chain. As a result, the coordination mechanism allows for a sustainable handling of perturbations that affect the manufacturing and transportation systems in supply chains.

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13 Friday, 08:00 AM - 09:30 AM, Sorrento 1,2 *Track:* QPJ, 12 *Chair:* Luiz Carlos de Brito Mello
Session: Session 12: Process Analysis with Statistics

020-0022 An Alternative Approach to Managing Variation in Employee Performance

Canan Kocabasoglu Hillmer, Cass Business School, United Kingdom
Steve Hillmer, University of Kansas - School of Business, United States
Dennis Karney, University of Kansas - School of Business, United States

The objective of this paper is to assess the role of quality control charts in identifying development needs for employees in High Performance Work Systems. This is structured along the following three steps: first, we provide an in-depth literature review of the concept of variation in employee performance in both the human resource and quality management streams, concluding with a framework for classifying different types of variation in employee performance. Second, we re-evaluate the role and effectiveness of control charts in managing variation and helping identify development needs of employees in High Performance Work Systems. Finally, we introduce an alternative tool to control charts that overcomes some of the main weaknesses of the control charts and is easy to use.

020-0010 A Competitivity Analysis of Brazilian Offshore Shipyards

Luiz Carlos de Brito Mello, Universidade Federal Fluminense, Brazil
Renata Mello Bandeira, Instituto Militar de Engenharia, Brazil
Jose de Farias Filho, Universidade Federal Fluminense, Brazil

The article presents, through the study of multiple cases, results of a survey conducted for the purpose of analyzing domestic shipyards' operation against foreign shipyards that were selected as benchmarks. The choice of these benchmarks, as well as the national shipyards, was made through the national largest

customer of the industry. The authors analyze performance of yards' manufacturers of oil platforms and supportvessels for offshore exploration on the following dimensions: (i) methods and production techniques; (ii) layout; (iii) use of information technology; (iv) strategic management; (v) planning and production control; (vi) use of tools to support the project; and (vii) management of the supply chain. At the end results obtained arepresented, which points to the need for improvement and also suggestions for improvements.

14 Friday, 08:00 AM - 09:30 AM, Sorrento 3,4 *Track:* PDI, 15 *Chair:* Ralf Drauz
Session: Quality, Lean and Innovation

020-0895 Competitive Analysis and Product Planning Using House of Quality (HoQ) for Biomass Power Plant: A New Product

Nambirajan Thangasamy, Pondicherry University, India
Raman Perumal, The Energy and Resources Institute (TERI), India

With the development of technology and life style, the world faces challenges to meet energy demand. Increase in fossil fuel prices adds to the problem. Agro residues (like rice husk, ground nut shell, coconut shell, etc.) are considered to replace fossil fuel. Biomass power plant uses equipment called biomass gasifier which converts biomass into high quality gaseous fuel named as Syngas (Synthesized Natural Gas). Syngas is similar to liquefied petroleum gas or compressed natural gas. Present work focuses on competitive analysis and product planning using 'House of Quality(HoQ)' for biomass power plant as a new product. A detailed mathematical model is presented for construction of a Quality Function Deployment (QFD) matrix. Customer requirements and technical characteristics of various types of electricity production plants are discussed in detail. A "House of Quality" diagram is presented which compares the competitiveness of the existing electricity production plants.

020-0345 Kansei Engineering Applied to Brazilian E-banking Service

Karina Pretto, Fundação Getúlio Vargas, Brazil
João Mario Csillag, Fundação Getúlio Vargas, Brazil

There are some traditional product conception techniques, such as Kano (Kano et al., 1984), Conjoint Analyses (Green and Srinivasan, 1978), or QFD (Akao, 1990). All of them deal with physical aspects and their impact on overall customer satisfaction. A different proposal done by Nagamachi, in 1989, brings a new concept based on both sentimental approach and customer feelings, called Kansei Engineering. In Brazil, Kansei is a new and uncommon approach and, in order to explore some of its benefits, this research intends to apply Kansei philosophy in an internet banking study. Due to the fact that internet and investment markets deal with a lot of feelings and because of huge growth of number of Brazilian online users, we decided to evaluate some Kansei concepts with Brazilian customers. First results point that trustworthiness, security and promptness are important aspects evaluated by internet banking customers.

020-0187 Change of Process Costs after Adding a New Variant Part - A Pragmatic Approach

Daniel Handel, Staufen AG, Germany
Ralf Drauz, RWTH Aachen University, Germany

Adding new variant parts into production, not based on customer demand, is a major cost driver in manufacturing companies due to growing complexity of underlying processes. If new variant parts fractionally substitute for existing parts their economies of scale worsen. These assumptions could be verified with activity-based costing. To measure change in costs after every adding of a new variant part is time-consuming and without knowledge of future processes limited. Cross-departmental implications are calculated and suggestions are given for different categories of variant parts. The measurement is applied to a machinery maker. Through process analyzes direct and indirect costs, likewise non-recurring and current costs, at each value chain level (single part, work-in-progress, product) and can be allocated to the specific part added. The research creates cost awareness in every department, especially R&D, towards parts reduction. It provides a decision basis for cost-efficient product development and closes gaps in literature.

15 Friday, 08:00 AM - 09:30 AM, Naples 2 *Track:* GEN, 1 *Chair:* Daniel Lacerda
Session: Human factors in operations management

020-0064 Hidden Cost of Absenteeism and Presenteeism at Work: A Pilot Study

Hesan Quazi, Nanyang Technological University, Singapore
Hong Tan, Nanyang Technological University, Singapore
Hong Tan, Nanyang Technological University, Singapore
Sisi Guo, Nanyang Technological University, Singapore

Absenteeism is one of the most frequently measured indicators of organization's health but it gives an inaccurate picture of employee health and workplace productivity. Presenteeism is the counterpart of absenteeism and is more expensive than absenteeism and also difficult to measure. Presenteeism is a type of employee behavior when they come to work sick. Studies have shown that the cost of presenteeism could be ten times as high as that of absenteeism. Other studies have also reported the cost of presenteeism due to various common health conditions (e.g., allergy/flu, arthritis, asthma, and back, neck & spinal problems). This study reports the findings of a survey based pilot study in Singapore on the cost of presenteeism due to a number of specific common health conditions of employees. Information on the finding of similar studies in other countries will also be reported.

020-0578 Executive Compensation and Financial Performance in Brazilian Industrial Companies

Elizabeth Krauter, University of Sao Paulo, Brazil
Almir Sousa, University of Sao Paulo, Brazil

The objective of this paper is to investigate the relationship between executive compensation and corporate financial performance. The research data are secondary and the non-probabilistic sample is composed of 44 Brazilian industrial companies. In order to operationalize the independent compensation variable, we use average monthly salary, average variable salary and three indexes that we created for this research--benefits, career and development. These compensation data refer to the fiscal year of 2006. In order to operationalize the corporate financial performance, we use two accounting indicators--growth of sales and ROE--for the fiscal years of 2006 and 2007. We use the size of the companies as a control variable. The results of multiple regression analysis do not corroborate the hypothesis that there is a positive and significant relationship between executive compensation and corporate financial performance.

020-0806 Contribution of Investment in Education of Human Capital: A Case Study

Silvana Gemelli, Universidade de Caxias do Sul, Brazil
Maria Emilia Camargo, Universidade de Caxias do Sul, Brazil
Eric Dorion, Universidade de Caxias do Sul, Brazil
Ana Elizabeth Moiseichyk, Universidade Federal de Santa Maria, Brazil

This research examined the contribution of educational investment of human capital to achieve competitive advantage in the metallurgical industry. The study is supported by three theoretical approaches: knowledge, intellectual capital and human capital, and the conjunction of these three areas has allowed the process

to understand the contribution of educational investment in human capital. The research was conducted in four phases. The results reinforced the perceptions of officials and leaders regarding the investment in education, the relationship between investment in education and the competitive advantages, and application and dissemination of knowledge gained and the impact of education on intellectual capital. The article presents a conceptual model that classifies the types of improvements in four quadrants.

020-0651 A Meta-Method to Workforce Planning

Daniel Lacerda, PPGEPS/UNISINOS, Brazil
Secundino Corcini Neto, GMAP/UNISINOS, Brazil

Workforce Planning studies are not new. Various approaches, quantitative and qualitative, in different industries have been applied in organizations. The workforce planning needs to consider, simultaneously, several factors: i) multi-functionality, ii) activities planning, iii) knowledge and skills, iv) balance of activities, v) adjustment of human resource capacity to demand, vi) measurement of work methods, vii) performance indicators and the managerial role. Decisions concerning the conduct effective workforce planning must be considered. Clearly, there is a gap in the literature for proposals to formalize the elements to be considered, broadly, for the structuring methods to conduct workforce planning. Therefore, this work results in the proposition of a meta-model that may guide the conduct of the planning processes of the workforce planning. The resulting meta-model of workforce planning can aid researchers and practitioners.

16 Friday, 08:00 AM - 09:30 AM, Naples 1 *Track:* SOM, 13 *Chair:* Annibal Scavarda
Session: Technology in Services

020-0425 Distinguishing the Performance of Manufacturing and Service Operations: The Partial Adjustment Approach

Winston Lin, The State University of New York at Buffalo, United States
Ilyoung Jung, The State University of New York at Buffalo, United States

This paper attempts to distinguish the performance of U.S. manufacturing and service operations as the impacts of information technology and analyses productivity paradox, the impacts of the substitution and complement relationships among capital, labor, and IT capital at the firm level, using a constant elasticity of substitution (CES)-based partial adjustment approach. The panel data composed of forty-six firms cover the period from 1999 to 2007, using seemingly unrelated regressions. The empirical evidence suggests that an unbalanced growth between the manufacturing and the service sector can be observed by performance values. The service sector is, however, composed of a set of heterogeneous characters with performance indexes ranging from 0.476 to 8.003, exceeding some manufacturing firms. Moreover, the service industry is found to display strong substitution phenomena among capital, labor and IT and suffer from the productivity paradox. IT has substantial impacts on the parameters associated with the CES production function.

020-0783 A Framework for E-supply Chain Management for E-services: The Challenges for the E-era

Annibal Scavarda, School of Business and Management, American University of Sharjah, United Arab Emirates
Narasimhaiah Gorla, School of Business and Management, American University of Sharjah, United Arab Emirates

Nowadays, in the e-era, where most of the leading economies are service oriented and e-business is being widely used for their management, supply chain management has become one of the most studied and practiced fields. Supply chains are traditionally analyzed in the context of goods-oriented industries, but not in the services-oriented ones. The service sector is mostly characterized by intangibility, perishable output, non-inventory orientation, its high customer contact, its high labor intensity, and its simultaneous production and consumption. So supply chain management frameworks need to be extended to include these service perspectives together with the e-business management. This article proposes a framework for analyzing e-supply chain management for e-services. The framework will be validated empirically based on the surveys of executives of various services, such as, government, healthcare, hospitality, tourism, transportation, and education organizations in the United States, Hong Kong, India, and the United Arab Emirates.

17 Friday, 08:00 AM - 09:30 AM, Naples 3 *Track:* BOM, 12 *Chair:* Debbie Tesch Wout Wezel
Session: Behavioral Operations 2

020-0930 Stakeholder Relationships and Project Success: An Examination of Sponsor Executing Behaviors

Debbie Tesch, Xavier University, United States
Timothy Kloppenborg, Xavier University, United States
Chris Manolis, Xavier University, United States

We have been conducting studies focused on the identification and/or validation of executive sponsor behaviors impacting on project success. Project success measures have been consistent throughout all stages of this research, but sponsor behavior differs by stage in the project life cycle. Our current study examines empirically behavior associated with the role of a project sponsor during the executing stage of a project. Five distinct behavioral factors emerged for sponsors during the executing stage: build stakeholder relations; provide resources; ensure risk and quality; ensure communications; and ensure progress. Our findings indicate that building stakeholder relationships has a significant impact on the firm's future and meeting agreements; ensuring risk and quality has a significant impact on meeting agreements; and ensuring communications has a significant impact on customer success. We offer theoretical and practical explanations for our findings.

020-0158 The Effect of Group Goals and Information Transparency on Rescheduling Quality

Wout Wezel, University of Groningen, Netherlands
Cees Snoo, University of Groningen, Netherlands

In many firms, execution of production schedules is disturbed throughout the day by events such as rush orders, machine breakdowns, and material availability problems. After such a disruption, a schedule must be revised as fast as possible to prevent idle time or tardy orders. In cases where departments have distinct but mutually interdependent schedules, changes must be coordinated carefully, and human schedulers must communicate to find solutions that are feasible for all departments involved. To find out whether information transparency and goal sharing are important for coordination and communication behavior in such circumstances, we performed a laboratory experiment with two hundred undergraduate business students. The findings show that global performance is higher when individual schedulers focus on their own department goal compared to schedulers pursuing global firm goals. Furthermore, being able to view each other's schedules only leads to higher performance when pursuing a global firm goal.

020-0601 The Influence of Safety-Specific Transformational Leadership, Safety Consciousness, and Hazard-Reducing Systems on Warehouse Accidents

René De Koster, Rotterdam School of Management, Erasmus University, Netherlands
Daan Stam, Rotterdam School of Management, Erasmus University, Netherlands
Bert Balk, Rotterdam School of Management., Erasmus University, Netherlands

The present research investigates antecedents of safety performance in warehouses. Specifically, in 78 Dutch warehouses we studied what factors influence the

number of accidents that occurred in the past 3.5 years. Based on prior research in (behavioral) operations management, safety management, and organizational behavior, we identified hazard reducing systems (HRS), safety-specific transformational leadership (SSTL), and safety consciousness (SC) as potential predictors of safety performance. Path analysis on data from a survey amongst 78 warehouse managers and 1033 warehouse employees showed that SSTL is a key predictor of safety performance. It affects safety performance directly (contrary to our expectations SC does not mediate this relationship) and also acts as a mediator of the relation of HRS and safety performance. Subsequently, we propose that leaders may be critical in fostering safety on the work floor.

18 Friday, 08:00 AM - 09:30 AM, Naples 4 *Track:* CSC, 1 *Chair:* Philip Moscoso

Session: Operations, Source of Competitive Advantage in Fashion Business

020-0234 The Lead-time and Sell-thru Connection in the Fast Fashion Business

Philip Moscoso, IESE Business School, University of Navarra, Spain
Alejandro Lago, IESE Business School, University of Navarra, Spain
Victor Martinez de Albeniz, IESE Business School, University of Navarra, Spain

This paper studies empirically if differences in supply lead-times due to different suppliers exert an influence on product sell-thru in fast fashion companies. POS sell-thru data over a year for different SKUs of a particular company is analyzed. It is shown that shorter supply lead-times generally improve product sell-thrus, but assortment decisions may mitigate the effect.

020-0392 The Impact of Sourcing Strategies on Supplier Incentives for Short Life-Cycle Goods

Eduard Calvo, IESE Business School, Spain
Victor Martinez de Albeniz, IESE Business School, Spain

Multiple sourcing with quick response has been recognized as a useful tool to manage demand risk for short life-cycle goods, e.g., in apparel fashion items. However, general wisdom has traditionally ignored the effect of these practices on supplier incentives. In this paper we find that when suppliers take pricing decisions, multiple sourcing does not always lead to higher supply chain efficiency nor buyer profits as compared to single sourcing. Specifically, multiple sourcing may lead to higher price quotes from suppliers as the threat of losing business is not credible anymore. That is, the effects of double marginalization may offset the potential increase in supply chain profit due to higher ordering flexibility.

020-0797 Towards Multi-objective Decision Support for On-line Shopping

Afshin Mansouri, Brunel University West London, United Kingdom
Emel Aktas, Brunel University West London, United Kingdom
David Gallear, Brunel University West London, United Kingdom
Davood Golmohammadi, University of Massachusetts Boston, United States

This paper addresses application of multi-objective optimization (MOO) to support informed decision making in on-line shopping. Typical supply chain decisions in online shopping and the capabilities of MOO to enhance decision making across the chain are examined. Application of the proposed methodology is demonstrated through a case inspired from a real application in kitchen appliances industry. In this case, there is a trade-off for online retailer between total purchase/delivery cost and delivery due date. The customer makes product choice from the online catalogue specifying the earliest and latest dates to receive the product. Based on the supply chain status, the multi-objective optimizer provides Pareto optimal (or a good approximation of it) to the customer for fast trade-off analysis. The paper concludes with practical implications and challenges for the implementation of the proposed model as a business solution and highlights the avenues for further research.

020-0331 Analyzing Store-level Inventory Record Inaccuracy

Rogelio Oliva, Texas A&M University, United States
Howard Hao-Chun Chuang, Texas A&M University, United States
Subodha Kumar, Texas A&M University, United States

Motivated by previous studies addressing item-level inventory record inaccuracy (IRI) in the retail sector, this paper broadens the unit of analysis and develops a system dynamics model to address store-level IRI. As opposed to existent studies that impose peculiar distributional assumptions on the magnitude of IRI, we empirically estimate the hazard rate and the conditional probability mass of IRI by using a data set from a Spanish retailer. We derive the equilibrium of information degradation out of the system dynamics model and use the empirical estimates to infer unobservable parameters (e.g., inspection efficacy). The forgoing modeling efforts enable us to analytically derive the optimal stock inspection policy. We are currently working on the optimal joint inspection and replenishment policies.

19 Friday, 08:00 AM - 09:30 AM, Naples 6 *Track:* CSC, 14 *Chair:* Ganeshkumar Chandirasekaran
Session: Conceptual/Frameworks

020-0597 Supply Chain Management Practices and Firm Performance: Development of Constructs and Propositions

Nambirajan Thangasamy, Pondicherry University, India
Ganeshkumar Chandirasekaran, Pondicherry University, India

The objective of this research work is to review the existing literature on supply chain management (SCM) practices with respect to firm performance and present key insights. Research papers from high-quality, international refereed journals have been critically reviewed. Research issues are explored under five categories namely supply chain practices, supply chain concerns, supply chain competency, supply chain strategy and firm performance. This has resulted in the development of key constructs and propositions. The research outcomes are given below: (1) authors summarize the existing literature on supply chain management practices with respect to firm performance and classify the literature based on the nature of work and contributions,(2) authors present the overall approach towards the development of constructs, (3) authors present research questions leading to key proposition for further research and (4) authors report the key findings and insights.

020-0475 The Contribution of Selected Manufacturing Practices to Achieve Product Customization in Supply Chains: A Cross-industrial Comparison

Artur Swierczek, University of Economics, Poland

The era of mass customization requires supply chains to manufacture and deliver products catering to individual and refined customers' preferences. Therefore, from the supply chain standpoint, it is necessary to identify different generic groupings of the products which fulfill specific customers' needs. One of these categorizations is highly customized products accomplished through product configuration and its appropriate design. It enables customers to make a choice between components and assemble them to form many different and desired product offerings. The aim of the paper is to identify and estimate the role of selected manufacturing practices in product customization in supply chains. In order to achieve this goal, the relationships among the obtained levels of product customization and manufacturing practices in supply chains will be investigated.

020-0634 Positioning of the Order Penetration Point (OPP): A Supply Chain View

Luiz Felipe Scavarda, DEI / Pontifícia Universidade Católica do Rio de Janeiro, Brazil
Katja Klingebiel, TU Dortmund and Fraunhofer IML, Germany
Annibal Scavarda, School of Business and Management, American University of Sharjah, United Arab Emirates
Augusto Reis, DEI / Pontifícia Universidade Católica do Rio de Janeiro & CEFET-RJ, Brazil

The order penetration point (OPP) defines the stage in the manufacturing value chain, where a particular product is linked to a specific customer order. Also viewed as the point at which real demand penetrates upstream in a supply chain and termed as a de-coupling point. With the proliferation of the number of varieties of a product (e.g., different colors, flavors, sizes, etc.), the correct positioning of the OPP becomes more important. The goal of this paper is to analyze the product variety management offered to the Brazilian automotive market. Ford passenger cars produced in Brazil are the object of study. The research embraces a supply chain perspective including upstream members like component suppliers to downstream members like the points of sale (dealers). The findings obtained in the Brazilian market are compared with the ones obtained in the European market and the resulting different OPP are discussed and analyzed.

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23 Friday, 10:00 AM - 11:30 AM, Tuscan 1 *Track:* HOM, 2 *Chair:* David Dobrzykowski
Session: Lean Healthcare

020-0553 Improving Patient Care with Six Sigma: A Collaboration between Academia and Health Care Providers

Gary LaPoint, Syracuse University, United States

Academia can come to the aid of hospitals to help improve patient care and improve operations. Working with the Whitman School of Management at Syracuse University, one area hospital hopes that by applying six sigma tools and concepts, they can decrease costs and improve patient satisfaction by reducing the length of patient stay, the number of medication errors and the number of readmits. One notable project involves a re-design of the COPD treatment process. Pilot testing and implementation of improvements is about to begin, which could result in improved patient care and millions of dollars in savings, as well as becoming a template for the treatment of other chronic illnesses.

020-0006 Lean Myths in Healthcare

Steven Bradt, Manchester Business School, United Kingdom
David Bamford, Manchester Business School, United Kingdom

This paper presents research findings regarding perceptions in the application of lean methods in health. It primarily focuses on people exposed to lean methods (Novice to Expert) who are active within a healthcare organization. Analysis methods include statement agreement (Likert) to validate empirically the degree by which perceptions have validity. The methodology was designed to be applied as a practical validation tool to establish the level of agreement regarding positive or negative perceptions within an organization, region or aggregation. The research provides a conduit of understanding where perceptions reside within health organizations and to what extent they are accepted.Early findings from the research regarding leadership's participation in the transformation highlight that only 33% of respondents felt that the executives of the organization were leading the initiative in the application of a lean approach; 66% felt that lean leadership came from lower levels within or from outside the organization.

020-0496 Partner Relationship as a Coordination Mechanism for Lean in the Healthcare Delivery Supply Chain

David Dobrzykowski, Eastern Michigan University / College of Business, United States
Mark Vonderembse, University of Toledo / College of Business and Innovation, United States
Daniela Todorova, Eastern Michigan University / College of Technology, United States

Lean has been shown to be an effective approach for integration in traditional manufacturing supply chains centralized by financial coordination mechanisms. While scholars suggest that such SCM concepts should also be applied to achieve integration in decentralized environments (e.g., the healthcare delivery supply chain), others caution that these applications can be thorny given the unique characteristics present in this context. In the absence of traditional coordination mechanisms, the behaviors of actors in decentralized supply chains can be aligned using non-financial/behavioral coordination mechanisms. This study explores behavioral coordination mechanisms in the healthcare delivery supply chain, suggesting that Partner Relationship - comprised of Trust, Commitment, and Shared Vision - can support relationships among a hospital's Leagile strategy for healthcare delivery, the use of Lean Principles, and the Integration of healthcare delivery. SEM is used to analyze data from a large-scale study of hospitals across the U.S.A., providing support for these hypothesized relationships.

24 Friday, 10:00 AM - 11:30 AM, Tuscan 2 *Track:* HOM, 16 *Chair:* Aaron Ratcliffe
Session: Strategy and Quality in Healthcare

020-0641 A Relational Leadership Perspective on Unit Level Safety Climate

Debra Thompson, University of Pittsburgh, United States
Ranjaraj Ramanujam,, Owen School of Management , Vanderbilt University, United States
Susan Sereika, University of Pittsburgh, United States
Helen Burns, University of Pittsburgh, United States
Gail Wolf, University of Pittsburgh, United States
Holly Lorenz, UPMC Health System, United States
Tamara Minnier, UPMC Health System, United States
Leslie Hoffman, University of Pittsburgh, United States

Frontline nursing leaders are viewed as critical determinants of measures to ensure patient safety. However, specific leadership behaviors that prompt actions to achieve this goal are under-examined. The purpose of this study was to compare nursing staff perceptions of safety climate in clinical units characterized by high and low ratings of Leader-Member Exchange (LMX) and explore characteristics that might account for these differences. In a cross-sectional survey of staff (n=711) and unit directors from 34 inpatient units in a large academic medical center, we found significant differences between clinical units with high and low LMX scores on five measures of safety climate: supervisors' safety expectations, organizational learning-continuous improvement, total communication, feedback and communication about errors, and nonpunitive response to errors. The LMX perspective can be used to identify differences in perceptions of safety climate. Strategies for operationalizing these findings and implications for future research will be presented.

020-0523 Measuring Quality of Care Outcomes: Scale Development for the Health Care Service Delivery Process

Emily Kohnke, Iowa State University, United States
Theekshana Somaratna, Iowa State University, United States

This study will develop a robust scale to measure quality of patient care. While there are existing scales which measure quality in the service industry, there is not one which satisfactorily addresses the complexities of the health care delivery environment. This study builds on previous work to develop service quality measures in other service industries such as SERVQUAL and the model proposed by Sánchez-Hernández et al. 2009. Based on these scales, we will develop a measure of process quality in the delivery of health care that will contribute to our understanding of the measurement of service quality in contexts where both the relational and tangible aspects of the service are important to outcomes. The resulting scale will measure the quality of the health care service process and be useful in studies of health care performance improvement initiatives to examine service process quality and customer satisfaction outcomes.

020-0312 Capacity Increase in the Private Hospital Market

Walter Cintra Ferreira Jr, FGV-EAESP, Brazil
Ana Maria Malik, FGV-EAESP, Brazil

There is a general understanding that the number of hospital beds is decreasing. Brazilian statistics show that there is an overall decrease in the number of beds, mostly due to private hospitals (public ones are growing). In São Paulo it is being recognized that the number of private hospital beds is increasing. Our objectives are to understand the reasons for the general tendency not being followed in São Paulo, Brazil; how decisions are made,their financing and their internal communication processes. Methods include interviews with hospital CEOs regarding decision making, operations management, communication and financing processes leading to bed increase. Results indicate that different hospitals have different strategies. External consulting is not often used for decision

making, but for implementation. Eventually, emerging/reactive strategy is the prevalent model, instead of market studies. Increase in demand is considered a key motive. We conclude that competition is an important driver. There are mostly general beds, for a wealthier population.

020-0748 Optimal Quality and Capacity under Health Provider Competition

Aaron Ratcliffe, University of North Carolina at Chapel Hill - Kenan-Flagler Business School, United States
Wendell Gilland, University of North Carolina at Chapel Hill - Kenan-Flagler Business School, United States
Ann Marucheck, University of North Carolina at Chapel Hill - Kenan-Flagler Business School, United States

Quality, access, affordability, and efficiency are key strategic objectives for effective health service delivery. Health insurance and imperfect information create moral hazards for consumers, reinforcing the importance of non-price competition in health services. Managed care attempts to modify incentives and control costs by negotiating prices and directing access and utilization. We develop an equilibrium queuing model to investigate operational implications of provider competition for insured, wait-sensitive patients. Providers are represented as single-server queues which maximize profits by optimizing quality and capacity. Customers join a queue or balk to maximize expected utility comprised of service valuation, copayment, and expected waiting time. We characterize the Nash equilibrium for the duopoly and compare results with the monopoly and social welfare optimization. We extend our results to include fixed budgets and correlations between quality and capacity, and study the role of managed care through third-party pricing models.

25 Friday, 10:00 AM - 11:30 AM, Tuscan 3 *Track:* OMM, 1 *Chair:* Dennis Yu
Session: Operations Management in Competition

020-1053 Quality, Entry Deterrence, and Competition

Ozgen Karaer, Gap Inc., United States
Feryal Erhun, Stanford University, United States

We analyze the role of quality, an attribute of a product that increases consumers' willingness to buy, as a competitive tool in a quality-price setting. We study a potential entry model where the incumbent uses quality as deterrent when faced with a potential entrant, and an inevitable entry model where the entry takes place independent of the incumbent's strategies. With the potential entry model, we investigate conditions motivating the incumbent to blockade, to deter, or to accommodate the entrant. Interestingly, the incumbent may under-invest in quality to enable the entrant's market penetration. With the inevitable entry model, we study timing effects and collaboration in the duopoly market. We show first- and second-mover advantages are dependent on market conditions, and collaboration benefits the firms but not the end consumers. Finally, we extend our quality model to broader settings and explain some pricing trends in the video game console market.

020-0935 Stockouts and Retail Competition

Yan Dong, University of Maryland, United States
Kefeng Xu, University of Texas, San Antonio, United States

We study stockouts and recovery as firms' competitive strategies in a retailing environment where order lead times are long. The uncertainty of market demand leads to stockouts as service failures and requires the retailers to find ways to salvage the unfulfilled demands. To compete more effectively and efficiently, retailers need to take into consideration stockouts and recovery measures when making pricing decisions. Our research explores firms' competitive strategies in this environment, and insights as to how such strategies respond to environmental factors.

020-0196 Optimal Pricing and Referral Reward Programs under Competition

Run Niu, Webster University, United States
Paul Messinger, University of Alberta, Canada

Referral reward programs can be successfully used to promote both services and tangible products. In this paper, we model and analyze optimal pricing and referral reward programs for two competing firms. We model and analyze two general competing firms selling substitutable products or services to a common pool of potential customers. We formulate three-stage simultaneous games between two firms: timing strategy in the first stage (easy access or restricted access), levels of rewards in the second stage, and retail prices in the third stage. We find that the more rewards the firms offer, the more they benefit with easy access programs. The best strategy for both firms is to offer the same timing strategy with absolute rewards. However, which strategy is better depends on demand functions, successful referral rates, and levels of rewards. When offering percentage rewards, it is always best for both firms to offer easy access programs.

020-0486 Price and Capacity Competition in a Differentiated Products Duopoly under Demand Uncertainty

Dennis Yu, Clarkson University, United States
Betul Lus, SUNY Empire State College, United States

We explore a firm's optimal product differentiation and capacity decisions under duopoly competition. We consider both simultaneous and Stackelberg games. The customers are heterogeneous in their evaluation of the product quality. The unit capacity cost is an increasing function of design quality. When the market size is deterministic, both simultaneous and Stackelberg games yield unique equilibrium of quality and capacity. The leader of the Stackelberg game always produces high quality product. When there is uncertainty in the market size, we study the games where the firms design the products and set production capacity before demand realization and price the products after demand is realized. Our result indicates that there exists unique asymmetric equilibrium of production capacity in both simultaneous and Stackelberg games.

26 Friday, 10:00 AM - 11:30 AM, Tuscan 4 *Track:* ESO, 2 *Chair:* René De Koster
Session: Low Carbon Supply Networks

020-0360 A Maturity Model for the Strategic Design of Sustainable Supply Networks

David Kirkwood, University of Cambridge, United Kingdom
Leila Alinaghian, University of Cambridge, United Kingdom
Jagjit Srai, University of Cambridge, United Kingdom

Global supply network (SN) design has developed in recent years from traditional lowest landed-cost analysis to the more strategic concept of SN configurations that drive the selection of particular archetype network structures of constituent actors which have a complementary set of operational capabilities. These approaches have required the development of supply chain maturity models that support SN analysis and design. The growing global emphasis on the sustainability agenda has driven industrial practitioners to increasingly report on corporate social responsibility and triple bottom line, and whilst some corporate sustainability maturity models exist there is only a nascent understanding of the importance of the supply network. From a consideration of recent literature in sustainability maturity models and supply network design, a framework is proposed that enables an objective means for both evaluating network maturity and informing reconfiguration for improved sustainability performance.

020-0913 Low Carbon Supply Network Management: From Footprint to Redesign

Jialun Hu, University of Cambridge, United Kingdom
Yongjiang Shi, University of Cambridge, United Kingdom

Significant movement is expected towards low carbon emission supply chain development. Reviewing the current literature it is found that while empirical research on the carbon efficient supply chain models has emerged, a practical framework for combining low carbon concerns with supply chain design is still not yet adequately addressed. This paper aims to propose a preliminary model of low carbon supply chain to help practitioners and researchers to understand this topic. A review of low carbon emission SCM literature is presented here depicting this emerging field. Eight sub-issues in supply chain are identified as important in reducing carbon emission, and analyzed following the process of footprinting, improving and redesigning. Practical case studies in ICT and automotive industries are detailed and analyzed to support the model. In sum, this research delivers a preliminary low carbon supply network framework and current industry practices reflecting the model, contributing to the supply network design theory.

020-0483 Non-dominated Time Window Policies in City Distribution

René De Koster, Rotterdam School of Management, Erasmus University, Netherlands
Derya Akyol, Dokuz Eylul University, Turkey

Urban freight contributes significantly to pollution, traffic congestion, and safety problems in city centers. In response, many cities have introduced time-access restrictions. Setting time windows is challenging due to the conflicting interests and objectives of the stakeholders involved. We develop a framework for balancing retailer (costs), municipality (satisfaction), and environmental (emissions) objectives, using data envelopment analysis (DEA), under different urban time-window policies. Based on data of three Dutch retail organizations, with a large number of stores affected by such time windows, our results show that time windows harmonized between cities result in the best overall performance. The currently used time window policies appear to perform rather poorly and can be improved in costs for the retailers, satisfaction of the cities and pollutant emissions alike.

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Friday, 10:00 AM - 11:30 AM, Tuscan 5 *Track:* ESO, 15 *Chair:* Brian Jacobs
Session: Green and Financial Performance

020-0106 The Impact of Alliances on Firm Level Emissions and Financial Performance

Brian Jacobs, Michigan State University, United States
Sriram Narayanan, Michigan State University, United States
Sachin Modi, University of Toledo, United States

The positive correlation between firm environmental performance and financial performance is usually attributed to the efficiency gains and reputational benefits of pollution prevention and waste reduction. However, anecdotal evidence indicates that some firms improve their environmental performance by outsourcing dirty processes. In this study, we examine the association between firm alliances and firm emissions as an indication of whether firms are achieving environmental performance improvements through outsourcing. We also consider whether such strategies translate into improved financial performance.

020-0562 Impact of Green Supply Chain Management Initiatives on Firm Value

Raktim Pal, James Madison University, United States
Indranil Bose, The University of Hong Kong, Hong Kong

In recent times, an increasing number of firms have taken various green supply chain management (GSCM) initiatives. However, how much value such initiatives generate remains a topic for debate. We use event study method to analyze the change in stock price of firms due to implementation of GCSM practices. We analyze 104 announcements related to GSCM and determine what causes statistically significant gain in stock prices for these firms. Manufacturing firms, firms with high R&D expenses, and early adopters show a strong increase in stock prices on the day of the announcement. At the same time, small firms, firms not well -known for taking green initiatives, as well as firms with low growth potential considerably surprise the market when they make such announcements. Our analysis substantiates that adoption of green supply chain practice indeed creates value and the promise of success is not limited to only a few elite firms.

020-0610 The Effect of Investment in Intangible Assets on Firms Performance

Zhi Tao, Kent State University, United States
O.Felix Offodile, Kent State University, United States

Increasing competition in the market place is continually forcing firms to change their investment paradigm from real assets to intangible assets as new engines of long-term success. The purpose of this paper is to investigate how three major intangible assets (marketing, R&D, human capital) affect a firm's financial performance, especially during normal and recessionary economy. Results from our study show that investments in intangible assets provide financial returns in current and successive years of the investment. Further, during a normal economy, firms invest aggressively on intangible resources in an attempt to create sustainable advantage over competitors. However, during a recessionary economy, firms tend to minimize these investments.

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Friday, 10:00 AM - 11:30 AM, Tuscan 6 *Track:* TEC, 2 *Chair:* Gokcen Arkali
Session: Evolution of Ideas and Knowledge in Technology Management

020-0937 Art, Science, Knowledge, and Control in Technology Evolution

Roger Bohn, UC San Diego, United States

This paper analyzes the spectrum from art to science in technologies and industries. My first claim is that all technologies can be placed on this spectrum, including nontraditional technologies like professional sports, diplomacy, and crime. Second, in all cases that I have examined closely, the progression is along two axes simultaneously: 1) how the technology is controlled, and the accompanying procedural knowledge, and 2) how the technology is understood, meaning causal knowledge. Third, when examined over long periods (decades or centuries) economically important technologies tend to evolve from art toward science. Yet many technologies are today far from science, which has many possible explanations that I will speculate about. Finally, I propose that the art-science progression should be taught to our students much as we teach the Product-Process Matrix. For example, it provides ways to describe and predict OM properties of emerging technologies.

020-0761 The Evolution of Project Management Research: A Citation Analysis

Dwight Smith-Daniels, Raj Soin College of Business, Wright State University, United States

We perform citation analysis for the major journals and publications in Project Management to reveal the evolution of the intellectual structure of the field between 1980 and 2010. This time span includes the growth of field as a recognized discipline and expansion beyond a narrow focus on project scheduling in the Operations Management literature. Our study provides statistical analysis providing the major intellectual shifts in the field during this time span.

020-0625 Information Technology Risk and Return Trade-Off: New Evidence from Recent Data

Gokcen Arkali, Istanbul Sehir University, Turkey
Indranil Bardhan, University of Texas at Dallas, United States
Vish Krishnan, Unversity of California at San Diego, United States

Prior literature is rich in terms of the productivity and profitability impact of IT but is limited in terms of explaining IT risk-return relationship. Even the existing research on the impact of IT investments on firm risk measures, such as earnings or stock-returns volatility, is not well established. A recent empirical study by Dewan, Shi, and Gurbaxani (2007) has established a link between IT risk and IT return using a production function framework. However, their dataset spans a time period which does not allow them to see the impact of the post-Internet era. We conduct a replication analysis of Dewan, Shi, and Gurbaxani (2007) with a recent and unique dataset to test their findings and interpret the differences that we discover. While we find little support for the relative contribution of IT on firm risk, we support the highly positive return on IT among high IT risk firms.

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29 Friday, 10:00 AM - 11:30 AM, Tuscan 7 *Track:* PDI, 2 *Chair:* Metin Cakanyildirim
Session: Analyzing New Product Development

020-1046 Single/Dual Rollover Version Introduction Strategies: Dual Rollover Backfires with Many Strategic Customers

Chao Liang, School of Management, The University of Texas at Dallas, United States
Metin Cakanyildirim, School of Management, The University of Texas at Dallas, United States
Suresh Sethi, School of Management, The University of Texas at Dallas, United States

Frequent product version introductions and shorter version life cycles, especially in the high-tech and fashion industries, emphasize the importance of version rollover strategies - how to phase out the old version while introducing the new version. We study two primary rollover strategies: single (-product) rollover and dual (-product) rollover. With single rollover, the company stops selling the old version as soon as the new version is introduced. With dual rollover, the old version remains in the same market together with the new version. We study the interaction between product rollover strategies with strategic consumers' waiting behavior. Our analysis shows that single rollover can outperform dual rollover under certain conditions regardless of the innovation of the new version over the old version. These conditions are pretty general unless the innovation rate is very high.

020-0580 Analytical Modeling of the Effect of Modularity on New Product Development

Jebum Pyun, Korea University / Business School, Korea, Republic of (South Korea)
Myung-sub Park, Korea University / Business School, Korea, Republic of (South Korea)
DaeSoo Kim, Korea University / Business School, Korea, Republic of (South Korea)

As customers' needs grow more diversified, the issue of product variety has become more important. While increasing product variety can better satisfy diverse customers' needs, it also poses additional problems in manufacturing operations. Consequently, firms introduce modularity in making products to mitigate negative effects of product variety and increase operational performance. The extant literature has studied the benefits of modularity in designing sub-assemblies or end products. Nonetheless there are only a few studies that analytically investigate the effect of modularity in new product development. Therefore, this study intends to develop an analytical model for exploring the effect of modularity when a component from new technology is introduced into an existing product, in order to provide important managerial implications to the practice.

020-0922 Design of Green Product: The Impact of Development Cost

Chunming Shi, Wilfrid Laurier University, Canada

We develop a model analyzing green product design considering development cost. We show that two ratios play an important role when designing the levels of ordinary quality and environmental quality: the market ratio of green consumers and the valuation of green quality by green consumers compared with ordinary consumers.

020-0289 Aligning Product Architecture and Supply Chain Management: Lessons from a Survey

Pamela Danese, University of Padova/DTG, Italy
Pietro Romano, University of Udine/DIEGM, Italy
Thomas Bortolotti, University of Udine, Italy

Modularity is a key choice in product architecture that literature usually associates with improvements in different competitive performances of a firm, such as costs, quality, flexibility, manufacturing cycle time and customer service. In particular, several authors pose that product modularity can guarantee performance improvements by assuring a better integration of suppliers with the focal company. This paper analyzes the influence of product modularity on operational performance and the mediating effect on this relationship of supplier integration. This study uses data from the third round of the High Performance Manufacturing (HPM) project data set. The analyses are based on a sample of 266 manufacturing plants settled in several countries around the world. To test the existence of the mediation effect, a structural modelling comparison approach was applied. Results found demonstrate that there is a positive relationship between product modularity and operational performance, and that supplier integration mediates this relationship.

020-0315 Product Innovation: An Empirical Study into the Impact of Simultaneous Engineering on New Product Quality

Beatriz Minguela Rata, Universidad Complutense de Madrid, Spain
Francesco Sandulli, Universidad Complutense de Madrid, Spain
Jose Fernández-Menéndez, Universidad Complutense de Madrid, Spain
José López-Sánchez, Universidad Complutense de Madrid, Spain

The importance of new product development in remaining competitive, as well as of their quality as a source of competitive advantage, is unquestioned. What is in doubt is the traditional way of implementing the development process because experience shows that satisfactory levels of quality are not always reached in new products. The purpose of this paper is to analyze the impact of a practical alternative, simultaneous engineering (through its fundamental principles), on the increase in quality of new products. A linear regression analysis is run on a sample of innovative companies in Spain from a medium-high technology sector (manufacturers of electronic components, radio, television, communications equipment). The results appear to indicate that simultaneous engineering can account for the rise in new product quality. Early involvement is the basic principle which has no effect on new product quality, and the use of multifunctional teams has the greatest effect on this variable.

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30 Friday, 10:00 AM - 11:30 AM, Tuscan 8 *Track:* ERS, 2 *Chair:* Mei Cao Gernot Kaiser
Session: Empirical Research in OM II

020-0150 Exploring the Relationship between Information Sharing, Information Quality and Customer Integration: A Contingency Perspective

Roberto Chavez, ESADE Business School, Spain
Brian Fynes, University College Dublin, Ireland

Cristina Gimenez, ESADE Business School, Spain
Frank Wiengarten, ESADE Business School, Spain

Customer integration is a fundamental principle of supply chain management, which is closely related to information sharing. However, there is little empirical research that draws linkages between these constructs. Furthermore, while information sharing offers great potential for customer integration, recent empirical evidence suggests that more information does not necessarily imply more value. Research should focus on contextual aspects and couple them with information sharing practices. More specifically, research should look at the quality of information as well. We address these gaps in the literature through the following research questions: 1) To what extent do information sharing and information quality impact upon customer integration, 2) To what extent is the relationship between information sharing and customer integration contingent upon information quality. The data was obtained through a survey of 228 manufacturing companies in the Republic of Ireland, and the data analysed using ordinary least square regression analyses.

020-0296 The Interactions between Internal and External Integration and Their Combined Effects on Operational Performance

Chee Wong, Hull Business School & Logistics Institute, United Kingdom
Sakun Boon-itt, Thammasat Business School, Thailand

There has been a need for firms to look both inside and outside their organizations for opportunities to collaborate to ensure they can response to dynamic market needs. However, there is so far no conclusion on how internal and external integration may interact. A previous study found that the impact of external integration on performance was indirect and it is mediated by internal integration. The purpose of this paper is to clarify and test the interactions between internal and external integration and their combined effects on operational performance. Based on 151 responses from the automotive industry in Thailand, our multiple regression models indicate that the interactions between internal and external integration positively affected product innovation, product quality and production cost but not delivery performance and production flexibility. This paper contributes to the efforts in the development of a contingency theory for supply chain integration.

020-0966 Mediating Effect of Supply Chain Collaboration on IOS Enabled Innovation

Mei Cao, University of Wisconsin-Superior, United States
Qingyu Zhang, Arkansas State University, United States

To respond to the dynamic environment, firms have striven to achieve greater process, product, and service innovation via supply chain collaboration, by leveraging the resources and knowledge of their supply chain partners. Interorganizational systems (IOS) further extend firms' opportunities to strengthen their supply chain partnerships and create innovation. The objective of the study is to explore the impact of IOS appropriation and supply chain collaboration on innovation. Data were collected through a Web survey of U.S. manufacturing firms in various industries. The statistical methods used include confirmatory factor analysis and structural equation modeling (i.e., LISREL). The results indicate that IOS appropriation supports supply chain collaboration, which in turn improves innovation. Supply chain collaboration completely mediates the relationship between IOS use for integration and innovation, while it partially mediate the relationship between IOS use for communication and innovation and between IOS use for intelligence and innovation.

020-0862 Does Attitude Matter? Supply Chain Integration's Impact on Performance

Inga-Lena Darkow, EBS Business School, Germany
Gernot Kaiser, EBS Business School, Germany

This study extends the developing body of literature on supply chain integration (SCI). The previous literature is inconsistent in its findings about the relationship between SCI and supply chain performance. We attribute this to incomplete perspectives of SCI, in particular the tendency to focus on attitudes, patterns or practices only. In this study, we report the results of a survey-based analysis conducted with supply chain professionals from 122 multi-national companies based in Germany. Utilizing partial least squares structural (PLS) equation modelling techniques, we show that (i) applying an interaction model of the three perspectives attitudes, patterns and practices has a strong association to supply chain performance, (ii) the integration "triangle" (attitude-patterns-practices) can be observed for internal and supplier integration more clearly than for customer integration. Consequently, in order to impact performance by supplier and internal integration, companies need to be willing and capable of integration and apply the right tools.

31 Friday, 10:00 AM - 11:30 AM, Tuscan 9 *Track:* BOM, 2 *Chair:* Kay-Yut Chen
Session: Trust, Reciprocity, and Rationality

020-0384 Kindness Can be Expensive: A Model of Reciprocity in the Service Industry

Kay-Yut Chen, Hewlett-Packard Laboratories, United States
Claudia Márquez-Nava, Instituto Tecnológico de Estudios Superiores de Monterrey, Mexico
Pano Santos, Hewlett-Packard Laboratories, United States
Alex Zhang, Hewlett-Packard Laboratories, United States

Service firms depend on the performance of their employees. Recent research has shown that behavioral and social factors can have a significant impact on workers' productivity. In particular, reciprocity has been identified as an important one of such factors. In this paper, we examine the effect of reciprocity in a dual service-labor market. We analyze both a monopoly case and a competitive scenario where two firms compete both in the labor market and the service market. Reciprocity is modeled as a response to a reference wage. We show that higher level of reciprocity can lead to lower profits for the firms and lower wages for workers. In addition, we characterize the conditions when reciprocity is harmful, and when reciprocity is beneficial. These results are robust with respect to several variations in the setting and model specifications.

020-0577 Calibrating Individual Behavior for Contract Design

Diana Wu, University of Kansas, United States
Kay-Yut Chen, HP Research Labs, United States

Traditional supply chain contract design theory assumes expected utility maximizing agents. Recent experimental studies have shown that bounded rational models explain decision-making behavior better. In this paper, we show that the optimal contract depends on the level of bounded rationality of a newsvendor. Thus, it is important, in the context of contract design, to calibrate levels of bounded rationality of individuals, in addition to modeling its structure. In particular, we model two aspects of bounded rationality, probabilistic choice and anchoring. Human experiments were conducted under four types of supply chain contracts. We found that people are heterogeneous, and the levels of bounded rationality are distributed in a wide range. However, the levels of bounded rationality seem to be consistent over time and across individuals. Lastly, we discover that the levels of probabilistic choice and anchoring are highly correlated across individuals, which suggests that a deeper cognitive structure is driving these behaviors.

020-0558 Monthly Warranties in a Heterogeneous Market with Dynamic Learning

Guillermo Gallego, Columbia University, United States
Ruxian Wang, Columbia University, United States
Julie Ward, HP Laboratories, United States

Ming Hu, University of Toronto, Canada
Jose Luis Beltran, HP Laboratories, United States
Enis Kayis, HP Laboratories, United States
Shelen Jain, HP Laboratories, United States

Steep price declines and frequent technology improvements in industries like consumer electronics adversely impact the sale of extended warranties since product replacement upon failure is an increasingly attractive alternative to buying extended warranties. To make warranties more appealing, we propose offering flexible-durationextended warranties, like monthly billing with month-by-month commitments. Customers update their beliefs of the product reliability over time and make warranty continuation decisions accordingly. These new warranties can appeal to those who are uncertain about the product's reliability and to those who are uncertain about how long they will keep the product. We present an analytical model of the customer's optimal warranty coverage decisions under the objective of minimizing expected support costs over a finite horizon. We show that under some mild conditions, the customer's optimal coverage policy has a threshold structure. We also show through numerical studies how monthly warranties can result in higher profits and attach rates.

020-0791 Supply Chain Risk Orientation: The Path Towards a Risk-conscious Culture

Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland
Nikrouz Neshat, Swiss Federal Institute of Technology Zurich, Switzerland
Christoph Bode, Swiss Federal Institute of Technology Zurich, Switzerland

Organizational culture has often been suggested to be an important factor for successfully coping with supply chain risks. Indeed, there is empirical evidence to suggest that firms with different organizational cultures may respond quite differently to the risk of supply chain disruptions. Still, the current knowledge about the link between culture and supply chain risk management is limited. To fill this gap, this paper theoretically connects supply chain risk management to the broader literature on business orientations to propose and conceptualize the construct of supply chain risk orientation. Based on a thorough review of the supply chain risk and organizational culture literature, we propose a framework which delineates how supply chain risk orientation is able to explain a firm's superior performance in turbulent supply chain environments.

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32 Friday, 10:00 AM - 11:30 AM, Tuscan 10 *Track:* ICM, 2 *Chair:* Metin Cakanyildirim
Session: Inventory Management under Incomplete Information

020-0992 Partially Observed Inventory: The Case of a Cash Register

Alain Bensoussan, University of Texas at Dallas, United States
Metin Cakanyildirim, University of Texas at Dallas, United States
Meng Li, University of Texas at Dallas, United States
Suresh Sethi, University of Texas at Dallas, United States

Due to shrinkage, theft, misplacement, actual inventory levels are not exactly known in practice. Inventory managers have databases to keep inventory records, which systematically differ from actual inventory levels. These managers can refine their inventory information with the inventory records to improve ordering decisions. Methodologies are presented for refining information via Bayesian updating and then making decisions. These methodologies are also numerically applied to various problem instances.

020-0745 Analysis of Forecast Accuracy under Incomplete Data

Burcu Aydin, HP Laboratories, United States
Kemal Guler, HP Laboratories, United States
Enis Kayis, HP Laboratories, United States
Mehmet Sayal, HP Laboratories, United States

This work focuses on a crucial success element in Collaborative Inventory Management (CIM) processes: accuracy of information shared between parties. One of the core concepts in CIM is the management of inventory levels according to the forecasted demand and supply of both parties. The success of inventory management depends on the accuracy of the forecasts issued by each side to the other. The task of measuring this accuracy can get complicated when some of the necessary data is missing. In this work we investigate a CIM model where the issued forecasts and inventory levels (supply) are available, but the actual demand information is missing. To estimate the demand we define a novel version of the Switching Model where backlogging demand from one period to the next is allowed. We propose and compare methods to solve this model, and give a discussion on numerical analysis.

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33 Friday, 10:00 AM - 11:30 AM, Tuscan 11 *Track:* SOM, 2 *Chair:* Mats Winroth
Session: Servitisation

020-0338 Realizing Apt Value Through Servitization: A Framework

Julie Paquette, HEC Montréal, Canada
Larry Menor, Richard Ivey School of Business, The University of Western Ontario, Canada

This research addresses the need to advance trans-disciplinary theory and understanding on the management of servitization strategies that enable value realization for customers and for the firm. First, we present a research model that posits the need to manage four sequenced facets of servitization quality and value management: defining value opportunities, designing a servitization strategy, delivering this strategy effectively and diagnosing the strategy's efficacy in terms of value realization. Second, we report findings emanating from an empirical study of the relationship between servitization strategy and value realization. Our research highlights (1) the multidimensionality of value realization in the servitization context, (2) the criticality for organizations pursuing a servitization strategy to dynamically align value opportunities with provider-based design and delivery considerations and (3) the need for a servitization logic informed equally by both provider and customer perspectives on service in order to advance productive decision making and action-and generate good science.

020-0244 Designing Servitized Offerings in Manufacturing Organisations

Richard Clayton, Loughborough University, United Kingdom
Chris Backhouse, Loughborough University, United Kingdom
Samir Dani, Loughborough University, United Kingdom
Jeremy Lovell, Bombardier Transportation, United Kingdom

Driven by the highly cyclical nature of their increasingly commoditised product offerings, many manufacturers are seeing the benefits of offering services. Academic literature is almost unanimous in advocating the value of a servitization strategy, however, few studies seek to help manufacturers design product-service offerings. This research paper addresses this knowledge gap, reporting the use of a new process to aid practitioners create integrated product-service offerings. The output of a four-year Engineering Doctorate research programme, the process is presented and discussed with reference to the relevant literature. Furthermore, the research paper reports on the application of the process in a global transportation company whose aim was to create a step change in service

capability through new product-service offerings. The application identified that two recurring themes are important - the value of the new offerings and the product-service design dimensions. These themes are explored and discussed.

020-0134 A Lean Perspective on Servitization of Manufacturing

Mats Winroth, Chalmers University of Technology, Sweden
Glenn Johansson, Jönköping University, School of Engineering, Sweden

Servitization of manufacturing is a fairly recent approach addressed in literature. The term is recognized as the process of creating value by integrating products with services. Servitization is supposed to contribute to a sustainable society through its potential to support dematerialization, i.e. reduction of materials used in production and consumption. Key aspects of lean are resource efficiency and customer-orientation. Though lean production has gained a high degree of attention, few studies have addressed the potential relationships between lean and servitization. Servitization is however not only relevant from a sustainability perspective, but can be regarded as “the next step” to create user value. This paper aims at providing a better understanding of the relationships between lean and servitization through an analysis of literature where the lean and servitization approaches are compared and contrasted. The underlying assumption is that a lean approach might support a manufacturing organization’s transition towards a servitization organization.

34 Friday, 10:00 AM - 11:30 AM, Roma 1,2 *Track:* LOM, 1 *Chair:* Xin Jin
Session: Network Design & Capabilities

020-0924 The Role of Logistics Capabilities in Creating Supply Chain Resilience: A Country Comparison

Serhiy Ponomarov, University of Tennessee, United States
Mary Holcomb, University of Tennessee, United States

Logistics and supply chain capabilities, categorized into demand-, supply-, and information management groups, have been shown to lead to improved firm performance and sustainable competitive advantage for the firm. Capabilities, however, are often difficult to sustain under conditions of uncertainty. Yet supply chain operations have built-in uncertainty and risk involving a multitude of processes and activities that are interrelated and mutually dependent. It is essential that firms understand these inherent vulnerabilities, and build capabilities that efficiently and effectively manage them. This research examines the role that logistics capabilities play in developing resilient supply chains designed to incorporate event readiness, provide an efficient response to critical events, and be capable of recovering to their original state or even better post-disruptive event. A comparative analysis of North American to European Economic Area firms is also presented to demonstrate regional specifics and effectiveness of risk mitigation approaches.

020-0934 A Configuration and Capability Framework for Last-mile Logistics Systems

Xin Jin, University of Cambridge, United Kingdom

This paper explores the structure and capability of last-mile logistics systems. A new classification of systems is proposed. New insights into the capabilities of various configurations of last-mile logistics systems are used to provide the basis for a practical approach to strategy development and system design. The last-mile strategy tends to be a new way to bridge the two extremes of low cost versus high service, but little systematic research has focused on this new type of logistics system. The research aims to answer the following key questions: •How might last-mile logistics systems best be represented?•How might last-mile logistics systems be properly configured?•What capabilities can be provided by last-mile logistics systems?The research proceeded through three stages - theory construction, validation and illustration, and workbook design and implementation. This paper provides new understanding about the structures and capabilities of last-mile logistics systems. It also opens the way for deepening the discussion on attributes of last-mile logistics systems and exploring system design process.

020-1077 International freight forwarder selection criteria: an AHP based evaluation from Indian shippers’ perspective

Kannan Vanumamalai, Department of Management, Birla Institute of Technology, India

The purpose of this paper is to assist international freight forwarders (IFFs) in devising effective marketing strategies to attract and retain Indian shippers by letting them understand the list of criteria Indian shippers use in their IFF selection decisions along with the amount of importance they assign to each criterion. The criteria were explored from transportation literature, SERVQUAL, telephonic interviews and focus group interview. To evaluate the criteria, analytic hierarchy process was used. AHP pairwise comparisons were carried out by another focus group. It was found that Indian shippers use 23 criteria in the IFF selection decisions. They perceive ‘low freight rates’ as the most important and ‘quality certifications’ as the least important criterion. This study will help IFFs to decide which criterion is to be given priority and which not while devising marketing strategies for Indian market. This decision is vital to provide the best level of shipper satisfaction.

35 Friday, 10:00 AM - 11:30 AM, Sorrento 1,2 *Track:* QPJ, 1 *Chair:* Luis Antonio Gutierrez
Session: Session 1: SCM Strategic Implications

020-0707 Competitive Strategies and Paradigms of Manufacturing Clothing Fashion - MCF

Francisca Mendes, UNIP - Universidade Paulista, Brazil
João Mendes, FAAP - Fundação Armando Álvares Penteado, Brazil
José Sacomano, UNIP - Universidade Paulista, Brazil
Fabiana Lima, FMU - Faculdades Metropolitanas Unidas, Brazil
José Paulo Fusco, UNESP - Universidade Estadual Paulista, Brazil

The research presents the competitive aspects of MCF - Fashion Apparel Manufacturing. This is an analytical framework of the competitive strategies and paradigms of manufacturing described by several authors in order to meet consumer demand for innovative products and updated. The fashion apparel's main features are: wide variety of products with short life cycle and production in small lots, shrinking time between product development and placement at retail. Products are highly diverse and differentiated, diverse in their shapes and volumes of tissues and differentiated by colors and patterns. This is a consequence of a Competitive Strategy Focus and Differentiation. The strategic paradigms of MCF are: Agile Manufacturing, Flexible Manufacturing, and Responsiveness to the products of greater innovation and mass customization products for Postponement.

020-0508 Complex Relations of Production and Organizational Diagnosis

Rolf Erdmann, Universidade Federal de Santa Catarina, Brazil
Caroline Gonçalves, Universidade Federal de Santa Catarina, Brazil
Janaina Piana, Universidade Federal de Santa Catarina, Brazil
Marcelo Correia, Universidade Federal de Santa Catarina, Brazil

The organizational environment complexity is increasing because of the competitiveness and the many ways of decision making. Considering this fact, this paper proposes the development of an instrument of organizational diagnosis based on the complex relations of production systems and factors of competitiveness. One aim, through this, is to assess and improve the performance of industrial organizations. The evaluation and validation of this instrument was made in a meat

packing company in southern Brazil. The results point to a consistent set of measures developed that provides global vision of the organization and provides support to decision making and management of results. They also verify the interdependence of the categories assessed, which produces a positive multiplier effect on the inference of individual improvement.

020-0882 Adjusting SERVQUAL Model in a Public Education Library Service

Luis Antonio Gutierrez, Universidad de Guadalajara, Mexico
Claudia Cruz, Universidad de Guadalajara, Mexico
Graciela Lopez, Universidad de Guadalajara, Mexico

Among the quantity of services provided by public high education systems in México, there is possible to improve service systematically by studying cyclical measurements between perceptions and expectations. Adjusting and applying a questionnaire at the library service users in the Center of Exact Sciences and Engineering of the University of Guadalajara, México and using the SERVQUAL model proposed by Zeithaml, Parasuraman & Berry, it was possible to determine these gaps and analyze the parameters: a) Service factors, b) Expectations-Perceptions, c) Quality perception index, and d) Satisfaction matrix. We will illustrate the results about perception quality and determine by this means strengthens and weaknesses to move in the direction of designing improvement goals and associated plans.

37 Friday, 10:00 AM - 11:30 AM, Naples 2 *Track:* GEN, 2 *Chair:* Samir Srivastava
Session: New issues in operations management

020-0354 Impact of Counterfeiting on Efficient Supply Chain Management & Avoidance Mechanisms

Nutan Chaoudhary, Indian Institute of Management Bangalore, India
Shalini Jhall, Indian Institute of Management Bangalore, India
Diatha Sundar, Indian Institute of Management Bangalore, India

Counterfeiting is omnipresent across products and geographies. Counterfeiting is rising owing to globalization, advanced technologies, consumers' willingness for fake goods, lax regulatory policies and IP regimes. Though attempts have been made at anti-counterfeiting measures, complexity of this problem demands an integrated approach to understand the counterfeiting ecosystem. Counterfeiting infests supply chain stakeholders like manufacturers, consumers, government, and industry associations in multiple ways. The interplay of influencing factors has a cause and effect outcome on the supply chain Ecosystem. This causality is interpreted, in this paper, from empirical facts and is further analyzed by developing causal loops. Long-term impacts on these stakeholders, a generic duopoly market scenario with a regulatory authority is simulated using a system dynamics approach. The impact of anti-counterfeiting technologies, market-based competition and a stringent regulatory authority on managing efficient supply chains has been evaluated by simulating various scenarios.

020-0746 Home-made vs. Factory-made - Emerging Implications of the Supply Chain for the DIY Industry

Jordania Leon-Jordan, University of Wisconsin-Parkside, United States
Abey Kuruvilla, University of Wisconsin-Parkside, United States

The Do-It-Yourself Industry, a relatively new one, is growing rapidly as the recent financial meltdown has moved cash-strapped homeowners to handle home projects themselves. This research examines the growth of the DIY industry to its present state and explores emerging trends. It presents motivations for the do-it -yourselfer, and studies major drivers of this market with emphasis on internet, mainstream media and advertising. It then explores how the bigger chains have modified operations to adjust to the new needs of this segment. The study makes projections of how demand will have implications on supply chains in the future. It projects that the mainstream supply chain as we view it, will change from the traditional model of Supplier - Manufacturer - Distributor - Retailer and Consumer, to a compact supply chain of Design and Raw Materials reaching the customer who is also the manufacturer. The study then suggests streams for future research.

020-0086 Reverse Logistics for End-of-life Vehicles in India

Shalin Gupta, IIM Lucknow, India
Samir Srivastava, IIM Lucknow, India

The growing importance of managing reverse logistics of end-of-life Vehicles (ELVs) cannot be overstated. This paper suggests a two-stage reverse network set-up for end-of-life vehicles in India. These would comprise a collection cum dismantling facility and a shredding facility. We estimate the number of end-of-life vehicles per state using Indiastat.com data. We focus on jeeps and cars only due to unavailability of comprehensive suitable data for other vehicle categories. Based on estimated number of ELVs in each state/union territory and applying the three criteria - economies of scale of operations, geographical proximity of candidate locations and favorability of the regulatory environment - 9 candidate geographical zones were identified. A comprehensive analysis of the probable locations in each zone and the factors working in favor and against each location were then worked out to finally suggest two shredding sites at Gurgaon-Manesar Industrial Area and Hosur Industrial Area respectively.

38 Friday, 10:00 AM - 11:30 AM, Naples 1 *Track:* GOS, 9 *Chair:* Burak Kazaz John Park
Session: Supply Risk Mitigation

020-1008 Supply Selection Using Conditional Value at Risk

Cigdem Gurgur, Purdue University, United States

Procurement decisions play a vital role in firms' value creation. Disruptions due to supply inadequacies could have a major impact on profitability. In this study we consider supplier selection and quantity allocation decisions for a firm facing supply unreliability and demand uncertainty. The benefit of having a large supplier pool is expressed in the form of reduced risk against supply disruptions. Using a single source, on the other hand, provides cost savings due to better partnership with the supplier. We also explicitly address the strategic behavior of suppliers in pricing decisions. Using a game theoretic framework, we find how the pricing decisions of the suppliers change in response to procurement decisions. We also show that when suppliers are not price takers and they have significant market power, the optimal strategy for the firm is to raise the number of suppliers.

020-0978 Design Outsourcing in a Differentiated Product Market: The Role of Bargaining and Scope Economies

Qi Feng, University of Texas at Austin, United States
Lauren Lu, University of North Carolina at Chapel Hill, United States

During the last two decades, original equipment manufacturers (OEMs) gradually extended their outsourcing activities beyond manufacturing and outsourced product design and development to original design manufactures (ODMs). This new outsourcing model shifts the control of product design from an OEM to an ODM. We develop a dynamic game to study how design outsourcing may impact product differentiation and downstream competition among OEMs.

020-0596 Operational Hedging and Diversification under Supply and Demand Uncertainty

Fabian Sting, Erasmus University, Rotterdam School of Management, Netherlands
Arnd Huchzermeier, WHU - Otto Beisheim School of Management, Germany

When facing supply uncertainty caused by exogenous factors such as adverse weather conditions, firms diversify their supply sources following the wisdom of "not holding all their eggs in one basket." We study a firm that decides on investment and production levels of two substitutable unreliable resources. Applying basic real options thinking, production decisions account for actual supply capabilities while investment decisions are made in advance. We adapt the concepts of random capacity and stochastic proportional yield to capture trivariate supply and demand correlation. We identify optimal forms of investment decisions that depend on the resources' reliability, capacity costs, and contribution margins. Contrary to insights from basic financial hedging theory, we show that supply hedges provide substantial value even if supply resources are perfectly positively correlated. Furthermore, when demand risk exposure increases, it is the backup supply'scorrelation with demand that matters for investment rather than correlation between supply.

020-0894 Volatile Market with Pricing Flexibility vs. Stable Market with Price Restrictions

Burak Kazaz, Syracuse University, United States
Scott Webster, Syracuse University, United States

This study considers a firm’s pricing and production decisions under supply and demand uncertainty. Specifically it investigates whether the firm should keep prices stable even under supply fluctuations or let prices fluctuate according to the crop supply, resulting in a volatile market demand. The paper introduces a new elasticity measure of the combination of stochastic supply and demand. The new elasticity measure, price-elasticity of marginal lost sales, leads to conditions under which the problem is jointly concave in its decision variables, and therefore there exists a unique optimal solution for this complicated problem. These conditions are robust as the results are proven under significantly general definitions of supply and demand uncertainty.

39 Friday, 10:00 AM - 11:30 AM, Naples 3 *Track:* HOM, 21 *Chair:* Claude Machline
Session: Healthcare Supply Network

020-0017 Supply Chain Network Operations Management of a Blood Banking System with Cost and Risk Minimization

Anna Nagurney, University of Massachusetts Amherst, United States
Amir Masoumi, University of Massachusetts Amherst, United States
Min Yu, University of Massachusetts Amherst, United States

Blood service operations are a key component of the healthcare system all over the world and yet the modeling and analysis of such systems from a supply chain network optimization perspective have been lacking due to their associated unique challenges. In this paper, we develop a network optimization model for the complex supply chain of human blood. In particular, we consider a regionalized blood banking system consisting of collection sites, testing and processing facilities, storage facilities, distribution centers, and demand points. Our multicriteria system-optimization approach on generalized networks with arc multipliers captures many of the critical issues associated with blood supply chains such as the determination of the optimal allocations, and the induced supply-side risk, as well as the induced cost of discarding the waste, while satisfying uncertain demands as closely as possible. Our presented framework is also applicable, with appropriate modifications, to the optimization of other supply chains of perishable products.

020-0036 Multiproduct Supply Chain Network Design with Applications to Healthcare

Anna Nagurney, University of Massachusetts Amherst, United States
Min Yu, University of Massachusetts Amherst, United States
Qiang (Patrick) Qiang, Pennsylvania State University, United States

In this paper, we develop a model for supply chain network design in the case of multiple products, with particular relevance to healthcare. The model allows for the determination of the optimal capacities of supply chain network activities, in the form of manufacturing, storage, and distribution, as well as the optimal multiple product flows, and identifies at what minimal total cost the demands for the products at the various points are achievable. The model may be utilized for the determination of the optimal allocation of resources for multiple vaccine production as well as the production of medicines, among other healthcare applications. The model is sufficiently general to handle supply chain network design, as well as redesign.

020-0151 An Application of a MCDA Model for Future Healthcare Site Selection

Benjamin Dehe, University of Manchester, United Kingdom
David Bamford, University of Manchester, United Kingdom
Jim Bamford, NHS Bradford and Airedale, United Kingdom
Claire Moxham, University of Manchester, United Kingdom

The aim is to report on the development of a Multiple Criteria Decision Analysis (MCDA) Model that was implemented to optimise the location selection for a new healthcare centre. The paper demonstrates how MCDA was implemented within healthcare to enhance the decision making transparency and robustness. Literature on MCDA was reviewed to contribute to the model development. It was developed in collaboration with a local Trust as part of a new health centre (£15 million project). A substantial set of data gathered from the public consultation and three specific workshops, allowed to assess the two alternatives using the Evidential Reasoning approach.The final model has seven criteria and 28 sub-criteria. This technique was useful to reach a consensus and influenced the board to justify the final decision. The paper makes a contribution by implementing an MCDA model in the healthcare sector and by providing a replicable model for future application.

020-0495 The Clients´ Level of Satisfaction in a Health Plan: An Inquiry

Claude Machline, EAESP-FGV, Brazil
Fernando Serson, EAESP-FGV, Brazil
Adalberto Belluomini, EAESP-FGV, Brazil

This paper presents the results of a recent survey intended to assess the satisfaction level of the clients of a Brazilian private health plan. This plan covers 850 thousand subscribers. Besides their public health system, available freely to 200 million people, 40 million Brazilians also benefit from a private health plan. The methodology consisted of selecting a random sample of 1,600 clients and interviewing them by phone from the call center. The questionnaire, using a Likert scale, spanned all the services offered by the company for outpatients and inpatients. A specific software was developed to facilitate the interviews, register the data, tabulate the results and prepare the reports. The clients´ level of satisfaction was high, about 70% on the whole. Criticisms referred to lack of personal attention given by physicians to their patients; huge waiting times to get the appointments; and lack of coverage for some medical conditions.

40 Friday, 10:00 AM - 11:30 AM, Naples 4 *Track:* CSC, 2 *Chair:* Sung Hoon Chung
Session: Supply Chain Disruptions

020-0928 Robust Control of Emissions Uncertainty in Supply Chains with Supply Side Disruptions

Sung Hoon Chung, The Pennsylvania State University, United States
Robert Weaver, The Pennsylvania State University, United States
Terry Friesz, The Pennsylvania State University, United States

We consider an emissions management system for supply chains where oligopolistic manufacturing firms gain in product space as well as with respect to emissions capacity. Firms' production follows from intermediate goods produced in-house or procured from suppliers (make-buy decision), emissions can be controlled via manufacturing process organization, location, or timing. As supply faced uncertainty, disruptions impact emissions. A dynamic Nash game among such manufacturers is modeled as a robust continuous time differential variational inequality. Qualitative properties of the model are presented and a fixed point algorithm is suggested to solve the problem. In addition, numerical examples are provided for multiple disruption scenarios that illustrate the implications of the suggested framework to manage supply chain disruption risks.

020-0173 Analysis of a Two-Echelon Supply Chain with Disruptions in Supply

Refik Gullu, Bogazici University, Turkey
Damla Tomsuk, Bogazici University, Turkey

In this paper we consider a two-echelon supply chain model with a supplier, a manufacturer and two retailers. The supplier is subject to non-stationary supply disruptions. In every period the manufacturer places an order with the supplier by taking into account any possible supply disruptions in the planning horizon, and subsequently makes an allocation of available stock to retailers. Customer demand is observed at the retailer level and the demand is assumed to be deterministic but time-dependent. The aim is to find the optimal ordering policy for the manufacturer and the optimal allocation amounts to the retailers that will minimize expected system-wide costs over a finite planning horizon. We present a dynamic programming model for this problem, and give structural properties of the optimal ordering policy under a simplified allocation rule. We also discuss the effectiveness of the allocation rule and present various managerial insights through a numerical study.

020-0129 The Importance of Decoupling Recurrent on the Management of Supply Chain Disruption Risks

Peng Ma, Southeast University, China
Haiyan Wang, Southeast University, China

We consider a single period problem in a two-stage supply chain with a supplier and a retailer where the retailer faces random demand. This paper focuses on the expected order quantity and system costs when adopting appropriate mitigation strategies. We show that expected order quantity decreases when the retailer improves the reserved quantity, but increases when the retailer improves the order quantity in a successful period. In an instance with both disruption and yield uncertainty exit, expected order quantity decreases when the retailer improves the reserved quantity, but increases when the retailer improves the order quantity no matter whether disruption happens. As in S.Chopra et al. (2007), we show that increasing quantity from a cheaper but less reliable source is an effective risk mitigation strategy if most of the supply risk growth comes from an increase in recurrent uncertainty.

020-0037 Losses from Time-structured Supply Chain Disruptions

Kamil Mizgier, Swiss Federal Institute of Technology ETH Zurich, Switzerland
Matthias Juettner, University of Zurich and Swiss Finance Institute, Switzerland
Stephan Wagner, Swiss Federal Institute of Technology ETH Zurich, Switzerland

We propose a generic business interruption risk model for supply chain networks. In order to calculate the loss distribution of supply chain disruptions for a focal firm we apply a modeling approach based on stochastic processes analysis. The correlation structure induced by the specific network design is incorporated and analyzed via Monte Carlo simulation. Our findings enable more informed risk transfer decisions and more transparent insurance premium calculations for the insurance companies.

41 Friday, 10:00 AM - 11:30 AM, Naples 6 *Track:* CSC, 15 *Chair:* Murat Kristal
Session: Managing Supply Chain Relationships

020-0726 Supply Chain Relationships and Supply Chain Operations Strategies

Daisy Wang, University of Tennessee at Martin, United States
Suresh Tadisina, Southern Illinois University Carbondale, United States

Previous studies in operations strategies can be broadly classified as trade-off (focusing on only one operations capability) or synergy (building all operations capabilities). Trade-off advocates argue that if firms do not focus on one capability, they would end up being in second place and gradually lose their competitiveness. Scholars supporting synergy, however, believe that the fierce competition forces firms to build more than one capability. Further, results have been inconsistent in terms of which type of operations strategy leads to better performance. This study looked at this issue using a different unit of analysis. Instead of studying firms' operations strategies, the supply chain's operations strategies were examined. The study results support that the congruity of supply chain operations strategies is positively related to supply chain performance and serves as a pure moderator between supply chain relationships and performance.

020-0816 Using Adaptive Limit Control Charts to Identify Significant Events in Supply Networks

William Sawaya, Texas A&M University, United States
Surya Pathak, University of Washingtin, Bothell, United States
Murat Kristal, York University, Canada
Jamison Day, Louisiana State University, United States

Firms managing supply network systems face variable data relating to different aspects of their business; and then make business decisions based on their observations. A key part of the decision whether to take action or not revolves around understanding normal system behavior and system abnormal behavior. If the available information is not used properly in the decision making process, less than efficient heuristics are used based on incorrect assumptions leading to sub optimal decisions, loss of efficiency and reduced customer service levels. Identification and separation of non-normal events within the data seems to be a key to successful supply network management as decision makers can influence behavior of system towards a desirable state while not tampering when conditions are normal. This research outlines the adaptation of tradition process charting methods to a dynamic supply network environment where stand control chart assumptions may be violated.

020-0336 Impact of Cultural Differences in Buyer-Supplier Negotiations

Dina Ribbink, University of Western Ontario, Canada
Curtis Grimm, University of Maryland, United States

Globalization is very important in today's economy. An increasing number of businesses are involved overseas. Many of them have realized the need to take different cultural traits into account when negotiating. However, current literature has neglected to investigate how these cultural differences get reflected in the actual contracting between international partners. The research investigates the impact of cultural differences in the context of dyadic buyer-supplier negotiations. In the negotiation, participants, classified by their country of origin, are asked to take on the role of either a buyer or a seller. They negotiate prices and quality levels for three products. This study finds that cultural differences within the negotiation dyad reduce joint profits when compared to dyads of participants with similar cultural backgrounds. Cultural differences weaken the effect of trust and opportunism on joint profits.

020-0513 Mass Customization Strategies, the Corresponding Contextual Factors, and the Performance Consequences

Gensheng Liu, University of Memphis, United States
M. Johnny Rungtusanatham, University of Minnesota, United States
Xiaowen Huang, Miami University, United States
Murat Kristal, York University, Canada

A configurational approach is taken to derive different mass customization strategies that are employed by manufacturers to address diversified customer demands. The strategic groups are then used to investigate the contextual factors that drive manufacturers into different groups, and to study the conditions under which each strategic group has the best performance. The contextual factors investigated include business strategy, supply chain environment, etc. The results will help manufacturers to choose the best mass customization strategy in different environmental conditions.

020-0680 Intra-firm Budgeting and Coordination in the High Technology Industry: An Empirical Analysis

Sriram Narayanan, Michigan State University, United States
Shrihari Sridhar, Michigan State University, United States
Raji Srinivasan, University of Texas at Austin, United States
Gary Lilien, The Pennsylvania State University, United States

Firms are complex entities with multiple divisions (e.g., marketing, operations, and R&D) performing a set of complex and specialized tasks. For firms to be successful, it is essential that the combined outcome from all the divisions results in profitability. Thus a key issue is to understand to what extent interdependencies between a firm's divisions can be exploited to a firm's advantage. In this paper, we examine the interdependencies between the budget setting process of operations, marketing and R&D and consequently examine its effects on firm performance. We focus on the high-technology industry. We use publicly available data to construct measures that reflect the degree to which operations, marketing and R&D consider other functions in their budget setting process. Subsequently, we estimate a contingent model of how firm performance is influenced by interdependent budgeting. The estimation results help provide insights on when coordination through budgeting may result in increased profits.

45 Friday, 12:30 PM - 02:00 PM, Tuscan 1 *Track:* HOM, 3 *Chair:* Hui Zhao
Session: Strategic Decisions in Healthcare Supply Chains

020-0073 Inventory Positioning in Global Clinical Trial Supply Chains

Adam Fleischhacker, University of Delaware, United States
Yao Zhao, Rutgers University, United States

To speed recruitment, clinical trials are going global to find patients willing to participate in studies of new drugs. While this benefits recruitment efforts, the supply chain is challenged to maintain available drug supply at globally scattered testing sites; especially when considering a clinical trial's goal to recruit a fixed patient horizon as quickly as possible. To address this unique challenge of a clinical trial supply chain, we provide a new class of multi-echelon inventory models.

020-0411 Fee-for-Service Contracts in Pharmaceutical Distribution Supply Chains: Design, Analysis, and Management

Hui Zhao, Purdue University, United States
Chuanhui Xiong, Purdue University, United States
Srinagesh Gavirneni, Cornell University, United States

The pharmaceutical supply chain has experienced dramatic changes since 2004. Before that, pharmaceutical distributors earn their margins mainly from investment buying (IB), forward buying in speculation of drug price increases. Then, an industry-wide change to fee-for-service (FFS) for the distributor was triggered. Despite the dramatic impact on the industry of this big change, limited research in the operations area has been conducted to guide the operations in this industry. The purpose of this research is two-fold. First, we characterize the manufacturer's and the distributor's optimal decisions under FFS, which help the industry players to benefit most from the new FFS model. Second, we study how the FFS contract and the Inventory Management Agreement under FFS model should be designed such that each individual party can be better off than under IB model. Simulation studies verify analytical results and provide further interesting insights for this industry.

020-0412 Managerial Perception and Its Implications for Strategic Decision-making

Mahender Singh, MIT, United States
Shardul Phadnis, MIT, United States
Yossi Sheffi, MIT, 02139

This research seeks to contribute to the literature on strategy process through field research conducted in a firm in the U.S. healthcare sector. Strategy literature has explored the domain of strategy content extensively, but has not paid as much attention to strategy process. Strategy process is just as important because it directly influences the quality and practice of strategic decision-making. The U.S. healthcare sector is currently experiencing extreme cost pressure and high uncertainty about its future direction. This provides a good setting to study how managers think about the business environment in a turbulent industry. We propose hypotheses related to managerial perception of the business environment in strategic decision-making based on the lessons from organization science, psychology, and strategy. We test the hypotheses in an inductive study using a mix of qualitative interviews and surveys with 24 executives at the firm.

020-0915 The Link between IT Leveraging Competence and Affordable Access to Primary Care: Affordability as an Antecedent to Access

David Zepeda, University of Minnesota, United States
Kingshuk Sinha, University of Minnesota, United States

In addressing the health needs of an increasingly diverse population, a central focus is not only on providing greater access to health care, but also in making it more affordable. Treatment costs have been identified as a barrier to access. On the other hand, health information technology has been argued to have the potential to increase access to care. Using clinic level data of 300+ clinics, this study looks at the relationship between electronic health record (EHR) utilization and affordability and their impact on access to primary care.

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46 Friday, 12:30 PM - 02:00 PM, Tuscan 2 *Track:* HOM, 17 *Chair:* Justin Drupsteen
Session: Process Improvement in Healthcare

020-0678 Testing A3s in Coaching Health Workers in Improvement Projects

Norman Faull, University of Cape Town, South Africa
Theonevus Chinyanga, University of Cape Town, South Africa
Craig Frederichs, University of Cape Town, South Africa

Two different action research projects involved coaching health workers via the A3 structure to achieve specific performance improvements. One project was in a public sector community health clinic; the primary researcher was a doctor working in the clinic. The second project was in a private-sector pathology laboratory; the primary researcher was a medical doctor not working there. Modest improvements were achieved in both projects, with different lessons from each. The laboratory project used a consistent method with the participants to assess their level of understanding and buy-in, yielding different insights from the clinic project. The lessons learnt in these two projects will be reported.

020-0117 Understanding the Enablers and Barriers of Internal Integration in Hospitals

Justin Drupsteen, University of Groningen, Netherlands
Taco Van der Vaart, University of Groningen, Netherlands
Dirk Pieter Van Donk, University of Groningen, Netherlands

There seems to be no doubt about the positive effects of integration, either within or between organizations. Surprisingly, in hospital management internal integration - the cooperation between different functional departments in order to fulfill mutually accepted requirements - is lagging behind. This paper aims at better understanding the reasons for this phenomenon by investigating the enablers and barriers of internal integration in hospitals. In three case studies we investigate integration between four departments: the outpatient clinic, diagnostic radiology, preoperative screening and the operating theater. Our results suggest that internal integration in hospitals is influenced by factors such as the hospital's organizational structure and culture, the level of specialist autonomy, performance measurement, and the degree of discrepancy between functional objectives, organizational objectives and care objectives. Our empirical findings form the basis for a conceptual model that extends current knowledge of internal integration in general and more specifically, its applicability in hospitals.

020-0906 The Structuring Process of Materials Management: The Case of the University Hospital of Dourados-MS

Rafael Lourenço Pereira, UFGD, Brazil
Sergio Brun, UFGD, Brazil
José Lopes, UFMS, Brazil

Rolf Erdmann, UFSC, Brazil
Marie-Anne Stival Lozano, UFSC, Brazil

This article aims to analyze the process of structuring materials management in a hospital organization, specifically in the University Hospital of Dourados-MS. Moreover, the proposal is to present control tools and materials management, as well as enhancements to improve the management process. The investigation showed that although the structure of the warehouse was successful, it requires adjustments to the improvement of information and distribution of materials. Although the control and management techniques presented are applicable in hospital materials management, a first step should be in the organization of information, to provide consistent data. A short-term activity is the construction of a warehouse in the central institution and implementation of a computerized system, a system that is already purchased. It also may be noted that the flow of activities performed by sectors has evolved significantly. Finally, the procedures described here provide the basic phases for a proper structuring of materials management.

020-0742 Realtime Detection and Control of Influenza Pandemics

Suraj Alexander, University of Louisville, United States
Shengpeng Jin, University of Louisville, United States

Current indicators of the spread of contagious outbreaks, such as influenza, typically lag the spread of the disease and hence, these outbreaks have the potential to become pandemics. Nicholas Christakis and James Fowler in their book “Connected” provide several examples that illustrate the spread of infectious diseases through social networks, and they state that it is more effective to vaccinate “centrally” located individuals to control the disease spread. Our goal is to build on the research of Christakis et al. on social networks, and Hongbo Yu on spatio-temporal human interactions, to predict and chart the spatio-temporal spread of potential pandemics. Our plan is to utilize early indicators of potential contagious outbreaks and the spatio-temporal activities of “central” individuals to detect, chart and effectively control the spread, through efficient allocation of resources, such as vaccines and medical personnel. We illustrate our plan.

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Friday, 12:30 PM - 02:00 PM, Tuscan 3 *Track:* SCH, 2 *Chair:* Tolga Aydinliyim
Session: Contemporary Problems in Scheduing

020-0525 Quantifying the Impact of Layout on Productivity: An Analysis from Robotic-Cell Manufacturing

Tharanga Rajapakshe, University of Texas at Dallas, United States
Chelliah Sriskandarajah, University of texas at Dallas, United States
Milind Dawande, University of Texas at Dallas, United States

We consider the problem of optimizing throughput in single-gripper, bufferless robotic cells that produce identical parts under the free-pickup criterion and the additive-travel-time metric. For cells with a circular layout, we show that the problem of finding an optimal 1-unit cycle is NP-hard. Our main algorithmic result is a polynomial-time 5/3-approximation algorithm for this problem. We then demonstrate that our algorithm provides near-optimal solutions by compiling its performance on an extensive test bed of practically-relevant instances. Finally, we use the algorithm to assess the increase in throughput for cells with a circular layout over those with a linear layout. We show that a circular layout offers a significant improvement in productivity and demonstrate the robustness of this improvement by examining the sensitivity with respect to changes in the design parameters of the robotic cell.

020-0487 Approximations to Optimal k-Unit Cycles for a Dual-Gripper Robotic Cell in a Circular Layout with Additive Travel-time

Kyung Sung Jung, The University of Texas at Dallas/School of Management, United States
Neil Geismar, Texas A&M University/Mays Business School, United States
Chelliah Sriskandarajah, The University of Texas at Dallas/School of Management, United States

We consider the problem of scheduling operations in a dual-gripper bufferless robotic cell where the arrangement of machines is circular. The cell is designed to produce identical parts under the free-pickup criterion and the additive-travel-time metric. The objective is to find a cyclic sequence of robot moves that minimizes the long-run average time required to produce a part, or that equivalently maximizes the throughput in the cells. Obtaining an optimum k-unit cyclic solution is the focus of this paper.

020-0943 Coordination Issues for Timely Processing of Outsourced Operations

Tolga Aydinliyim, University of Oregon, United States
George Vairaktarakis, Case Western Reserve University, United States

We consider a dynamic capacity booking problem faced by multiple manufacturers outsourcing certain operations to a single third-party. Such business transactions are increasingly handled online where third-party’s available capacity and the associated booking costs are known by the manufacturers. Each manufacturer observes the current state of the third-party schedule, and then books capacity with the objective of jointly minimizing his holding costs resulting from early deliveries, tardiness penalties due to late deliveries, and capacity booking costs at the third-party. When making his reservations, each manufacturer has two alternative courses of action: reserving capacity that is not utilized by other manufacturers who made their bookings earlier, or forming a coalition with a subset or all of other manufacturers to achieve the best schedule for the coalition. We model this relationship among the manufacturers and the third-party as a cooperative savings game with transferable utility, and present a core allocation.

020-0835 Subcontracting in the Presence of Transactional and Contractual Customers

Tolga Aydinliyim, University of Oregon, United States
Zhibin Yang, University of Oregon, United States

We consider a subcontracting setting whereby a third-party, which has committed some portion of its available capacity to long-term (contractual) customers, seeks one-time transactions with short-term (transactional) customers to contract its remaining availability. A transactional customer considers subcontracting to finish processing its entire workload by a due date. Assuming the third-party prioritizes the workload from contractual customers, we study various coordination issues that arise and provide contract forms that coordinate the decisions of the third-party and transactional customer.

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Friday, 12:30 PM - 02:00 PM, Tuscan 4 *Track:* ESO, 3 *Chair:* Tim Kraft
Session: New Products and Sustainability

020-0541 Modularity, New Product Introduction, and Sustainability

John Khawam, Naval Postgraduate School, Graduate School of Business and Public Policy, United States
Stefan Spinler, WHU-Otto Beisheim School of Management, Germany

When developing new products, manufacturers have the ability to introduce products with varying levels of modularity. Modularity affects both profit and sustainability. A modular product contains modules that can be removed and replaced. The manufacturer can develop new modules rather than entirely new products. Therefore, customers buying upgraded modules only dispose of a portion of the product, thus reducing the total amount of waste. However, since a customer upgrading a module does not have an entirely new product, the value of an upgraded modular product may be less than the value of an entirely new

product. We study the trade-off between the profits and the sustainability of modular and non-modular products in a two-period game involving two customers who value modularity differently and a manufacturer who must choose the level of modularity of a product or products.

020-0940 Discount Pricing to Invoke Eco-friendly Consumption

Tolga Aydinliyim, University of Oregon, United States
Michael Pangburn, University of Oregon, United States

Sustainability concerns can potentially give rise to product variants with less waste, reducing a firm's costs and environmental impact. The direct impact on the consumer may be an inconvenience, invoking the firm to offer compensation, as in the case of Starbucks, which offers a 10-cent discount for a coffee purchase without a cup. Understanding the relationship between that discount and how it drives demand and profit is the primary focus of this paper. We consider a monopolist offering a standard and a low-waste variant of its product, the latter being sold at a discount. Consumers are heterogeneous in their willingness-to-pay and transaction (inconvenience) costs. We find that the optimal discount should be bounded by the variable cost-savings from the low-waste variant. We also show that the cost-savings benefits can be sufficiently substantive to cause the optimal policy to offer only the low-waste variant.

020-0165 Green City - Environmental and Social Responsibility in Industrial Clusters

Geraldo Ferrer, Naval Postgraduate School, United States
Sandro Cortezia, Unisinos, Brazil
Jaqueline Neumann, Faculdade Cenecista de Nova Petrópolis, Brazil

This research intends to be a reference for sustainable changes in industrial communities where manufacturing facilities execute parallel processes; so one facility's by-products cannot be used as inputs for the other facilities in the community. It analyzes the Green City project that took place in the town of Três Coroas, Brazil. We describe its management system, evaluating the change process and the economic, social and environmental benefits, and discuss the economic and environmental impact of the industrial waste (now turned by-product) since the recycling center has been in service. We demonstrate a success case of operational and cultural change in the disposal of industrial waste, describing the key points that helped the adoption of the new process and the role of the champion.

020-0048 The NGO's Dilemma: How to Influence Firms to Replace a Potentially Hazardous Substance

Tim Kraft, Stanford University, United States
Yanchong Zheng, Stanford University, United States
Feryal Erhun, Stanford University, United States

As public awareness of environmental hazards increases, a growing concern for firms is the potential negative environmental impact of their products and the chemicals those products contain. When a substance within a product is identified as potentially hazardous (e.g., BPA in baby bottles), an NGO interested in influencing firms to replace the substance must develop a strategy for how to best utilize its often limited resources. We analyze the NGO's decisions of who to target - the industry or the regulatory body - and how much effort to exert. In addition, we investigate whether NGOs should take a pragmatic approach and partner with firms or maintain an antagonistic relationship. We model the problem as a two-stage game-theoretic model. Our results indicate that pressuring the regulatory body is most effective when the existing likelihood of regulation is low and the expected penalty for not being prepared for regulation is high.

49 Friday, 12:30 PM - 02:00 PM, Tuscan 5 *Track:* OEE, 3 *Chair:* Jayashankar Swaminathan Houmin Yan
Session: Manufacturing and Engineering Management in Chinese Setting

020-0630 A Method of Estimating Primary Demand under Stockout-based Substitution

Tian Lei, The Chinese University of Hong Kong, Hong Kong
Houmin Yan, The Chinese University of Hong Kong, Hong Kong

Empirical studies in the retail industry suggest that customers are often willing to substitute within the product category when their first choice is unavailable. Therefore, observed sales can no longer be used as an equivalent when analyzing the primary (or first-choice) demand, which weakens the correctness of management decision or even sometimes makes it wrong. In this paper, we propose an approach to estimate the primary demand and substitution rates based on Point of Sale (POS) and inventory data. This approach clusters data into different states, each of which corresponds to a specific substitution scenario, and then yields unbiased and closed-form Maximum Likelihood Estimates (MLEs). Next, we conduct simulation to illustrate the estimation procedure and evaluate the performance of our method. Finally, we apply our method to a real case from the retail industry in China.

020-0759 The Antecedents of Process Integration in Business Process Outsourcing and Its Effect on Firm Performance

Vaidyanathan Jayaraman, University of Miami, United States
Sriram Narayanan, Michigan State University, United States
Yadong Luo, University of Miami, United States
Jayashankar Swaminathan, University of North Carolina at Chapel Hill, United States

As service processes become candidates for outsourcing, interest in the global business process outsourcing (BPO) industry has grown considerably. In this study, drawing on information processing theory, we examine the role of integration in BPO firms and its effect on performance. BPO Integration is concerned with the overall coordination of business processes across different units. It involves both internal process integration (effective integration of task execution within the BPO firm) and external process integration (integration between the BPO firm and their clients). Using survey data gathered from 205 Indian BPO service providers, we analyze the antecedents of process integration and its impact on firm performance. The antecedents we examine are task complexity, task security, end customer orientation of the client and IT capability of the BPO firm. Among other results, we find both internal and external process integration partially mediate the impact of the antecedents on performance.

020-0997 Analysis of Production Systems and Decision Support on Companies of Serra Gaucha, Brazil

Charles Rui, Universidade de Caxias do Sul, Brazil
Evandro Lazzarotto, Universidade de Caxias do Sul, Brazil
Ricardo Antonio Reche, Universidade de Caxias do Sul, Brazil
Maria Emilia Camargo, Universidade de Caxias do Sul, Brazil
Eric Dorion, Universidade de Caxias do Sul, Brazil
Pelayo Munhoz, Universidade de Caxias do Sul, Brazil

For companies to become more efficient, reduce costs and improve their processes, it is essential that they have tools to support production. In this context, the objective of this study was to identify the technologies of decision support for production systems and the potential improvements from the perspective of the ERP, MRP and CRP. The methodology used was classified as exploratory, qualitative, through documentary analysis and observation of processes. The results showed that the company has difficulties in getting consistent information to enable quick decisions, which may even influence the competitiveness of the

organization. The results of the AL indicate that the company needs to evolve with regard to the use of the full potential of their systems through the implementation of new modules, under penalty of lack of agility in the internal processes and of the customers' dissatisfaction.

020-0881 A Study of Production and Supply Chain Activities of SHGs in the Union Territory of Pondicherry with Special Reference to Training

Nambirajan Thangasamy, Pondicherry University, India
Siddhartha Thyagarajan, Pondicherry University, India

Objectives of this research work are: (1) to determine areas where training is needed for Self Helf Groups (SHGs) to manufacture different categories of products in the Union Territory of Pondicherry, INDIA, (2) to evaluate training programs in terms of productivity improvement and (3) to identify competition for these products. Primary data were collected from 61 SHGs. Data were collected through questionnaires. Analyses were done using descriptive statistical methods. Most SHGs require training to manufacture selected categories of products. Most SHG members have undergone training to manufacture a particular type of product. In most SHGs, training programs yielded an improvement in productivity. The majority of SHGs consider retail shops and small companies as competition to products manufactured by them.

51 Friday, 12:30 PM - 02:00 PM, Tuscan 7 *Track:* PDI, 16 *Chair:* Gulru Ozkan
Session: Knowledge Flows in the New Product Development Process

020-0229 Technologically New Products and Value Creation: The Moderating Effect of Knowledge Characteristics

Xiaojin Liu, The Hong Kong Polytechnic University, Hong Kong
Andy Yeung, The Hong Kong Polytechnic University, Hong Kong
Edwin Cheng, The Hong Kong Polytechnic University, Hong Kong

The development of technologically new products is crucial for firms to create value and maintain competitive advantage in business. While some researchers have examined how some factors lead to innovative ideas and thereafter new products, little is known about the direct relationship between introducing technologically new products and firm performance, as well as the contingent impact of firm's knowledge characteristics on such relationship. We first adopt event study method to empirically examine the long-term performance of the first mover in developing and introducing technologically new products. Then we apply Hierarchical Linear Modeling to examine the impact of some moderating factors, including firm's absorptive capacity, knowledge breadth, and knowledge impact. The results show technological new products enable firms to achieve above normal performance, and absorptive capacity and knowledge impact have significant and positive impact on firm performance, whereas knowledge breadth is a significant and negative moderator.

020-0501 A Methodology for Effective Sharing of Innovative Manufacturing Knowledge during Preliminary Design

Sara Mountney, Sheffield Hallam University, United Kingdom
Rajkumar Roy, Cranfield University, United Kingdom
James Gao, University of Greenwich, United Kingdom

The preliminary design stage for complex mechanical components requires the resolution of multiple design requirements. Often the manufacturing processes considered are under development and therefore innovative. The knowledge associated with them is immature and difficult to define, codify and share. It also needs to be expressed across different specialist domains. These factors create potential risks in the design process. This paper explores how such knowledge can be effectively acquired and shared between designers and manufacturing engineers. Of particular interest was the development of methods which can be used at an operational level. Using manufacturing knowledge requirements captured through a detailed case study, a practical and systematic methodology was created which utilized combined explicit and tacit approaches to knowledge management. The methodology was then validated using three components, each with an innovative manufacturing process. These evaluations demonstrated that using the combined knowledge management approaches was effective for the specific cases studied.

020-0507 Managing New Product Development Knowledge between Competing Firms

Gulru Ozkan, Clemson University, United States
Cheryl Gaimon, Georgia Institute of Technology, United States

We introduce a two period stochastic Stackelberg game on knowledge management strategies that drive NPD activities of two firms operating in the same market. In period one, the leader and the follower determine the amount of knowledge to share (patents, employee transfers) for joint development of a new product. In period two, both firms jointly invest in knowledge development (problem solving, experimentation). The net revenue earned by both firms is determined by the extent and effectiveness of the knowledge embedded in the new product. Each firm maximizes the net revenue minus the cost of knowledge development and the opportunity cost of knowledge sharing. Two sources of uncertainty are considered: the customer’s valuation of the knowledge embedded in the new product and each firm’s ability to integrate the shared knowledge in the NPD process. Solutions are obtained to analyze the impact of firm and market characteristics on knowledge management decisions.

52 Friday, 12:30 PM - 02:00 PM, Tuscan 8 *Track:* ERS, 3 *Chair:* Wolfgang Kersten Andrea Vinelli
Session: Empirical Research in OM III

020-0569 The Pursuit of ISO 14000 Impacts on Manufacturing Capabilities and Environmental Outcomes

Maryam Memar Zadeh, Ivey School of Business, University of western Ontario, Canada
Robert Klassen, University of Western Ontario,

Adopting the environmental management standard family of ISO 14000 has become an increasingly prominent aspect of environmental protection commitments. Yet the perceived outcomes in creating more value for both society and organizations have been subject to ceaseless debates. The stimuli of ecological orientations of companies, and consequently the adoption of proactive environmental standards, can be the result of external pressures by authorities and stakeholders or can be the outcome of companies' desire to improve their internal processes. Whatever these drivers of eco-commitment are, internal or external, they are dictated by the overall strategy of the firm and therefore they are reflected in formulation of manufacturing strategy. The current paper explores the drivers of environmental management system adoption and concludes that, since the corporate strategy ties environmental protection motives to the operational capabilities of the firm, ISO 14000 registration can improve environmental and financial outcomes through improvement in cost and quality manufacturing capabilities.

020-0440 Empirical Study on the Relationship among Product-Service Systems (PSS) Evaluation, Environmental Evaluation and Customer Satisfaction

Jinsoo Park, Korea University Business School (KUBS), Korea, Republic of (South Korea)
Jinmin Kim, Korea University Business School (KUBS), Korea, Republic of (South Korea)
Kwangtae Park, Korea University Business School (KUBS), Korea, Republic of (South Korea)
Kwang-Jae Kim, Pohang University of Science and Technology, Korea, Republic of (South Korea)

Yoo-Suk Hong, Seoul National University, Korea, Republic of (South Korea)

The concept of product-service systems (PSS) has been discussed in the literature for over a decade. But, the previous study on PSS paid little attention to the customer's perspective. In this study, we analyze the relationship among PSS evaluation, environmental evaluation and customer satisfaction in the house appliances rental industry in Korea. We develop a theoretical framework to link these important constructs according to the most frequently used definition of PSS. We conduct hypothesis testing using structural equation models with a sample of 251 respondents. It is shown that PSS evaluation has a positive effect on environmental evaluation and customer satisfaction. However, environmental evaluation is not positively related to customer satisfaction.

020-0753 How to Make Products Sustainable? An Empirical Deduction of a Comprehensive Concept

Wolfgang Kersten, Technical University of Hamburg, Germany
A. Knemeyer, The Ohio State University, United States
Sebastian Brockhaus, Technical University of Hamburg, Germany

The challenges of developing sustainable products have occupied industry and researchers for several years. Before the background of increasing importance of environmental and social concerns in business due to pressure by customers and regulation alike, the topic has received amplified attention since the beginning of the 1990s. In the wake of public advertence, sustainability has become a major global business trend. The design of products with regard to environmental and social performance leads to a need for a clear understanding of what makes products genuinely sustainable. In this presentation findings and implications of an empirical study will be summarized and discussed. The study includes data from companies from the U.S. and Europe. Grounded in the data, a comprehensive concept of a sustainable product will be put forward.

020-0545 Redesigning Supply Networks in the Fashion Industry

Laura Macchion, Department of Management and Engineering; University of Padova,, Italy
Pamela Danese, Department of Management and Engineering; University of Padova, Italy
Andrea Vinelli, Department of Management and Engineering; University of Padova,, Italy
Romano Cappellari, Department of Economics; University of Padova, Italy

The fashion industry is a global industry, where competition is planetary. Nowadays companies have to face the challenges posed by demand unpredictability and adapt to a new competitive environment. Competition from low-wage countries is increasing and consumers' behaviors are radically changed, being more price sensitive.This research aims at studying Italian fashion companies to evaluate new managerial and organizational models that support business development in fashion industry, and to examine what variables should be leveraged and what strategies implemented in response to the crisis to remain competitive.Firstly, 16 in-depth case studies have been conducted. Then, a confirmatory survey has been run to test and assess case study findings. Research provides fresh knowledge on fashion industry "successful" business models, by revealing the existence of different clusters of firms that have found alternative ways to compete in the new global context. This research indicates avenues of strategic innovation within the industry.

53 Friday, 12:30 PM - 02:00 PM, Tuscan 9 *Track:* BOM, 3 *Chair:* Robert Prescott Chris Backhouse
Session: HRM and Operations Management

020-0192 Micro and Macro Research Analysis in Fostering Business Partnership between HR and Operations

Robert Prescott, Rollins College, United States

With the birth of the strategic part of HRM it was hoped for a yield of improved thinking and planning to improve firm performance. Over recent years, the traditional, functional, micro, and strategic macro sides of HRM have developed in parallel, yet independent paths (Wright & Boswell, 2002). Micro HRM research has resulted in technically sophisticated and demonstrably effective specific HR practices. Macro HRM research has demonstrated that organizations implementing sets of generic HR practices tend to outperform those implementing fewer of those practices. Given the potential for systematic bias in the measures of HR (Gardner, Wright, & Gerhart, 1999), it seems that more work needs to be done with longitudinal designs related to the causal impact of HR on performance. The foundation of this paper is to cross these two paths in an operations focus.

020-0511 Employee Involvement Sustaining the Continuous Improvement Capability

Chen Yen-Tsang, EAESP/FGV, Brazil
João Mario Csillag, EAESP/FGV, Brazil

Intense and dynamic competitive environment requires firms to continuously improve to create new advantages. Under this scenario, continuous improvement (CI) can be considered one of the crucial capabilities of an organization; however, the high failure rate of the CI initiatives has made this capability difficult to achieve.This study, through multi-case studies, investigates what variables are involved in promoting high employee involvement to sustain the CI capability. The data were collected through on-site observations and deep multi-hierarchical interview. The sample is composed of a representative case of employee involvement sustained CI capability and two others cases which are developing their CI capability. This study found that employee involvement is related to leadership and can be influenced by contextual variables such as organizational structure, resource slack and plant environment. The practical implication of this study encourages managers explore the potential of employee involvement to sustain the CI capability.

020-0186 FACETS of Engagement in Operations Management: Facilitating the Advancement of Continuous Improvement through Enabling Tools

Helen Wagner, Loughborough University, United Kingdom
Susan Morton, Lougborough University, United Kingdom
Chris Backhouse, Lougborough University, United Kingdom

Although Lean Manufacturing is an established concept in both academia and industry, consideration of the stages that follow a company-wide Lean initiative has received far less attention. Pursuing continuous innovation (CI) takes commitment from all involved, and the gap between knowing about continuous innovation and actually doing it needs to be filled. To facilitate organizational CI, a need has been identified for a bespoke tool that will enable managers to understand their people and support problem solving activities, at the supervisory/team management level in particular. Having identified five main constructs that contribute to successful engagement of employees in CI and their respective diagnostic tools, the process of questionnaire development was researched. This offered guidelines for planning, question wording, ordering and presentation, which were actioned in the development. The work has resulted in a bespoke tool for facilitating engagement that will add to the information available to managers and academics alike.

020-0813 How Behaviour ChangeTheory Can Help Improve Operational Performance Management

Jutta Tobias, Cranfield University, United Kingdom

This paper builds on recent advances in the emerging field of behavioural operations, and extends it by arguing that behaviour change theory can fruitfully be applied to operational management, in particular in the domain of performance management and improvement. Our research goal is a better understanding of the factors that drive effective and sustainable operational change. Behaviour change theory integrates social and contextual variables with individual factors to predict a person's intention to change their behaviour. For decades, this theory has successfully been applied to other process-oriented, tactically focused research domains such as communication and entrepreneurship. Integrating this framework with operational performance management is likely to enhance the

predictive power of operational change interventions. The original contribution of this paper is to propose a new model for evaluating and improving operational (performance) management initiatives, by outlining theoretical and practical implications of incorporating behaviour change theory into this domain.

54 Friday, 12:30 PM - 02:00 PM, Tuscan 10 *Track:* ICM, 3 *Chair:* Sandra Transchel
Session: Inventory Management under Demand Substitution

020-0135 Joint Inventory Pricing and Assortment Decisions for Vertically Differentiated Products

Mrinmay Deb, Pennsylvania State University, United States
Susan Xu, Pennsylvania State University, United States

We consider the joint pricing, inventory, and assortment decisions of a retailer stocking a set of quality differentiated products in a newsvendor setting. Consumers have heterogeneous preferences and choose their most preferred product based on the quality and price (the vertical choice model) and do not substitute in the event of stock-out. We consider two cases: (i) the riskless case, where demand is heterogeneous but deterministic and (ii) the risky case, where demand is heterogeneous and uncertain. We find the optimal prices and assortments in each case. The optimal prices in both cases form an increasing convex mapping of the quality levels and the optimal risky prices are higher than optimal riskless prices. The optimal riskless assortment consists of the products whose costs form the lowest increasing convex curve on the quality-cost graph. The optimal risky assortment is found to be a subset of the optimal riskless assortment.

020-0814 The 'Efficient' Repetitive Multi-product Newsvendor

Saurabh Bansal, The Pennsylvania State University, United States
James Dyer, The University of Texas at Austin, United States

We provide new results that enable a multi-product news vendor to determine optimal inventory levels and the expected profit aftercertain changes in the demand parameters, using simple linear transformations of an old optimal solution. We focus on the news vendor who always prefers to satisfy the demand of a product using its own inventory before resorting to substitutions. These results are accurate when the demands are elliptically distributed,and are good approximations when the demands are lognormally distributed. The value of these results liein their use as rules-of-the-thumb for quickly obtaining repetitive solutions to the newsvendor's two stagestochastic linear program without having to solve it.

020-0609 Rationing in Distribution Inventory Systems for Perishable Items under Stockout-based Substitution

Stefan Minner, University of Vienna, Austria

We consider a periodic review one-warehouse, multi-retailer inventory system of items with a fixed shelf life. Customer demands for multiple products in a category are random and in case of a stockout, unsatisfied customers partly substitute within a product category. Inventory is replenished by the central warehouse according to a dynamic, inventory level dependent method and incoming orders are immediately allocated to the retailers.The paper presents a multi-echelon inventory model and a solution algorithm to determine order quantities and inventory allocation under predetermined service level constraints. This policy is compared to simple constant order and base-stock policies in a numerical study.

55 Friday, 12:30 PM - 02:00 PM, Tuscan 11 *Track:* SOM, 3 *Chair:* Joel Goldhar
Session: Defining Services

020-0586 Applying the Ferdow's Model in a Service Context

Markku Kuula, Aalto University, Finland
Antero Putkiranta, Metropolia AMK, Finland

Service business has become increasingly important for manufacturing companies around the world. Instead of offering only physical products, they are offering for their customers solutions that include physical products and services. In many cases the ownership of the physical products remains with the manufacturer. Previously, some tools have been used and applied--like the Hayes Wheelright product-process matrix--in a service/solutions context. The aim of this paper is to apply the Ferdow's "the strategic role of plants" model in a service/solutions environment. The Ferdow's model provides a very good tool to analyse the various reasons how, where and why the service/solution operations should be located. This paper gives examples of how this has been done in a full service/solutions environment.

020-0382 The Big Ideas in Service Operations: What Does The Literature Say?

Alan Cannon, The University of Texas at Arlington, United States
Sridhar Nerur, The University of Texas at Arlington, United States

In 2007 Chase and Apte explored the history of service operations research in attempting to address the question: What's the big idea? By means of an extensive review of more than a century of research, these authors explored what they considered to be the most consequential work regarding service operations that had been done to date. In our research effort, we step back and let the field itself have a say. We pursue a co-citation analysis of the service operations field's literature with authors as the unit of analysis. We believe this work, which exploits a variety of approaches in analyzing citation data, can more rigorously: 1) depict the essential topics in service operations; 2) link these topics together with respect to their specific and shared domains; and 3) clarify the broad intellectual themes that will (or should) be pursued as the field matures.

020-0233 Technological Intermediaries as Third Party Service Providers in Global Supply Chains

Berit Helgheim, Molde University College, Specialized University in Logistics, Norway
Bjørn Jæger, Molde University College, Specialized University in Logistics, Norway

The increased global competition is mainly driven by the technology evolution, harmonization of national and international laws and regulations, and the economic forces whereby companies realize the potential for more efficient business operations. In this paper we explore the role of technological intermediaries as service providers on information flow in business to business relationships. The utilization of technological opportunity seems to be premature in business-business relations. One factor may be the lack of knowledge for what kind of activities or services these providers may offer and the knowledge according to risk assessment by technological integration. Another may be that 3PIP providers have not seen the business opportunity and commercialized the opportunity for such business arrangements and do not have a proactive approach for marketing the service activities.

56 Friday, 12:30 PM - 02:00 PM, Roma 1,2 *Track:* NCC, 2 *Chair:* Qi Feng
Session: Session 2

020-0176 Sourcing from Unreliable Suppliers with Leadtime Difference

Qi Feng, McCombs School of Business, UT Austin, United States
Burcu Erciyes, A. B. Freeman School of Business, Tulane Univeristy, United States

We study a dynamic procurement planning problem in which the firm can replenish inventory from a fast and a slow supplier both with uncertain capacities. We characterize the optimal reorder point policy and analyze the order allocation between the suppliers. In particular, we show that it may be optimal to order exclusively from and allocate more long-term quantities to a supplier who is inferior to the other supplier in all dimensions including cost, leadtime, and reliability. Our observations highlight the importance of incorporating various supplier characteristics in a unified way when formulating supplier selection and order allocation strategies.

020-0482 Production Planning under Supply, Quality, and Demand Uncertainty with Customer Segmentation and Downward Substitution

Tim Noparumpa, Syracuse University, United States
Burak Kazaz, Syracuse University, United States
Scott Webster, Syracuse University, United States

We study the pricing and production planning problem under random, supply, quality and demand for two products that are downward substitutable. We consider an agricultural firm that has the ability to set the price of their high quality product while acting as a price taker in the low quality segment. The firm follows the recent trend in the agricultural industry by both growing its own crop through leasing lands from other farmers, and also purchasing additional fruit in the open market. Weather conditions, diseases, and natural disasters influence not only the amount of crop yield, but also the quality of the crop yield. We provide the optimal pricing and production decisions and the conditions that lead to unique optimal solutions. We show that the benefits of downward substitution become most effective under high variations of crop quality.

020-0603 Capacity Expansion and Contracts for Horizontal Capacity Coordination under Demand Uncertainty with Semiconductor Industry Applications

Xiaole Wu, Washington University in St. Louis, United States
Panos Kouvelis, Washington University in St. Louis, United States
Hirofumi Matsuo, Washington University in St. Louis, Japan

Within the semiconductor industry, there are integrated device manufacturers (IDM), fabless firms and foundries. Fabless firms specialize in device design, while foundries are dedicated to device manufacturing. IDMs integrate both functions. Foundries usually have an advantage in total capacity and production cost because of their specialization and economies of scale. The IDMs often make decisions for each device on whether to manufacture internally, sub-contract to foundries, or both. If the IDM decides to sub-contract part or all of the demand to the foundry, how the two parties should contract is a key decision problem. This paper studies two types of such contracts: fixed commitment contract and capacity reservation contract. We analyze them both from the IDM''s perspective and as a Nash Bargaining equilibrium. We analyze the different contracts and theiroptimal parameters and suggest the most reasonable contractual solutions, taking into accountprofitability and risk of the contracting firms.

020-1044 Revenue Sharing and Information Leakage in a Supply Chain

Guangwen Kong, University of Southern California, United States
Sampath Rajagopalan, University of Southern California, United States
Hao Zhang, University of Southern California, United States

While information sharing has many benefits to a supply chain, firms are often reluctant to share information with suppliers due to the fear of their leaking the information to competitors. We analyze a supply chain with one supplier and two retailers, one of whom orders first and has private information about uncertain market potential. This order information could be leaked to the uninformed retailer by the supplier to realize higher profits. We show that when the supplier and retailers use a certain revenue sharing contract, there exists a non-leakage equilibrium in which the supplier will not leak information. We identify many such contracts, with various wholesale prices and revenue share rates.

58 Friday, 12:30 PM - 02:00 PM, Sorrento 3,4 *Track:* SAP, 1 *Chair:* Shanshan Hu Rachel Chen
Session: Procurement Mechanism Design

020-0126 Procurement Bundling: How to Acquire Technology (Almost) Free

Leon Chu, University of Southern California, United States
Yunzeng Wang, University of California at Riverside, United States

We study a procurement mechanism when a buyer would like to acquire technologies along with products and compete with current suppliers in the future market. For the two-supplier case, each supplier has a dominant bidding strategy for the technology provision specified by the difference of the suppliers' technology strength and the ratio between the current project size and the future market size. The suppliers' technology provision can vary non-continuously with the market size ratio.

020-0958 Supplier Improvement under Competition and Knowledge Spillover

Nan Yang, Washington University in St. Louis, United States
Yimin Wang, Arizona State University, United States

We consider a model with two manufacturers that source a common component from an unreliable supplier, and compete in their consumer market by selecting a service level and other product-related factors. The demand process is given by a stochastic version of the general attraction model. The manufacturer can make an investment to improve supplier reliability, and we examine how supplier improvement effort is influenced by the potential knowledge spillover and the competitiveness of the market.

020-0208 Why Sellers Should Prefer Sequential Mechanisms

Andrew Davis, Penn State University, United States
Elena Katok, Penn State University, United States
Anthony Kwasnica, Penn State University, United States

We investigate two mechanisms commonly used for selling an asset where bidders incur an entry cost to learn their valuation: an English auction, and a sequential mechanism where bidders make entry decisions one after another and early arriving bidders can set a preemptive bid to deter future entry. Standard theory predicts that sellers should prefer the auction and bidders should prefer the sequential mechanism. We experimentally consider both mechanisms and find essentially the opposite preference; the sequential mechanism generates higher seller revenue, and bidder profits are the same between the two mechanisms. This stems from two behavioral phenomena: (1) in the auction, bidders underenter, and (2) in the sequential mechanism, bidders set positive preemptive bids but subsequent bidders appear to disregard them and overenter. We develop a model of noisy bidder entry, and show that it fits our experimental data well using parameter estimation techniques.

020-0826 Procurement Auction Design with Refined Belief

Shanshan Hu, Indiana University, Kelley School of Business, United States
Shengqi Ye, Indiana University, Kelley School of Business, United States
Qing Ye, Tsinghua University, School of Econ. and Management, China

In many procurement auctions, the buyer engages pre-bidding information acquisition from the potential bidders. It may result in a refined belief about the bidders' cost distributions, that is different from the original belief commonly shared by all auction participants. Taking the auctioneer's perspective, this paper seeks the optimal and practical designs that accommodate (or take advantage of) the belief difference. The derived optimal solution generalizes Myerson's auction design by awarding the object to the bidder with the lowest distorted virtual cost. The optimal payment rule is coded as a contingent scheme, which exploits the bidders' belief bias by paying less in outcomes with underestimated probabilities and paying more in the outcomes with overestimated probabilities. We also show that the contingent payment scheme is simply attached to the sufficient statistics of the losing bids.

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59 Friday, 12:30 PM - 02:00 PM, Naples 2 *Track:* GEN, 3 *Chair:* Gensheng Liu
Session: Operations flexibility

020-0444 Adopting ERP with Informality in order to Foster Both Efficiency and Flexiblity Operations

Yucan Wang, Aston Business School, United Kingdom
Greasely Andrew, Aston University, United Kingdom

This paper discusses whether efficiency and flexibility can be improved simultaneously when adopting ERP systems. ERP systems are well known for their ability to achieve efficient business performance by enabling a standardized business process design, but at a cost of a possible loss of flexibility in operations. The recent concept of leagile provides a strategy for manufacturing companies to find a balance between efficiency and flexibility in their supply chain management. Informality is related to flexibile operations because it can 'jump start' business initiatives. Based on a case study, the authors found ERP is implemented in some organizations with distinctive informality. These organizations not only require efficiency from the ERP system, but also continue to rely on flexible operations based on informal activities. The paper aims to investigate how a company combines ERP and informality in order to improve both operations objectives of efficiency and flexibility.

020-0899 Postponement: An Analysis of the Role of Supplier Flexibility

Soroosh (Sam) Saghiri, Kingston University London, United Kingdom
Stuart Barnes, University of East Anglia, United Kingdom

Numerous technical factors which influence postponement implementation, such as product modularity and process redesign, have been widely studied. Notwithstanding, the effect of external factors on postponement has been paid much less attention. This study addresses the relationship between supplier flexibility and postponement implementation. Four constructs of flexibility and three constructs of postponement - namely volume flexibility, mix flexibility, new product design flexibility, product modification flexibility, manufacturing postponement, ordering postponement and product design postponement - are identified, and measured variables for them are defined and validated. The links among supplier flexibility and postponement constructs are then tested through structural equation modeling (SEM) using empirical data from a sample of 219 manufacturing firms. The findings enhance the postponement knowledge with respect to external influencing factors from a general level to a more precise, specific level. The implications of the research outcomes are discussed and directions for future research are provided.

020-0653 Due Date Setting for Pooled Manufacturing Systems with Heterogeneous Demand

Tanja Mlinar, Université catholique de Louvain, Belgium
Philippe Chevalier, Université catholique de Louvain, Belgium

With the growing diversity of products and services demanded by clients, there is an increased tendency of using the same resource for different products; this is called pooling. The effects of pooling queueing systems on the average waiting times and the expected delay have been widely studied, especially in service environments such as call centers and communication networks. A make-to-order manufacturing setting can be modeled as a queueing system with an additional degree of freedom, which is the determination of the due dates promised to clients. The analysis of the effects of pooling such systems has not been addressed up to now. We show that the due-date setting and scheduling policies can be exploited to increase the benefits of pooling.

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60 Friday, 12:30 PM - 02:00 PM, Naples 1 *Track:* GOS, 8 *Chair:* John Park Burak Kazaz
Session: Pricing and Risk Management

020-0283 Incremental Capacity Expansion under Responsive Pricing

Yimin Wang, Arizona State University, United States

We consider a manufacturer's new market expansion problem when it already has some established facility in its existing market. We study both flexible and dedicated capacity expansion strategies, and we provide managerial insights on how strategy choices influence expected production volumes in the new and existing markets.

020-0269 Supply Chain Network Design Problem with Transfer Prices

Renato de Matta, University of Iowa, United States
Tan Miller, Rider University, United States

We propose a profit maximization model for a firm establishing or rationalizing a multi-national supply chain to produce and deliver finished goods from sources to consumers. Our methodology simultaneously evaluates the impact of intra-firm transfer pricing, global exchange rates and traditional location factors in the supply chain network design problem. We develop an efficient decomposition procedure which exploits the special structures of the problem. Computational results are presented.

020-0890 Risk Mitigation of Production Hedging

John Park, Syracuse University, United States
Burak Kazaz, Syracuse University, United States
Scott Webster, Syracuse University, United States

This research analyzes the influence of exchange-rate uncertainty on a global manufacturer's pricing and production planning decisions. It shows that production hedging, defined as producing less than the total demand, is not only a legitimate scheme to maximize expected profits, but also an effective supply chain strategy to reduce risk. The main findings include: (1) a firm can benefit by reducing its choice of the optimal selling price, (2) a firm can actually manufacture more products under production hedging than it does under a policy when it commits to the manufacturing of the total global demand, (3) the optimal selling price can be even lower than the unit manufacturing cost, and (4) modified versions of production hedging strategies can eliminate the probability of loss by further adjusting production quantity.

62 Friday, 12:30 PM - 02:00 PM, Naples 4 *Track:* CSC, 3 *Chair:* William Guerrero
Session: Optimization Models

020-0825 The Inventory Location Routing Problem with Deterministic Demand

William Guerrero, Los Andes University, Colombia
Nubia Velasco, Los Andes University, Colombia
Ciro Amaya, Los Andes University, Colombia
Caroline Prodhon, Institut Charles Delaunay - UMR 6279, Université de Technologie de Troyes, France

When locating depots, incorporating operational costs such as transportation costs and stocking costs leads to improved solutions. In supply chain management, coordinating depot location, vehicle routing and inventory management is a main challenge for the long run. Furthermore, the traditional approach of decomposing strategic, tactical and operative decisions provides sub-optimal decisions. We present for the first time two mixed-integer programming models to design supply chains considering simultaneously the routing and stock management costs when facing deterministic demand over a multi-period time horizon. The first model allows the split of the demand of retailers over the vehicle routes and over the finite time horizon. The second model is a variation to constrain the split of the demand and then, larger instances could be solved to optimality. Furthermore a branch-and-bound algorithm implementation is presented to solve randomly generated instances. The ongoing research is the implementation of heuristic methods to solve larger instances.

020-0451 Optimal Selection of Suppliers in a Supply Chain Network with Multiple Bidders for Each Stage

Shashank Garg, Handheld Solutions & Research Labs, India
Diatha Sundar, Indian Institute of Management Bangalore, India

In a cost competitive commodity market, procurement of raw materials and production and supply of finished goods at minimum cost play vital roles in managing an efficient supply chain. It becomes complex while dealing with agricultural products, where procurement of raw material(s) is seasonal and production is partly seasonal whereas finished products demand is steady throughout the year. Further complications arise when changes come in the set of service providers (supply side & distribution side) & their commercial contracts, annually. This paper models such a supply chain as a project network in which multiple time-cost bids are provided by multiple suppliers for each stage/node of the network. Market intelligence curves are developed for each stage/activity to determine the baseline cost-time solution for the network. Optimal set of suppliers is determined using the market intelligence curves and suppliers' actual bids by formulating the problem as a linear programming problem.

020-0886 Modeling Decision Strategies in Supply-Chains: An Agent-based Approach for Supply Network Planning in Dynamic Markets

Juergen Woeckl, Vienna University of Business and Economics, Austria

In global markets, one major issue for manufacturing organizations is to adapt the supply-chain to the dynamics of consumer markets. Heterogeneous market structures, trends, customer needs and product seasons are just a few of the challenges a global supply-chain needs to deal with. Future IT-systems need to be able to respond to stochastic and even unpredictable market changes in a better and more flexible way than classical enterprise resource planning (ERP) or supply-chain management (SCM) systems. This study is focusing on the optimization of supply networks for volatile consumer markets. Both the market dynamic and the strategies for supply network planning are modeled using an agent-based approach, which captures the dynamic of the decision problem implicitly. The two agent-based models are combined to provide a dynamic formulation of the decision problem for further optimization tasks. The interaction of the two agent-based models is studied and selected stylized facts reproduced.

63 Friday, 12:30 PM - 02:00 PM, Naples 6 *Track:* CSC, 16 *Chair:* Yulan Wang
Session: Competition in the Supply Chain

020-0052 Impact of Competition on Innovation in a Supply Chain

Jingqi Wang, Northwestern University/Kellogg school of management, United States
Hyoduk Shin, Northwestern University/Kellogg school of management, United States

We explore the impact of competition on innovation in a supply chain consisting of upstream manufacturers who invest in innovation and downstream retailers who sell to consumers. We show that if the manufacturer sets the wholesale price, downstream competition does not affect upstream innovation. However, if the retailers set the wholesale prices, downstream competition can induce more innovation in a supply chain. If manufacturers and retailers bargain, downstream competition can either increase or decrease upstream innovation: specifically, when competition is relatively weak, it induces more innovation, whereas when competition is relatively intense, it induces less innovation. We then demonstrate that all firms within a supply chain can be better off by giving the manufacturer more market power. We also provide implications of our results on the recent challenge faced by First Solar on how to motivate its glass suppliers to invest more in innovation.

020-0740 Does Investment in Supply Chain Management and Information Technology Provide Value for Very Small Firms?

Zach Zacharia, Lehigh University, United States
Catherine Ridings, Lehigh University, United States

The practices of Supply Chain Management (SCM) and Information Technology (IT) investment have long been touted for large companies to reduce inventory and order costs, improve quality and customer service, and increase revenues and profits. Do the benefits of incorporating SCM practices and utilizing IT outweigh the significant costs for very small firms? If there are benefits, are they cost effective? Our research seeks to answer these questions in the context of local food systems in which consumers are served by nearby producers and intermediaries. We develop several propositions for the value added benefits and costs for very small firms and short supply chains. Our goal is to develop realistic characterizations and testable hypotheses about how SCM and IT can affect the overall functioning of small firms in the context of local food systems.

020-0282 On the Advantage of Quantity Leadership When Outsourcing Production to a Competitive Contract Manufacturer

Yulan Wang, Hong Kong Polytechnic University, Hong Kong
Pengfei Guo, Hong Kong Polytechnic University, Hong Kong
Baozhuang Niu, Hong Kong Polytechnic University, Hong Kong

We investigate a supply chain comprising an original equipmentmanufacturer (OEM) and a contract manufacturer (CM), where the CM actsas both an upstream partner and a downstream competitor of the OEM. Thetwo parties can engage in one of the following Cournot competition games: a simultaneous-move game, a sequential game with the OEM as the Stackelberg leader and a sequential game with the CM as the Stackelberg leader. Based on these three basic games, we then investigate the two parties' decisions in choosing Stackelberg leadership or followership considering various system parameters.

64 Friday, 12:30 PM - 02:00 PM, Capri 3 *Track:* QPJ, 14 *Chair:* Kevin Watson

Session: Panel Discussion: The State of Process Improvement: Views from Lean, Six Sigma, and TOC

020-1017 Panel Discussion: The State of Process Improvement: Views from Lean, Six Sigma, and TOC

Kevin Watson, Iowa State University, United States

This invited panel will discuss the evolution and current state of development of Lean, Six Sigma, and TOC.

67 Friday, 02:30 PM - 04:00 PM, Tuscan 1 *Track:* HOM, 4 *Chair:* Lijie Song

Session: Capacity Scheduling & Emergency Department Operations

020-0077 The Financial Consequenses of Boarding in Hospital Emergency Departments

Robert Batt, The Wharton School at UPenn, United States
Christian Terwiesch, The Wharton School at UPenn, United States

We explore the operational ramifications of crowding in hospital emergency departments. A common indicator of crowding is patients “boarding” in the emergency department while awaiting transfer to an inpatient bed in the hospital. Boarding is a controversial topic in the medical community because it has been suggested that it is a way to tacitly prioritize high-dollar elective patients over lower-value emergency patients. However, the financial impact of boarding is not obvious since boarding creates congestion in the emergency department leading to higher levels of lost demand from patients leaving without treatment and ambulances being diverted. We use discrete event simulation to model a hospital under various boarding regimes and patient prioritization schemes. We find that reducing boarding can be not only operationally efficient but also financially beneficial for the hospital.

020-0181 Comparison of Traditional and Open-Access Appointment-Scheduling Policies

Rachel Chen, University of California at Davis, United States
Lawrence Robinson, Cornell University, United States

This paper compares two types of appointment-scheduling policies for single providers: traditional and open access. Under traditional scheduling, each of a specified number of patients per day is booked well in advance, but may not show up. Under open-access scheduling, a random number of patients call in the morning to make an appointment for that same day. Thus the number of patient arrivals will be random, for different reasons, under both policies. We find that the open-access schedule will significantly outperform the traditional schedule-in terms of a weighted average of patients’ waiting time, the doctor’s idle time, and the doctor’s overtime-except when patient waiting time is held in little regard or when the probability of no-shows is quite small.

020-0446 Reducing Length of Stay in Hospital Emergency Rooms through Process Redesign

Lijie Song, MIT-Zaragoza International Logistics Program, Spain
Nicole DeHoratius, The University of Portland, United States
Thomas Lee, University of California at Berkeley, United States

Point of care (POC) testing is becoming increasingly popular in US hospitals as a way to speed up testing processes, reduce patient length of stay, and improve patient satisfaction. This study uses propensity score matching (PSM) to test the impact of POC versus central lab testing on patient length of stay, using two years of patient data collected at an American hospital. Our analysis shows a significant reduction in length of stay for patients who undergo POC testing.

020-0214 Field Vehicle Supply Chain at the International Federation of Red Cross and Red Crescent Societies

Orla Stapleton, INSEAD, France
Alfonso Pedraza Martinez, INSEAD, France
Luk Van Wassenhove, INSEAD, France

The International Federation of Red Cross and Red Crescent Societies (IFRC) operates relief and development programs. These programs are composed of disaster management, health care, and capacity building activities. The IFRC is a benchmark organization in the areas of humanitarian logistics and fleet management. This paper analyzes the IFRC “better, faster and cheaper” field vehicle supply chain using Lee’s Triple-A framework and identifies the main trade-offs involved. We find that the extra cost to achieve agility in relief programs is compensated with cost effectiveness in development programs. Cost effectiveness in development programs is obtained at the expense of speed of procurement. We also identify challenges to the IFRC field vehicle supply chain as areas for future research in humanitarian operations management.

68 Friday, 02:30 PM - 04:00 PM, Tuscan 2 *Track:* HOM, 18 *Chair:* Davood Golmohammadi

Session: Lean In Healthcare: Current State & Challenges Ahead

020-0663 Linking Continuous Improvement to Quality of Care in Mental Healthcare: A Preliminary Study

Jamison Kovach, University of Houston, United States
Lawrence Fredendall, Clemson University, United States
Linda LaGanga, Mental Health Center of Denver, United States

Continuous quality improvement is generally viewed as the process of constantly striving to improve quality, which means that continuous quality improvement (CQI) activities involve learning and knowledge creation. In general, healthcare organizations have been adopting CQI programs to improve safety, increase patient satisfaction, and decrease costs. Recently, mental healthcare organizations have begun to use CQI to improve their operations. However, there are few research studies that test whether continuous improvement interventions actually improve the quality of care that outpatient clients/patients receive. This preliminary study identifies CQI and learning constructs to form a research model to explain both the relationship between CQI practices and the quality of mental healthcare provided and the role knowledge plays in this relationship. In order to study how CQI practices perform as learning behaviors that lead to knowledge creation, the study develops a survey instrument. The survey instrument is then empirically tested in a pilot study.

020-0171 Challenges and Issues of Lean Application in Healthcare

Davood Golmohammadi, University of Massachusetts - Boston, United States

Interest in the application of lean approach in healthcare has grown significantly in the last few years. The results often show the benefits to patient care and resource utilization. However, the implementation of Lean is not without its problems, with the process depending on factors such as organizational readiness, a culture of continuous improvement, effective leadership, the availability of resources and communication, and strategy. In this paper, we review challenges and issues of lean application in healthcare, and propose a framework to deliver sustainable improvements in healthcare.

020-0107 The Lean Paradox: Time and Other Dimensions in Healthcare Quality

Linda LaGanga, Mental Health Center of Denver, United States

Lean process improvement has made a successful transition from manufacturing to healthcare operations, beginning in hospital settings. Recent application of lean improvement in outpatient settings reveals new opportunities for healthcare quality improvement by considering the continuum of healthcare along several dimensions. In this research, we consider the role of outpatient care in reducing overall healthcare expenses and the interaction between behavioral and physical health. The dimension of time is also explored for its influence on healthcare outcomes through prevention of illness and promotion of wellness through timely access to care. Timeliness also plays a crucial role in the success of lean project implementation and contributes to the phenomenon of the “lean paradox” discovered in prior field research.

020-0091 Lean Application in Healthcare

Sanjeev Bordoloi, University of St. Thomas, United States
David Fischer, TRIA Orthopaedic Center, USA

Healthcare applications are starting to focus heavily on Lean Management. Lean management focuses on removing waste from processes, while delivering added value to customers. Although health care differs from manufacturing in several ways, there are also surprising similarities that make it possible to extend concepts from Toyota to healthcare management. This paper addresses an ongoing application of Lean principles at a specific hospital. Lean thinking started by identifying value-added and non-value-added items in each process. In order for lean principles to take root, healthcare leaders first had to create an organizational culture that is conducive to lean thinking. Then, staff could be involved to help redesign processes to improve flow and reduce waste. This paper demonstrates how lean principles can be used at a hospital to minimize wastes and improve productivity.

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69 Friday, 02:30 PM - 04:00 PM, Tuscan 3 *Track:* OMM, 2 *Chair:* Muge Yayla-Kullu
Session: Product Assortment

020-0389 Capacity Investments and Product Mix Choice under Economic Uncertainty

Muge Yayla-Kullu, RPI Lally School of Mgmt. & Tech., United States

We analytically study the effects of market uncertainty about customer valuation shifts on the product line decisions of a firm with limited resources. There are two product types with different qualities, unit production costs, and unit resource consumptions, and customers are heterogeneous in their willingness to pay for quality. In the first period, the firm decides its capacity investment for each product type based on the available resources and expectations on the customers' valuations. In the second period, customers' valuation distribution is realized and the firm makes its production and pricing decisions subject to the capacity investments. We find that considering resource availability and uncertainty early on would help firms survive through hard times.

020-0088 Configurable Product Assortment Planning with Considerations for Supply and Manufacturing Issues

Seyed Ali Taghavi, Wayne State University, United States
Ratna Chinnam, Wayne State University, United States

A manufacturer's assortment is the set of products that the company offers to its customers. Assortment planning is a critical decision that needs to balance benefits captured from diversifying the assortment and costs incurred by increasing assortment complexity. In this study, we build a framework that looks for the optimal assortment for a manufacturer of configurable products by considering the effect of product variety on supply, manufacturing and distribution costs. The framework would account for demand and substitution probabilities through an exogenous demand model.

020-0255 Commercialization of Platform Technologies

Daewon Sun, University of Notre Dame, United States
Hemant Bhargava, University of California Davis, United States
Byung Cho Kim, Virginia Tech, United States

Commercial success of many technology products, and especially platform technologies, requires adoption of astute business practices that involve product line design, price discrimination, and launch timing to manage the growth vs. revenues dilemma. We examine these issues for a platform firm that serves two markets, the user and developer markets, such that participation in one market depends positively on the size of the other market, but where there remains uncertainty in the extent of developer participation. We demonstrate that product versioning is an especially attractive strategy for platform firms, i.e., the tradeoff between market size and margins is tilted in the direction of more versions. However, when expanding the product line carries substantial fixed costs (e.g., marketing cost, cost of additional plant, managing multiple sets of inventory, increased distribution cost) then the uncertainty in developer participation adversely impacts the firm's ability to offer multiple versions.

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71 Friday, 02:30 PM - 04:00 PM, Tuscan 5 *Track:* OEE, 3 *Chair:* Cagri Haksoz
Session: Managing Operations in Turkey and its Hinterland
This session will present examples of managing operations in Turkey and its hinterland.

020-0044 Crossdocking Insights from a 3rd Party Logistics Firm in Turkey

Gurdal Ertek, Sabanci University, Turkey

In crossdocking, the inbound materials coming in trucks to the crossdock facility (CF) are directed to outbound doors and are directly loaded into trucks that will perform shipment, or are staged for a very brief time period before loading. Crossdocking has a great potential to bring savings in logistics; for example, most of the logistics success of Wal-Mart, the world's leading retailer, is attributed to crossdocking. This paper first reviews different types of crossdocking. Then a case study that describes the crossdocking applications of a 3rd party logistics firm in Turkey is presented. It is found out that crossdocking brings new challenges, which should be resolved for successful operations. Many of the challenges faced by the described 3rd party logistics firm and the practical solutions the firm applies are applicable to other companies that are interested in applying crossdocking.

020-0177 Redesigning the Procurement Process: The Case of a Turkish Company

Muhittin Demir, Izmir University of Economics, Turkey
Burcu Adivar, Izmir University of Economics, Turkey
Cagri Haksoz, Sabanci University, Turkey

In this paper we analyze the procurement process of a leading Turkish company. The company under consideration is the supplier of highly demanding multinational companies. On the other hand, the company itself works with a number of suppliers that are local small- to medium-sized companies. We first provide a supply chain alignment perspective that emphasizes the importance of the procurement strategy. We then discuss the supplier selection-evaluation system and procurement risk assessment and management processes of the company. We conclude with a comparison of the current and proposed designs for these processes.

020-0369 Private-Humanitarian Supply Chain Partnerships on the Silk Road

Orla Stapleton, INSEAD Humanitarian Research Group, France
Lea Stadtler, University of Geneva (HEC), Switzerland
Luk Van Wassenhove, INSEAD, France

Countries along the Silk Road have traditionally been affected by natural and man-made disasters. Such large-scale disasters are highly disruptive to commercial supply chains. Companies operating in these countries need to be better equipped to deal with the expected challenges that come with managing multinational supply chains in volatile environments. International humanitarian organizations, on the other hand, are familiar with working in volatile environments and their supply chains have been designed to respond to large scale disasters. Using three examples from the Silk Road, this paper analyzes

private-humanitarian partnerships for disaster relief operations. We illustrate how companies can contribute valuable expertise and resources to improve the overall response, but also learn from the experience in terms of operating in highly challenging contexts, flexibility, and increased knowledge of the area.

72 Friday, 02:30 PM - 04:00 PM, Tuscan 6 *Track:* HOC, 2 *Chair:* Keenan Yoho
Session: Humanitarian Assistance and Disaster Response (HADR)

020-0841 Strategies for Logistics in Case of a Natural Disaster

Aruna Apte, Naval Postgraduate School, United States
Keenan Yoho, Naval Postgraduate School, United States

The unpredictability of the timing of a disaster as well as the scope of its human and material destruction raises several serious questions for emergency planners and first responders. Decisions regarding the types of provisions that should be prepositioned, as well as their location, should be made well before a disaster strikes in order to provide quick response. We discuss a general framework for classifying disasters and then investigate several logistics policy options for effectively responding to them. The conceptual models developed in this work will serve as the theoretical base for future empirical work investigating appropriate policy options for different classifications of disasters.

020-0838 Antecedents and Consequences of Food Security in Sudden and Slow Onset Crises

Rosa Akbari, Naval Postgraduate School, United States

What factors must policy makers and aid organizations consider in order to ensure proper food security as part of effective supply chain management during slow and sudden onset humanitarian crises? This research explores the operational logistics behind food delivery, as well as the developmental implications of long term food assistance, with respect to both sudden and evolving incidents and situations. The process flow of sudden onset crises is compared to that of slow onset crises with respect to the structure and management of the supply chain. Field research conducted in Haiti (January 2010) and the Sahrawi refugee camps in Algeria (June 2010) are used to compare and contrast two different cases of food security within the context of supply chain management.

020-0810 Paying for Military Support in Humanitarian Assistance & Disaster Response: A Cost Analysis and Planning Model

Stephen Ures, Naval Postgraduate School, United States

The United States Department of Defense (DoD) has recently elevated the priority of military participation in humanitarian assistance and disaster response (HA/DR) to the level of a core mission, equivalent to conventional combat operations. The DoD possesses valuable assets and unique competencies that facilitate operations in dispersed locations without functioning infrastructure. Only the military possesses these capabilities at a sufficient capacity to respond to a major, sudden-onset disaster. Until the DoD provides a cost estimate for services, DoS cannot gauge the level of service desired from the DoD to support DoS missions. Examining the U.S. Navy's participation in HA/DR following two natural disasters, namely the 2004 Indian Ocean tsunami and the 2010 Haiti earthquake, this research analyzes the effectiveness of a cost model that is currently used by the DoD to budget contingency operations and investigates the potential for a more representative planning tool for future operations.

73 Friday, 02:30 PM - 04:00 PM, Tuscan 7 *Track:* PDI, 4 *Chair:* Hamid Noori
Session: Supply Chain Management and Innovation

020-0807 Integrating the Supply Chain for Innovativeness

Inga-Lena Darkow, EBS Business School, Germany
Gernot Kaiser, EBS Business School, Germany

This study links the developing body of literature on supply chain integration with the topic of innovation performance. Hardly any research exists in this area, and even less attention is paid to empirical results. Being innovative is recognized as a key factor for company success and determined by the adaptability to market changes, successful new product and service developments and acquiring new customers. Moreover, it is well known that integrating customers and suppliers into the innovation process is an important success factor. Therefore, we study the impact of supply chain integration on innovation performance. A German-based survey was conducted and partial least square modeling was used to determine the impact on innovativeness. The findings indicated that customer integration has an impact on innovativeness of a company. The results for supplier integration are more ambiguous. This study makes an important contribution to the literature on supply chain integration and innovativeness.

020-0209 Assessing the Effectiveness of Innovation Propagation in Supply Chains

Eman Nasr, Wilfrid Laurier University, Canada
Hamid Noori, Wilfirid Laurier University, Canada

This presentation provides a systematic analysis of the explanatory, situational and organizational factors that would help or hinder innovation propagation among members in existing supply chains. We define "innovation propagation" as the repeated movement of an innovation or innovation capability from one company to another one in its supply chain (SC). The central thesis of our research is a departure from the view that to guarantee the success or profitability of an innovation, organizations need to create a complementary and specialized package of (appropriation) mechanisms in order to restrain the flow of resources and capabilities to rivals.In this presentation, we will use case studies to explore the phenomenon and add deeper insights.

020-0012 Analyzing Boeing's Supply Chain Design for B787 (Dreamliner)

Narasimha Lamba, University of Massachusetts,Boston, United States
Ehsan Elahi, University of Massachusetts Boston, 02125

In 2004, Boeing launched the development program of its latest commercial airplane design, Dreamliner (B787). With the Dreamliner Boeing not only introduced a transformational and extraordinary design, but also revolutionized the way it used to develop a new model. It devised a new supply chain model in which suppliers were responsible to invest their own money to design, manufacture, and integrate major sections of the airplane based on general specifications provided by Boeing. The program, however, turned into the longest delay in the history of the company with huge extra costs for Boeing. In this paper we seek the root causes which led to all these problems. We then show how the new supply chain model along with other factors led to these problems. More specifically, we present how the adoption of this model weakened the company's position in leveraging its core competency.

74 Friday, 02:30 PM - 04:00 PM, Tuscan 8 *Track:* ERS, 4 *Chair:* Lothar Czaja
Session: Empirical Research in OM IV

020-0793 Implications for Competitiveness: Effectiveness in Reconfigurable Manufacturing Systems (RMS)

Cesar Ortega, Unah, Honduras
Ignacio Eguia, University of Sevilla, Spain

Jose D. Machuca, University of Sevilla, Spain
Jose Perez, University of Sevilla, Spain

A High Performance Manufacturing view is presented in order to put forward some current lean manufacturing conditions to set the stage for future implantation of Reconfigurable Manufacturing Systems (RMS). Thus, this paper uses 270 manufacturing plants from North America, Asia and Europe to focus on some manufacturing strategy (MS) and technology (T) practices (as scales part of lean manufacturing) in RMS, as well as on operational performance (OP) dimensions. Using reliable and valid performance dimensions and measurement scales, this paper empirically examines inter-industry and inter-class descriptive characteristics in the RMS involvement of T and MS practices and its relationship with OP. A series of descriptive analyses shows that manufacturing plants have high implementation levels of both T and MS practices related to lean manufacturing, and consider both a previous step and an intrinsic part of an effective RMS. Besides, performance dimensions, related to lean manufacturing, are being sought by plants.

020-0218 Complexity Management in SMEs - Results from an Empirical Analysis in the German Machinery and Equipment Industry

Lothar Czaja, University of Erlangen-Nuremberg, Germany
Andreas Wassmus, University of Erlangen-Nuremberg, Germany
Kai-Ingo Voigt, University of Erlangen-Nuremberg, Germany

In literature, satisfying the customers´needs is constantly regarded as one central premise to guarantee a company´s competitiveness in the long run. Therefore, there are many companies in the market that provide a huge variety of offered products. However, the traditional goal of complexity management initiatives has been to reduce costs by reducing the variety of offered products. Moreover, current studies confirm that companies with the lowest complexity grew faster than their average competitors, because too much variety leads to high complexity companies have to deal with. By providing the right level of product variety, companies can increase sales and market share, while cutting costs. In our paper, we will analyse with the help of an empirical analysis which are the main drivers of complexity in the German Machinery and Equipment Industry and how small and medium-sized enterprises of that industry deal with the increasing complexity of products and processes.

020-0076 An Empirical Analysis of Improvement Trajectories in Six Sigma Systems

George Easton, Emory University, United States
Eve Rosenzweig, Emory University, United States

This paper examines improvement trajectories in the context of six sigma by analysis of 198 six sigma projects from a Fortune 500 consumer products manufacturer. Drawing upon the organizational learning and manufacturing strategy literatures, we develop nine hypotheses pertaining to the drivers of the rate in improvement of the probability of six sigma project success over time. To test these hypotheses, we code relevant variables-including the foci of the projects undertaken over time and the location of the projects in the organization-based on archived six sigma project documentation. This database spans six years, and includes not only successful projects, but failed projects as well. Overall, our logistic regression analyses show that the more complex or difficult the nature of the six sigma project, the slower the rate of improvement in the probability of success.

020-0642 How to Address the Needs of Specific Target Groups: A Comparison between Fashion and Orthopaedic Footware Supply Chains

Valentina Franchini, Università degli Studi di Padova, Italy
Rosanna Fornasiero, National Research Council, Italy
Andrea Vinelli, Università degli Studi di Padova, Italy

This research is a part of the European 7th Framework Program RTD project named CoReNet, which aims at implementing innovative tools and methods for supply chain management to meet consumer needs and expectations for specific target groups - such as elderly, obese, disabled, or diabetic persons - by producing a small series of functional and fashionable footwear of high quality, affordable price and eco-compatibility.The paper compares the fashion and the orthopaedic footwear supply chains, through multiple case studies conducted in Italian companies, to understand how the production for the target groups mentioned before could be easily industrialized through a better integration of these two supply chains. Through business processes and requirements analysis, the paper proposes a supply chain topology that maps the most relevant characteristics, procedures and techniques, related to customer interaction, demand forecasting, co-planning, capacity planning, distribution practices, sustainability, production planning, order scheduling, order negotiation and event handling.

75 Friday, 02:30 PM - 04:00 PM, Tuscan 9 *Track:* BOM, 4 *Chair:* Rogelio Oliva Pauline Found
Session: Leadership and Organizational Change

020-0878 Not Getting What You Wanted: Understanding the Process by which Change is Thwarted in Organizations

John Hanson, University of San Diego, United States
Steven Melnyk, Michigan State University, United States

Change management is central to improve quality, get lean or promote innovation, but the literature suggests that success in these initiatives is rare. Research on change management has identified key success factors, but we find that they may be necessary, but not sufficient. In two deep case studies we show the mechanisms by which change efforts are blocked or transmuted into less desirable forms.We find that attention must be paid to both the “what” and the “how” of the new state because both must be changed simultaneously. Change efforts typically only address one at a time, but whichever component is left unchanged will crowd out changes to the other. This self-healing capacity is often attributed to culture and creates strong resistance to change. An immediate conclusion is that, under conditions of change, focusing on outcomes and delegating responsibility for the methods will be counterproductive.

020-0302 Leadership Style Investigation in Quinn's Competitive Values Framework for the Iranian Automotive Industry

Elmira Hajiaghazadeh Marandi, Islamic Azad University (IAU)- South Tehran Branch, Iran (Islamic Republic of)
Farshid Abdi, Islamic Azad University (IAU)- South Tehran Branch, Iran (Islamic Republic of)

Competing Values Framework (CVF) offers eight managerial roles for evaluating the effectiveness of the managers (Quinn & Rohrbaugh, 1983). The eight roles of CVF are innovator, broker, producer, director, coordinator, monitor, facilitator and mentor. Competing Values Framework has been used as an instrument for measuring the leadership style of managers from 1983. Since most of the research about leadership style based on CVF has been done in Australia and Western culture (Vilkinas, Tricia; Cartan, Greg, 1993; Vilkinas, Tricia; Cartan, Greg, 1997; Vilkinas, Tricia, 2000; Vilkinas & Wyse, 2004), this study seeks to discover whether a leadership model (CVF) developed for Western culture is an appropriate instrument for describing the managers’ leadership style in Iran's automotive industry. We investigate the perception of managers of their leadership style and the effect of organizational position on choosing managerial roles.

020-0180 The Choir as an Organization: Its Structure and Motivational Implications

Rita Fucci-Amato, University of São Paulo, Brazil
João Amato-Neto, University of São Paulo, Brazil
Edmundo Escrivão-Filho, University of São Paulo, Brazil

Choral singing - professional or amateur - can be itself considered a work practice, which provides cultural products and services, such as concerts and records.

Under this point of view, choirs are based on material resources (such as musical instruments and scores) and, prominently, on human resources (such as conductor and choristers). These characteristics indicate that choirs are social groups or organizations and require management of their operations and processes. This paper aims at presenting an empirical research developed in seven choirs of São Paulo city, Brazil, six of them amateur groups, and one that can be considered semi-professional. Through semi-structured questionnaires, conductors and choristers were asked about how motivation is an ability that their maestros demand. Interviews with the conductors and observation of rehearsals complete the data for analysis.

020-0179 The Maestro as Leader: Bases of Authority, Leadership Styles and Emotional Intelligence in Choral Conductors

Rita Fucci-Amato, University of São Paulo, Brazil
João Amato-Neto, University of São Paulo, Brazil
Edmundo Escrivão-Filho, University of São Paulo, Brazil

Maestros are an icon of leadership; their baton, a symbol of control. This paper aims at presenting empirical research developed in seven choirs of São Paulo, Brazil, six of them being amateur groups, and one that can be considered semi-professional. Through semi-structured questionnaires, conductors and choristers were asked to evaluate the bases of authority, the leadership style and the emotional intelligence and leadership sub-abilities of management of the maestros. The questions deal, respectively, with models and analyses of leadership developed by Max Weber, Douglas McGregor and Daniel Goleman, authors of different times, areas, activities and theoretical traditions.

76 Friday, 02:30 PM - 04:00 PM, Tuscan 10 *Track:* ICM, 4 *Chair:* Mohsen Elhafsi
Session: Inventory Control for Multiple Demand Classes

020-0732 Pooled Inventory under Dependent Demand

Enis Kayis, HP Laboratories, United States
Kemal Guler, HP Laboratories, United States
Burcu Aydin, HP Laboratories, United States
Mehmet Sayal, HP Laboratories, United States

Faced with multiple demand streams, a newsvendor has to decide the right level of inventory to satisfy total demand. The cases with independent and comonotonic demand streams are well documented in the literature. In this work, we bridge the gap and investigate how the structure of dependence in the demand sources affects the pooled inventory level and provide comparative statistics on the optimal pooled inventory level. We show that misspecification of dependence structure may lead to suboptimal inventory levels and under/over estimation of profits.

77 Friday, 02:30 PM - 04:00 PM, Tuscan 11 *Track:* SOM, 4 *Chair:* Chun-Hung Cheng
Session: Modeling Service Operations 1

020-0995 Personnel Transportation in Service Organizations with Minimum Inconvenience

Subramaniam Ponnaiyan, University of North Texas, United States

This study deals with vehicle routing and related issues encountered widely in service organizations which transport their work force from their residence to service center of the firm. The problem is significantly different from the basic vehicle routing problem because of detour and time window constraints. Detour constraints capture the excess travel time of employees with respect to their direct travel time. Time window constraint is imposed on the collection side and not at the pick points. Moreover, excess ride time (inconvenience) caused to the employees is considered individually in our study. Previous studies consider the excess ride time collectively. A partitioning based intuitive heuristic is developed to solve this problem. The results of the study offer valuable insights to the practitioners for planning vehicle routes, deciding the fleet size and analyzing alternatives like third party personnel logistics.

020-0631 Price Game Analysis of Leader-Follower Service Providers with Service Delivery Time Guarantees

Yulin Zhang, Southeastern University, China
Jian-wei Zhang, Southeastern University, China
Ying-Ju Chen, UC Berkeley, United States

Under the situation that customers have the same time sensitivity and obey the uniform distribution on a linear city with length one, we study the price game of leader-follower service providers (denoted as sp1 and sp2) with two types of service delivery time guarantee. The study shows that when the customer reservation payment (CRP) is smaller, the two service providers are both in local monopoly. With the increase of CRP, if sp2 chooses the longer service delivery time guarantee, they are still in local monopoly. Otherwise, they would compete for some customers. When CRP is larger, no matter which types of service delivery time guarantee they choose, they will compete for some customers. When they are in competition, the follower has the second-move advantage. If the per unit service cost and the service capacity cost are the same, the per unit time profit of sp2 is higher than sp1.

020-0082 Convex Relaxation Approach to Appointment Scheduling

Guohua Wan, Shanghai Jiao Tong University, China
Dongdong Ge, Shanghai Jiao Tong University, China
Jiawei Zhang, New York Univevrsity, United States

We study the problem of scheduling a set of jobs with predetermined order on a single processor to minimize the total cost incurred by job waiting times and processor idling times, where job processing times are discrete random variables without known distribution, and the costfunctions are convex functions of job waiting time or processor idling time. We formulate the problem as a stochastic program and prove that there exists an integer-valued optimal solution. We then develop an approach based on convex relaxation to solve the problem. Our study extends the results of Begen and Queyranne (2010) and Begen, Levi and Queyranne (2010), and simplifies the proofs significantly.

020-0020 Models and Algorithms for Identifying Critical Components in a Service System

Tsz Wai Lai, The Chinese University of Hong Kong, Hong Kong
Chun-Hung Cheng, The Chinese University of Hong Kong, Hong Kong

Critical components of a system are the components that, if lost, may pose a threat to the operations of the system. To ensure the operations, resources must be provided to protect them against possible attacks. In this work, we examine models for identifying these components in a system. Optimal solutions are explored. Tabu-search is used to deal with larger problem settings. Extensive computational results will be presented.

78 Friday, 02:30 PM - 04:00 PM, Roma 1,2 *Track:* LOM, 2 *Chair:* Stephan Wagner
Session: Logistics Service & Innovation

020-0278 Partnering for Logistics Service Innovation

Stephan Wagner, Swiss Federal Institute of Technology Zurich, Switzerland

Firms that open up their organizational boundaries and access valuable external sources of knowledge can create new opportunities for innovation. However, little is known about this conjecture in a logistics service context: whether logistics service firms utilize external knowledge and ideas for innovation, and if so, which types of partners they collaborate with in their innovation activities. This research addresses this void. Tobit regression analysis on secondary data was performed using the utilization of various types of external partners as sources of innovation to determine the innovation performance of transportation and logistics service firms. The results show that customers, suppliers and competitors (in descending order) contribute to service improvement, and customers contribute to the development of services that are new to the firm. In contrast, the use of universities and consultants as sources of innovation does not seem to affect innovation performance in the transportation and logistics service industry.

020-0041 Desired and Perceived Levels of Service in Transport Contracts

Ricardo Martins, School of Business Administration/Federal University of Minas Gerais (UFMG), Brazil
Débora Lobo, State University of Western Paraná (Unioeste), Brazil

This article aims to fill in some gaps in the literature regarding logistics and transport management. An analysis was made of the decision-making factors considered to be important by small-sized shippers when contracting transport services and for their levels of satisfaction with those services. For this purpose a structured questionnaire and the Multivariate Declared Preference Technique was used to analyze a sample of 305 small and medium-sized Brazilian industrial shippers. The results indicate that Service Confidence is the most important construct for shippers. This is followed, in order of importance, by Delivery Times, Frequency of Service, and Freight Information. The importance given to the constructs helps in understanding the rationale for agents using their own transport and arranging their own contracts for transport of their goods. The levels of service perceived by these shippers was also studied.

020-0039 Developing a Conceptual Framework for Logistics Innovation at 3PL Firms - A Case Study Approach

Shong-Iee Su, Soochow University/Department of Business Administration, Taiwan, Republic of China
Susanne Hertz, Jönköping International Business School/Department of Marketing and Logistics, Sweden
Lianguang Cui, Jönköping International Business School/Department of Marketing and Logistics, Sweden

Drawing on the recent case study results and literature reviews, a conceptual framework for logistics innovation at third-party logistics (3PL) firms will be developed and discussed. The 3PL logistics innovation framework will add to the innovation theory, particularly in the emerging logistics industry. The framework will be illustrated by literature and real case study findings.

020-0860 A Multidimensional Relative Efficiency Analysis of Brazilian Logistics Service Providers

Carlos Fries, Federal University of Santa Catarina, Brazil
Mônica Maria Luna, Federal University de Santa Catarina, Brazil
Bernd Scholz-Reiter, BIBA at the University of Bremen, Germany
Thomas Makuschewitz, BIBA at the University of Bremen, Germany

This data envelopment analysis (DEA) study examines the efficiency of a set of Brazilian logistics service providers based on a secondary data source from 2004 to 2010. This yearly evaluation of those firms that operated efficiently in their respective niche markets is followed by a detailed analysis of productive, technical, and managerial inefficiencies among the non-efficient firms. Steps taken by these companies in order to shift themselves to the efficient frontier are compared with those identified by the DEA as being potentially more appropriate. Each firm's change in modus operandi as well as its market position evolution during this period is traced, thus providing valuable comments on more advantageous possible future replacements.

79 Friday, 02:30 PM - 04:00 PM, Sorrento 1,2 *Track:* QPJ, 3 *Chair:* Vish Hegde
Session: Session 3: JIT Supply Chains

020-0629 Just in Time Benefits and Problems when the Customer Demand is Uncertain

Thomas Bortolotti, University of Udine, Italy
Pamela Danese, University of Padova, Italy
Pietro Romano, University of Udine, Italy

Just In Time (JIT) is a methodology that positively impacts on efficiency and responsiveness. However, in the literature some studies failed to support this relationship. A possible explanation of these mixed results could be the interaction between JIT practices and contingency factors. This study tests whether demand uncertainty moderates the relationship between JIT and operational performances. This research uses data from the third round of the High Performance Manufacturing (HPM) project data set. 244 international manufacturing plants represent the sample of our analysis. A CFA validates our measurement model, while a structural equation model (SEM) was used to test our hypotheses. This study demonstrates that the demand uncertainty negatively moderate the relationship between JIT and responsiveness, while it doesn't interact with the relationship between JIT and efficiency.

020-0867 Measuring Customer Centric Quality in Supply Chains

Vish Hegde, California State University East Bay, United States
Zinovy Radovilsky, California State University East Bay, United States

Measuring and analyzing quality in supply chain processes is a largely unexplored topic. This research intends to identify and analyze quality performance measurements in supply chains and the impact of various supply chain steps on quality performance. We accomplish this research by collecting customer complaint data on household appliance supply chains. This data was analyzed and insights were derived using critical incident technique methodology. We find that the highest frequency of quality problems is associated with the manufacturing step of the supply chain, and the next highest is with customer service. Further, we conclude that quality problems in the upstream of supply chain may not affect those in the downstream. Finally, we identify strong positive correlations between the number of quality problems in supply chain and products' age and price. Our research methodology and findings are helpful in aligning companies' supply chain process with customer expectations.

80 Friday, 02:30 PM - 04:00 PM, Sorrento 3,4 *Track:* SAP, 2 *Chair:* Lauren Lu Sameer Hasija
Session: Strategic Issues in Sourcing and Supply Chain Design

020-0788 Nonprofit Supply Chain Design with Unreliable Delivery Times and Capacity Constraints

Gemma Berenguer, University of California, Berkeley, United States
Zuo-jun (Max) Shen, University of California, Berkeley, United States

The nonprofit supply chain is a particular type of supply chain that deals with specific challenges and characteristics such as unreliable operations, demand

variability, nonprofit and multiple objectives, and decentralized control. In this paper, we take into account these challenges to construct a nonprofit supply chain design model. The model describes cost-based tactical decisions and service-based operational decisions. Further, we model limited capacities, lead time stochasticity, and correlated demands. We employ conic quadratic mixed-integer programming to solve our nonlinear mixed-integer program. We study the impact of demand correlation and lead time variability in our model. We also study the influence of service choice versus costs on the distribution of goods and services.

020-0530 Better Selection or Efficient Contracting? The Choice of Outsourcing Process and the Implications of Payment Schemes

Zhijian Cui, INSEAD, Technology and Operations Management Area, France
Sameer Hasija, INSEAD, Technology and Operations Management Area, Singapore

By comparing two service outsourcing processes--competitive bidding and negotiation--this study shows the contingencies under which one outsourcing process dominates another. We study the selection and contracting process in which one client without sufficient in-house capabilities seeks to outsource the service needs to one service vendor selected from two ex-ante identical vendors. We show in particular that competitive bidding dominates the negotiation process in most feasible conditions. However, when vendor selection becomes less risky and more costly, the negotiation process can yield a higher expected payoff for the outsourcer (client) than an optimal competitive bidding process. This study also highlights the implications of payment schemes for multiple purposes in the management of outsourced services.

020-0340 Is Outsourcing a Win-Win Game? The Effects of Competition, Contractual Form, and Merger

Annabelle Feng, University of Texas at Austin, United States
Lauren Lu, University of North Carolina at Chapel Hill, United States

Two well-accepted notions exist in the outsourcing literature: First, outsourcing to a low-cost supplier generates cost savings for a manufacturer, thereby leading to a win-win outcome for both firms. Second, outsourcing softens competition. This paper challenges these notions using a model with competing supply chains. Each supply chain consists of an upstream supplier and a downstream manufacturer, who engage in a bilateral negotiation of an outsourcing contract. We demonstrate that with a wholesale-price contract, outsourcing is always a win-win game. With a two-part tariff, however, the suppliers' cost advantage is a double -edged sword for outsourcing. While it reduces the manufacturers' costs, it may intensify downstream competition or weaken the manufacturers' bargaining position. When the manufacturers compete with quantity, outsourcing to low-cost suppliers leads to intensified competition. When the manufacturers compete with price, the suppliers charge high unit prices to soften downstream competition. However, the manufacturers' bargaining position is weakened.

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Friday, 02:30 PM - 04:00 PM, Naples 2 *Track:* GEN, 4 *Chair:* Bob Emiliani
Session: OM Theory

020-0659 The Principles of Scientific Management 100 Years Later: Is Taylorism Still Relevant Today?

Jeff Schultz, Loom, Inc, United States
Steve Brown, University of Exeter, United Kingdom

It is fitting that 100 years after the publication of the most influential book, by the man who helped create modern management and the founding of the American B-School itself, to ask if there is anything relevant today from the teachings of Frederick W. Taylor.Perhaps if we strip away the demonized version of Taylorism, we will find a philosophical methodology that is still largely in play in corporate America today, a philosophy that starts with the belief that the leaders of our industries can be trained scientifically; note the rise of the professional MBA. Taylor and his top-down management system have been roundly condemned and all sorts of blame has been laid at his feet (the demise of the auto industry in the 1970s, for example), but one need not look hard to find the application of his philosophical principles throughout modern corporate America.

020-0676 Understanding, Learning and Action: Addressing the Process of Thought Theory of Constraints

Daniel Lacerda, PPGEPS/UNISINOS, Brazil
Luis Rodrigues, PPGEPS/UNISINOS, Brazil
Ricardo Cassel, PPGEPS/UNISINOS, Brazil

Current research, scientific studies and academicians have addressed the problem of understanding, learning and acting on organizational problems. Differences in people's perceptions about organizational problems or situations can sometimes block people's ability to overcome difficulties. These differences in perceptions may have different causes, such as employees' view of the world, assumptions, and emotions. Therefore, one needs a tool or a methodology to serve as a guide for discussions. Oriented discussions can generate a shared understanding of the problem, collective learning and possibly greater effectiveness in overcoming the difficulties. In this sense, this work seeks to explain the Theory of Constraints Thinking Process as a driver for organizational discussions. Finally, it discusses limitations and potential of this methodology.

020-0119 Frank George Woollard: Flow Production Pioneer

Bob Emiliani, Central Connecticut State University, United States

This paper introduces the long-forgotten work of Frank George Woollard (1883-1957), who in the mid-1920s established flow production in the British motor industry, and its remarkable similarity to current-day production principles and practices used by Toyota Motor Corporation, also known as Lean production. It places Woollard's work in the context of other 20th century pioneers in industrial management and flow production.

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Friday, 02:30 PM - 04:00 PM, Naples 1 *Track:* OMF, 1 *Chair:* Preetam Basu Margarita Protopappa-Sieke
Session: Session 1: Supply Chain Finance

020-0115 Challenges of Supply Chain Finance: A Hierarchical Model

Dileep More, Indian Institute of Management Calcutta, India
Preetam Basu, Indian Institute of Management Calcutta, India

Global sourcing, distribution and outsourcing have increased the complexity of supply chain (SC) networks and operations. The language of money binds various segments of any SC, in which the operational managers are busy dealing with information and material flows to facilitate the desired cash flows. However, the variety of challenges in supply chain finance (SCF) imposes a number of constraints in managing the cash flows in the SC. The extent of influence each challenge enforces on SC partners differs and often leads to inefficient processing of transaction activities. In this study, a hierarchical relationship model of the challenges faced by SCF has been developed establishing the relationship dynamics among them. The study also identifies appropriate action plans, policies and strategies for deploying SCF with the purpose of reducing vulnerability and managing risks in the entire SC.

020-0449 Towards a Theory of Financial Supply Chain Management - Exploration from a Multiple Embedded Case Study

David Wuttke, Supply Chain Management Institute, EBS University, Germany

Constantin Blome, Supply Chain Management Institute, EBS University, Germany
Margarita Protopappa-Sieke, Supply Chain Management Institute, EBS University, Germany
Michael Henke, Supply Chain Management Institute, EBS University, Germany

Financial and physical supply chains have converged in recent years. Yet our knowledge about how the financial and physical supply chains are jointly managed in practice is limited. Furthermore, the theoretical underpinning of Financial Supply Chain Management is in its infancy. In our research we use a multiple embedded-design case study of 8 firms to explore how firms integrate financial and physical flows. In addition we elaborate on antecedents and performance effects. Based on our empirical observations we posit four propositions, contributing to a mid-range theory of Financial Supply Chain Management. We find that internal integration is an antecedent, whose effect is moderated by top management commitment. External integration enables firms to use practices including higher financial risks. Our research is based on the notions of transaction cost economics as a major theoretical anchor for our findings.

020-0767 A Financial Approach to Benchmark Supply Chain Performance in Latin America

Marcela Giraldo, Center for Latin-American Logistics Innovation (CLI), Colombia

The literature shows a wide range of key indicators to measure supply chain performance. These indicators include a variety of concepts such as agility, flexibility, responsiveness, and reliability. They provide detailed information mainly relevant to people from supply chain and operation areas but hardly valued by other areas in the company. This research proposes a methodology that uses financial information as the common language to benchmark supply chain performance. It takes financial indicators related to business operations which are focused on costs, return of assets and cash flows to identify relevant differences among companies. This methodology is a starting point for supply chain managers in order to speak the same language with the CEO and CFO. Moreover, it could be useful to track the impact of the operational indicators at the financial level. A case study of Latin American companies is presented to illustrate the methodology.

020-0085 Using SCRM Framework for Application of Value at Risk Methodology for Manufacturing Firms

Ashutosh Chandel, IIM Lucknow, India
Samir Srivastava, IIM Lucknow, India

Supply chain risk management today goes beyond traditionally insured risks such as tangible assets and related liabilities. The objective of this paper is to use SCRM framework for application of Value at Risk methodology for manufacturing firms. The concepts used by financial institutions are used as a reference, for coming up with proper risk measures relevant for manufacturing companies. We factor the three kinds of risks a company faces - demand risk, inventory risk and supply risk. We assess both low impact high probability as well as high impact low probability events. This paper goes a level beyond the framework suggested by the supply chain council by breaking down the supply chain risk to the next level and defining the various components and calculation methods. After identification of the proper risk measures, we focus on the risk mitigation strategies based on those measures.

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83 Friday, 02:30 PM - 04:00 PM, Naples 3 *Track:* OMM, 8 *Chair:* Kunpeng Li
Session: Timing for Market Entry

020-1055 Optimal Decisions on Time-to-Price-Reduction

Kunpeng Li, Sam Houston State University, United States
Chongqi Wu, California State University, East Bay, United States

The time-to-price-reduction has a great impact on consumer’s purchasing decisions. Consumers with low valuation need to wait a certain period of time for the reduced-price product. The longer the waiting time, the lower the product surplus would be for consumers, and the lower the present value of profit from consumers with low valuation. However, the waiting time also has a positive effect on the production cost. Due to a learning curve, the longer the waiting time, the lower the production cost would be for firms. We develop a self-selection model to explore the optimal decisions of product design and introduction.

020-0780 Analysis of Market-exit Time Decisions

Aysegul Toptal, Bilkent University, Turkey
Sila Cetinkaya, Texas A&M University, United States

We consider a supplier facing stochastic demand and study the optimal time-to-exit the market, given an initial inventory level. An important characteristic of the system under consideration is that the supplier offers preplanned discounts in the price over time. We model the case where demand arrivals follow a Nonhomogeneous Poisson Process with an intensity that is dependent on both the price and time. We derive a general expression for the supplier's expected profit function over theselling period. Our numerical analysis reveals that a significant revenue improvement can be achieved by carefully deciding the length of the selling period under the pricing approach considered.

020-0675 Software Giant's Entry in the Open Source Software Support Market

Byung Cho Kim, Virginia Tech, United States
Tridas Mukhopadhyay, Carnegie Mellon University, United States
Hyoduk Shin, Northwestern University, United States

This paper examines the impact of an established software vendor's entry in the open source software (OSS) support market on the competition among OSS support providers. Inspired by Oracle's Unbreakable Linux program, which maintains compatibility with Red Hat Linux and resynchronizes with the codes of every new version of Red Hat Linux, we investigate how a software giant's entry affects existing OSS support providers. Interestingly, we find the conditions under which Oracle's entry helps Red Hat and hurts its competitor, Novell, implying that Red Hat can make even higher profit in the oligopolistic market with Oracle than in the duopolistic market. Also, quality deficiency of Oracle service compared with Red Hat turns out to be a key factor which determines total and consumer surplus. Our results indicate that both total and consumer surplus increase as the quality gap between Oracle and Red Hat supports increases.

020-0429 Make It Faster if Not Better, An Empirical Study of the Effects of Production Timing Decisions on Movie Financial Performance

Tom Tan, Wharton Business School, University of Pennsylvania, United States
Kartik Hosanagar, Wharton Business School, University of Pennsylvania, United States
Josh Eliashberg, Wharton Business School, University of Pennsylvania, United States

The movie production process generally includes development, pre-production, filming, post-production and distribution. Studios decide on the progress of the movies based on their capacity allocation. Therefore, understanding the impact of the timing of each production stage is critical for strategic production planning decisions, for expenditure and timing of advertising, and for labor coordination. However, little attention has been paid to the effects of these production decisions in the previous literature. In this paper, we provide empirical evidence to shed new light on the effects of production timing decisions on the box office performance. We show that the production stages have different impacts on the box office revenues. We quantify these effects and handle the endogeneity issues. We also consider the interactive effects of the movie production decisions and the advertising decisions. Our findings suggest that the production durations tend to have negative effects on the movie financial performance.

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84 Friday, 02:30 PM - 04:00 PM, Naples 4 *Track:* CSC, 4 *Chair:* Rob Zuidwijk
Session: Energy Supply Chains

020-1012 A Supply Chain Perspective of Renewable Energy

Edgar Blanco, MIT, United States
Jarrod Goentzel, MIT, United States

Renewable energy sources, such as wind or solar, are part of the long-term environmental portfolio of solutions being explored by companies and governments. Unlike traditional energy sources, there is a wider application of supply chain management techniques to address the mismatch between supply and demand. In this presentation we will provide a supply chain perspective to renewable energy, as well as examples and opportunities for operations management approaches.

020-0110 Modeling the Impact of Smart Meters on European Electricity and Gas Supply Chains: The Case of Eandis in Belgium

Kris Meyers, Vlerick Leuven Gent Management School, Belgium
Jean-Pierre Hollevoet, Eandis, Belgium
Patrick Devos, Eandis, Belgium

Smart Meters provide a two-way communication between the distributors and consumers of energy. This new facility introduces new supply/demand matching opportunities, as well as supply chain coordination challenges. Matching supply and demand is of major importance in the electricity supply chain because electricity storage is scarce and costly. The Belgian energy supply chain company Eandis spearheads a smart electricity and gas meter implementation project for four million households until 2018. We present a model to capture the full impact of improved forecasting, dynamic supply management, multiple-tier pricing opportunities, and shrinkage prevention in the resulting smart energy supply chain. The model estimates the financial and non-financial effects of this new technology on the entire value chain: energy producers, distributors, customers, government.

020-0624 Strategic Carbon Footprint Labeling in a Supply Chain

Rob Zuidwijk, Erasmus University / Rotterdam School of Management, Netherlands
Charles Corbett, UCLA / Anderson School of Management, United States

When firms plan to put carbon footprint labels on their products, it is often ambiguous how those carbon footprints should be determined. Current standards for carbon footprint reporting also leave room for ambiguity. This gives firms some flexibility in how to allocate carbon emissions to different products. In this paper, we examine conditions under which that flexibility in fact helps to reduce the firm's total carbon footprint without compromising profits.

020-1019 Economic Analysis Grid Battery Storage Operation

Jarrod Goentzel, MIT, United States
Prashant Saran, MIT, United States
Clayton Siegert, MIT, United States

Wind energy is a fast growing energy source, but intermittency and remoteness drive the need to complement wind energy with storage. Pumped Hydro Electric Storage units are the established and most widely studied application. Other technologies like flow (ZnBr) and NaS batteries are emerging but are still not considered economically viable. We assess the profitability of a wind plant plus battery storage system considering network design decisions and daily operating policies. We use a Monte-Carlo simulation model incorporating wind plant output, market prices, storage costs and technical characteristics to calculate profitability of various scenarios and policies. Our results show significant improvement in profits for certain policies; and we demonstrate that large-scale battery storage technologies available today can be economically viable without special subsidies.

020-0957 An Alternative Approach for Evaluating Capacity of Intermittent Electric Power Generation Sources

Xiaoyue Jiang, Tulane University, United States
Geoffrey Parker, Tulane University, United States
Edward Anderson, University of Texas, United States

A great concern for using renewable electric power on a large scale is its stochastic nature, which is termed intermittency in the industry. As a consequence, the ultimate capacity contribution of renewable sources to the grids and ways to ameliorate intermittency remain a subject of discussion. We propose a network calculus (NetCal) approach to model the capacity metric with respect to a set of given quality-of-service (QoS) requirements. The NetCal approach emerged from the field of telecommunication engineering to analyze analogous QoS guarantee issues. Essentially, deterministic queuing systems are defined and analyzed under a special algebra, for which performance bounds for delay and backlogs can be elegantly characterized. As an application, the electricity source is interpreted as a queuing server and its capacity as the derivative of the service curve, a fundamental construction in NetCal. The proposed approach enables optimization of storage device configuration and operations for guaranteed supply performance.

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85 Friday, 02:30 PM - 04:00 PM, Naples 6 *Track:* CSC, 17 *Chair:* Amitabh Sinha
Session: Risk Management in Supply Chains

020-1006 Evaluating the Conditional Value-at-Risk for the Selective Newsvendor Problem

Arleigh Waring, University of Michigan, United States

This paper utilizes a Pareto efficient frontier to evaluate the inherent tradeoffs between risk and reward for the Selective Newsvendor model. The Selective Newsvendor sells a single product within one selling season to a number of markets. Prior to the selling season, the firm decides which markets it will serve and the total quantity it will procure from the supplier. We evaluate the Selective Newsvendor's risk using Value-at-Risk and Conditional Value-at-Risk, two common financial tools used in portfolio optimization. Evaluating the Selective Newsvendor under these risk conditions yields inventory and market selection decisions. We then compare this risk-averse inventory and market selection decision to the original solution posed by the selective newsvendor problem. This comparison yields a Pareto efficient frontier for the selective newsvendor problem which shows how the effect changing the level of risk affects the market selection and therefore the expected profit.

020-0075 Systematic Risk in Supply Chain Sales: Empirical Study and Implications

Nikolay Osadchiy, Emory University, United States
Vishal Gaur, Cornell University, United States
Sridhar Seshadri, University of Texas at Austin, United States

This paper studies the systematic, market-associated risk in sales revenue in supply chains. Using industry-level data for the U.S. economy we show that the systematic component in sales variance is significant and increases from lower echelons of supply chains (retail) to upper echelons (manufacturing). We

hypothesize that the increase is due to the aggregation of orders placed by the customers downstream. Using the input-output data at the industry level, we find evidence supporting this hypothesis. Finally, we confirm that the higher systematic risk in sales revenue is priced by financial markets: stock portfolios for industries with high systematic risk have higher risk premium.

020-0967 Understanding Supply Side Risk in Supply Chain Management: A Fuzzy Framework

Kunal Ganguly, Institute of management Technology, India

Understanding and assessing risks is fundamental to success in supply chain management. This paper develops and demonstrates a fuzzy risk assessment framework to effectively assess risk for an organization. The sources of risk were extracted based on industry expert view and prior research. A fuzzy inference engine which embeds human expert knowledge expressed through natural language gives a superior capability to the approach. The case of an engineering company simulated using fuzzy framework showed that this method could capture imprecise perceptions about risk factors and quantify them effectively. It also showed that human knowledge embedded as intelligence could effectively map and quantify sources of risk into different categories.

020-0169 Dynamic Risk Management of Commodity Operations: Model and Analysis

Sripad Devalkar, Ross School of Business, University of Michigan, United States
Ravi Anupindi, Ross School of Business, University of Michigan, United States
Amitabh Sinha, Ross School of Business, University of Michigan, United States

We model the dynamic risk management problem for a commodity processor in a multi-period setting. We propose a time-consistent risk measure based on the conditional value at risk (CVaR) and obtain the optimal policy structure. We develop efficient heuristics to compute the operational and financial decisions. We show that a time-consistent risk measure provides better mean-risk trade-off and reduces thechance of extreme losses over the horizon, compared to optimizing the CVaR of total profits.

020-0407 Timing of Price and Service Level Decisions under Competition and Demand Uncertainty

Olga Perdikaki, Texas A&M University, United States
Dimitris Kostamis, University of North Carolina at Chapel Hill, United States
Jay Swaminathan, University of North Carolina at Chapel Hill, United States

We study how competition affects firms' timing of price and service level decisions relative to demand realization when demand is uncertain. We model a symmetric duopoly in which the firms compete on price and service levels and analytically characterize the Nash equilibrium in the timing of the above decisions, as well as in the price and service levels. We find that in the service level timing game only symmetric equilibria will emerge, whereas in the price timing game asymmetric equilibria can arise under certain circumstances.

86 Friday, 02:30 PM - 04:00 PM, Capri 3 *Track:* CSC, 23 *Chair:* Greys Sosic

Session: Competition and Cooperation in Supply Chains

020-0138 Joint Selling of Complementary Products under Downstream Competition

Yuhong He, University of California Irvine, United States
Shuya Yin, University of California Irvine, United States

This paper considers complementary suppliers' incentives to form alliances and jointly sell their components when final products assembled from these components compete with eachother for demand. We examine how competition among final products would shape suppliers' motivations to form coalitions.

020-0837 Underestimation of the Bullwhip Effect and the Decomposability Assumption

Dean Chatfield, Old Dominion University, United States
Jack Hayya, Penn State University, United States

Many current approaches to supply chain inventory system modeling decompose a supply chain into a set of node pairs. This decomposition is based on the assumption that the entire structure will act as the simple sum of the activities of the node pairs. We investigate the impact this decomposition has on bullwhip effect measurement. Using a custom simulation tool, we build a monolithic multi-stage model, plus a corresponding set of node pair models, of a 5-stage serial supply chain. We execute the simulation models under various conditions, comparing the modeling approaches as well as comparing with a widely used analytical approach to bullwhip effect quantification from the literature. We show that a decomposition-based model underestimates the amount of order variance amplification.

020-0415 Supplier Alliances under Default Risk

Xiao Huang, Concordia University, Canada
Tamer Boyaci, McGill University, Canada
Mehmet Gumus, McGill University, Canada
Saibal Ray, McGill University, Canada
Dan Zhang, McGill University, Canada

We study the role of alliances in dealing with default risks in supply chains by considering both complementary suppliers in assembly systems and substitutable suppliers in competitive markets. Each supplier is endowed with additive resources that can reduce the chance of a default. The suppliers face the trade-off of joining larger alliances that have better chance to survive versus smaller ones that result in higher profit allocations. We analyze coalition-proof Nash equilibria. The results imply that coalitions are more likely to form among suppliers with similar risk endowment levels. Moreover, larger alliances are less stable with substitutable suppliers than complementary ones. We also look into downstream assembler/buyer’s incentive to invest in upstream risk structures. The results suggest that the assembler focuses on the scope of an investment, while the buyer emphasizes the depth of the investment.

020-0164 Sales Channel Competition among Dual-channel Retailers and Manufacturers

Liang Han, University of Southern California, United States
Greys Sosic, University of Southern California, United States
Sriram Dasu, University of Southern California, United States

Adding clicks to bricks? Adding bricks to clicks? Staying unchanged? Many traditional retailers and e-tailers consider dual channel strategies indispensable in today’s intense sales competitions. Manufacturers are also involved in the game by using exclusively controlled online stores. With the option of dual channels, both retailers and manufacturers face tradeoffs between market expansion and cannibalization. In this paper, we use a game-theoretical approach to investigate both the pricing and non-pricing strategies used by retailers and manufacturers under different scenarios of sales channel competitions. We also analyze equilibrium pricing strategies for both manufacturers and retailers, and propose non-pricing strategies to help them improve their performances.

Saturday, 08:00 AM - 09:30 AM

89 Saturday, 08:00 AM - 09:30 AM, Tuscan 1 *Track:* HOM, 5 *Chair:* Carrie Queenan

Session: Technology Enabled Healthcare Operations

020-0473 Healthcare Information Technology: The Interplay of Organizational and Floor Level Applications

Kenneth Boyer, Ohio State University, United States
John Gray, Ohio State University, United States
John Gardner, Ohio State University, United States

The U.S. government is making a 19 billion dollar investment in encouraging hospitals and other healthcare providers to invest in information technologies (HIT) including electronic medical records, computerized physician order entry and RFID patient tracking. While technology can be marvelously effective, two decades of research in the private sector by both operations and IT scholars reveals that the managerial systems surrounding major software investments are critical for success. We examine the interaction of three factors: 1) HIT investment using a secondary dataset from HIMSS analytics, 2) the degree to which these systems are integrated and how they are used to analyze patterns at the organizational and floor levels using primary data from a survey of 271 hospitals and 3) patient outcome data from a secondary dataset from the U.S. Center for Medicare and Medicaid Services.

020-0875 IT Leveraging Competence and Access to Primary Care: Electronic Health Record Utilization as a Moderator of Performance Effects

David Zepeda, University of Minnesota, United States
Kingshuk Sinha, University of Minnesota, United States

Not everyone enjoys the same opportunities to access quality health care. Chronic conditions, which require ongoing access to primary care, are a leading cause of disparities in health. Studies show that socio-demographic factors can negatively impact health outcomes. Low-income individuals, in particular, suffer from disproportionate rates of chronic conditions and poorer health. As a quality improvement initiative, health information technology has been regarded as a critical component in reducing health care disparities. Using clinic level data of 400+ clinics, this study looks at the moderating effect of electronic health record (EHR) utilization on the relationship between access and diabetes care outcomes in primary care settings.

020-0988 Relational Coordination in Health Care Supply Chain Design for Underserved Communities: An Empirical Study of Cardiac Care Delivery in China

Emily Kohnke, Iowa State University, United States
Kingshuk Sinha, University of Minnesota, United States

This research is motivated by the global mismatch in the supply and demand of quality health care for underserved communities. To assist in addressing the need for increased access to health care services, this research is based on the strategic coordination mechanisms of access, awareness and affordability. This paper examines inter-organizational relationships and roles between partners in the health care supply chain and how those interactions influence the delivery of care using the lens of relational coordination theory. This study considers not only the structure of the supply chain design for health care delivery, but also the impact of work structures and human interactions on its effectiveness. Using data collected from a longitudinal field study and a 3-stage least squares methodology, this study finds that relational coordination can be observed to have a significant impact on inter-organizational relationships and the volume and quality of care delivered.

020-0276 Telemonitoring to Improve Cost and Quality of Pregnancy Care: A Field Experiment

Carrie Queenan, University of Notre Dame, United States

We conduct a field experiment to analyze the effectiveness of remotely monitoring women with high risk pregnancies. This study seeks to quantify the impact of telemonitoring on costs (short and long term), quality of care, pregnancy specific anxiety, and health outcomes. Using a control and intervention group, we test how telemonitoring improves the process of caring for patients through early intervention leading to fewer hospital stays and reduced pregnancy-specific anxiety.

90 Saturday, 08:00 AM - 09:30 AM, Tuscan 2 *Track:* HOM, 19 *Chair:* Santiago Kraiselburd

Session: Modeling Drug Pricing/Assortment and Fleet Management

020-0288 Supply Chain and Resistance Implications of Drug Variety

Eirini Spiliotopoulou, MIT Zaragoza International Logistics Program, Spain
Prashant Yadav, ZLC, MIT-Zaragoza International Logistics Program, Spain

Drug efficacy is a public good that is threatened by the emergence and spread of resistance. Multiple studies show that available drugs should be used in a socially optimal way in order to contain the emergence and spread of resistance. In this paper we quantify the benefits associated with drug variety and compare them against the cost of higher variety in the supply chain. Extending a simple general disease model to include the emergence and evolution of resistance we show that the percentage of the infected population that cannot be treated is decreasing with the number of available drugs. We compare the benefits of delayed resistance with the increase in procurement and safety stock holding costs that result from a wider drug assortment. We apply the model for the case of malaria treatment. Our model lends insights to policy makers into the socially optimal size of the drug assortment.

020-0264 Donor Coordination / Harmonization: Impact of Restriction on the Health Outcome

Ananth Iyer, Purdue University, United States
Santiago Kraiselburd, MIT-Zaragoza International Logistics Program, Spain
Lijie Song, MIT-Zaragoza International Logistics Program, Spain
Jorge Barnett, MIT-Zaragoza International Logistics Program, Spain

The WHO has identified donor coordination as a key task. Improved coordination across donors may permit significant improvement in outcomes for the same level of resource commitment. We propose the use of a model-based approach to assist in this donor coordination effort. The model is applied to the free health care program in Sierra Leone. It shows under different demand scenarios, the impact of four different proposed configurations of the system on the total populations' health outcome. The goal of the model is to permit (a) WHO to work with donors to understand how their choices affect performance, (b) use of the model to assist in evaluating the impact of adjustments to donor choices and thus (c) enable coordination by the WHO. Customization of the model to country and disease characteristics will permit the model to capture field conditions.

020-0869 On the Impact of Share Contracts on Pharmaceutical Companies, Health-payers & Health-providers: Implications for Costs, Quality, & Coverage

Michael Borowitz, Organization of Economic Cooperation and Development (OECD), France
Santiago Kraiselburd, Zaragoza Logistics Center, Spain
Gerardo Pelayo, Zaragoza Logistics Center, Spain
Prashant Yadav, Zaragoza Logistics Center, Spain

The pharmaceutical industry faces intense pressures from different fronts which may threaten the innovation process. New drugs for chronic conditions, which typically enter the market at very high prices and have highest uncertainty regarding the health outcomes derived from an intervention are pushing the discussion towards reimbursement contracts where the risks are optimally shared. We build a static model of the relationship between a pharmaceutical company, a health-payer, and a health-provider to analyze the performance of price-only versus risk-sharing reimbursement contracts when the pharmaceutical company can invest to increase demand, and the health-payer can invest to improve the health system's capabilities. In parallel, we contrast a centralized healthcare system where health-payers determine the prescription policy implemented by health-providers, against a decentralized system where health-providers choose their optimal prescription policy, and observe the incentives created, patient coverage, and quality of the coverage under the different organizational structure - reimbursement contract combinations.

020-0865 Health Care Product Distribution Logistics: Issues, Challenges and Emerging Trends

Mohan Gopalakrishnan, W.P. Carey School of business, Arizona State University, United States
Eugene Schneller, W.P. Carey School of Business, Arizona State University, United States
Bushra Rahman, Arizona State University, United States

Health care product distribution is a high-volume/low-margin activity that hospitals have mostly carried out in concert with an external partner organization that considers distribution to be a core competency. The purpose of this study is to present the results of scrutinizing the growing penchant among hospitals of late toward self-distribution. Through literature review, and actual interviews with hospital supply chain managers, the study will throw light on the reasons to in-source and the concern to traditional distributors which are experiencing growing costs, pressure on margins, and new competition. Lessons learned from this study indicate that self-distribution is not a homogeneous phenomenon - ranging from hospitals taking on all distribution functions to merely replicating selected functions that are common to distributor organizations.

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91 Saturday, 08:00 AM - 09:30 AM, Tuscan 3 *Track:* GEN, 14 *Chair:* Greys Sosic
Session: SCM college student paper competition

020-1064 POMS Supply Chain College Student Paper Competition

Greys Sosic, University of Southern California, United States

The College of Supply Chain Management of the Production and Operations Management Society (POMS) announces its 2011 Best Student Paper Competition. Each submitted paper will be judged based on its contribution towards the advancement of theory and practice of supply chain management.The student finalists make presentations for POMS Supply Chain College Student Paper Competition.

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92 Saturday, 08:00 AM - 09:30 AM, Tuscan 4 *Track:* ESO, 5 *Chair:* Gokce Esenduran
Session: Remanufacturing

020-0321 How Does Competition with a Remanufacturer Affect Product Quality?

Adem Orsdemir, University of North Carolina Chapel Hill/Kenan-Flagler Business School, United States
Eda Kemahlioglu-Ziya, University of North Carolina/Kenan-Flagler Business School, United States
Ali Parlakturk, University of North Carolina/Kenan-Flagler Business School, United States

We study how the existence of an independent remanufacturer (IR) affects an OEM's product-quality decisions and the social surplus. We show that when remanufacturing cost advantage is low, OEM can deter the IR's entry by serving higher-valuation segments. This reduces the social surplus compared to the no-competition case. Further decrease in remanufacturing cost allows the entry of the IR. In this scenario, when IR barely enters the market, OEM still serves high-valuation consumers and surplus is smaller than the no-competition case. When IR enters, OEM stops investing on quality gradually with decreasing remanufacturing cost. When remanufacturing cost is too low, IR remanufactures all available cores. In this region OEM does not compete on quality but on quantity and decreases the first-period quantity. This limits the number of cores that the IR can use and reduces the IR's market power. High remanufacturing cost advantage increases surplus.

020-0136 Delayed Differentiation for Multiple Lifecycle Products

Daniel Guide, The Pennsylvania State University, United States
James Abbey, The Pennsylvania State University, United States
Gilvan Souza, Indiana University, United States

Use of a base model with a common platform and a modular design approach allows a firm to offer updates for improved performance and flexibility via remanufacturing when products have multiple lifecycles. However, as the product evolves through multiple lifecycles, the large pool of variants leads to the curse of product proliferation, which often results in longer lead times, higher inventory levels, and lower levels of customer service. To cope with the product proliferation problem, we employ a delayed differentiation model in a multiple lifecycle context with a mixed-integer linear programming (MILP) model and an analytical investigation to analyze an evolutionary delayed differentiation approach with a distinct push-pull boundary.

020-0143 The Impact of Legislation on Product Recovery: Reuse or Recycle?

Tamer Boyaci, McGill University, Desautels Faculty of Management, Canada
Ibrahim Karakayali, McGill University, Desautels Faculty of Management, Canada
Vedat Verter, McGill University, Desautels Faculty of Management, Canada
Luk Van Wassenhove, INSEAD, France

It is widely accepted that current legislation on end-of-life/end-of-use products does not provide enough incentives for OEMs to engage in product reuse/remanufacturing. One proposal is to include product remanufacturing in the calculation of material recovery rates and increase associated targets. Utilizing a static model of a profit-maximizing OEM with joint manufacturing and remanufacturing capabilities, we investigate both the economical and environmental impact of such changes in legislation from a multi-stakeholder perspective. For economical impact, we consider OEM profits and total consumer surplus. For environmental outcomes, we consider both virgin material usage and total amount of disposal amount. Subsequently, we investigate whether the same or comparable outcomes can be achieved via more voluntary, market-based policy tools. We show that a tax-subsidy policy, which places a tax rate on disposal and uses the funds generated therefrom to subsidize remanufacturing, can be very effective in this manner.

020-0298 Regulating Markets for Valuable Waste: Cherry Pickers vs. Scavengers

Atalay Atasu, Georgia Institute of Technology, United States
Gokce Esenduran, Ohio State University, United States
Luk Wassenhove, INSEAD, France

Take-back legislation mandates minimum collection and recycling rates for waste products on the manufacturers. If product take-back has a net cost then there would be no take-back unless imposed by the legislation. However, this is not true for products with valuable material content. The recoverable value remaining in waste products may create competition between manufacturers and scavengers and divert them from landfills even in the absence of legislation. Hence, it is not clear whether markets should be regulated for the take-back of waste products with valuable material content. We model this problem using a Hoteling framework and find that a regulated market always achieves higher recovery rates when the producer and the scavenger choose partial coverage. However, this might not be the case under full coverage. Our results identify the circumstances where the policy-maker should not distort an efficient waste market by imposing an aggressive recovery target on the producer.

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93 Saturday, 08:00 AM - 09:30 AM, Tuscan 5 *Track:* ESO, 16 *Chair:* Dana Johnson
Session: Sustainability in the Energy Sector

020-0645 Carbon Abatement in Global Supply Chain Networks

Joana Comas, EPFL-Ecole Polytechnique Fédérale de Lausanne, Switzerland
Ralf Seifert, EPFL- Ecole Polytechnique Fédérale de Lausanne, Switzerland
Jean-Sébastien Tancrez, EPFL-Ecole Polytechnique Fédérale de Lausanne, Switzerland

Most large firms are currently challenged to reduce their environmental impact, in particular their carbon footprints. Leveraging the interconnections and complexity of global supply chains offers opportunities to reduce carbon emissions in a more cost-effective manner than just focusing on individual processes. We devise a mathematical model for supply chain network design that includes the selection of facility locations, facility technologies, transportation modes and inventory levels, whilst respecting carbon footprint targets. These emission targets can be voluntary or mandatory, and defined for the total supply chain or specific to the markets where products are sold. With the joint consideration of different processes, i.e. manufacturing, transportation and inventory management, we are able to examine solutions with the minimum abatement cost. We analyse firms' potential for carbon footprint improvement depending on the nature of their products, and derive insights for managers and policy makers.

020-0387 Comparative Analysis of Life Cycle Greenhouse Gas Emissions of Supply Chains for Biofuel and Fossil Fuel Production

Fengli Zhang, Michigan Technological University/Mechanical Engineering, United States
Dana Johnson, Michigan Technological University/School of Business and Economics, United States
Robert Handler, Sustainable Futures Institute, Michigan Technological University, USA
David Shonnard, Department of Chemical Engineering, Michigan Technological University, USA

To reduce U.S. dependence on imported oil and to reduce carbon emissions, renewable biofuel production from biomass has experienced emerging interest. This study focused on life cycle greenhouse gas emission impacts of forest biomass supply chain for ethanol production designed for the Forest Biomass Statewide Collaboration Center (FBSCC) project in Michigan, U.S. The life cycle stages considered included biomass harvesting, transportation via truck/rail, and onsite storage. The comparison system is a supply chain for petroleum-based fuel production, exemplified using data specific to the U.S. provided by the Department of Energy (DOE). The results show that from feedstock supply perspective, ethanol production from forest biomass is more environmentally friendly (about 50-60% less GHG emissions) compared with petroleum-based fuel production. Forest biomass supply by truck performs better (about 5 million kg less carbon emissions) than rail supply, resulting from the small transportation distance (67 miles average one-way).

020-0526 Environmental Innovation and Sustainable Development of the Canadian Oil Sands Industry

Nathanial Johnson, Mount Royal University, Canada
Michael Luciuk, Mount Royal University, Canada
Kalinga Jagoda, Mount Royal University, Canada

An increased awareness of the environment and the impacts of global warming have led many companies to modify their business strategies. As Canada's largest contributor to greenhouse emissions, the oil sands of northern Alberta have a tarnished public image. This new awareness has forced the government to enforce environmental constraints and regulations, which is a good start, but more can be done. This paper proposes an integrated framework that can aid industry managers, regulating bodies, special interest groups, and environmental companies in seeking strategic partnerships. It will outline the key factors in determining the need and purpose of support infrastructure while outlining the major actors in the process. The framework will further identify the linkages between the factors and actors with both internal and external stakeholders. The framework will be illustrated by using a case study involving a Calgary-based environmental consulting firm.

020-0153 Sustainability in the Brazilian Ethanol Industry: Is It Feasible?

Marta Cleia Andrade, Pontificia Universidade Catolica de Goias, Brazil
Ely Paiva, Fundacao Getulio Vargas (FGV-EAESP), Brazil

This study aims to analyze a best practice company from the sugar-ethanol industry using the concepts of Green Supply Chain Managment and sustainability. This industry is severely criticized regarding its practices in relation to the environment. The analysis is based on a single case study. The results suggest that when a company from this industry pursues a sustainable approach to its operations, it is feasible to mitigate environmental impacts and to improve local social conditions. It is known that such practices are sources of competitive advantage. However, clear gaps are present in its routine practices of integration and collaboration with supply chain partners. Nevertheless, the company’s environmental policies have led to international accreditations and awards. Social and environment policies have also improved the company’s image, competitiveness, access to new business opportunities and international markets. A doubt that remains is whether its social policies influence the sustainability of its financial performance.

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94 Saturday, 08:00 AM - 09:30 AM, Tuscan 6 *Track:* HOC, 3 *Chair:* Alfonso Pedraza Martinez
Session: Humanitarian services and operations management

020-0232 Decentralization and Trade-offs of Equity and Efficiency in Humanitarian Fleet Management Systems

Maria Besiou, INSEAD Social Innovation Centre, France
Luk Van Wassenhove, INSEAD Social Innovation Centre, France
Alfonso Pedraza Martinez, INSEAD Humanitarian Research Group, France

Previous research has shown that International Humanitarian Organizations manage their field fleets using four types of systems: 1) centralized, where decisions regarding global fleet management (FM) are made centrally by the fleet management unit (FMU); 2) decentralized, where there is no global FMU and decisions regarding FM are made independently at program level; 3) hybrid, combining features of centralized and decentralized models regarding procurement and policy design; and 4) leasing, where decisions regarding global FM are made nationally by an autonomous FMU that leases vehicles from an external stakeholder.

Using system dynamics, we model the four systems and their trade-offs in cost efficiency and equity/availability support both relief and development programs. Our findings provide insights to understand which of the four systems should best satisfy a particular organization's needs when operating in a given context.

020-0484 Flow Models for Humanitarian Aid Distribution

Gregorio Tirado, Universidad Complutense de Madrid, Spain
Miguel Alvarez, Universidad Complutense de Madrid, Spain
M. Teresa Ortuño, Universidad Complutense de Madrid, Spain
Begoña Vitoriano, Universidad Complutense de Madrid, Spain

The intervention of international organizations is essential when a major disaster strikes a vulnerable country and a quick response is necessary. In this context, efficiency, coordination and transparency in the management of the available resources mobilized to provide humanitarian aid is crucial. Criteria such as time of response or equity are essential when dealing with vulnerable people in need, and since the relief operations to be performed are usually developed in an atmosphere of uncertainty, attributes such as road reliability or ransack risk also become important. This work presents a decision support system for humanitarian aid distribution considering different objectives based on the previous criteria. The original model developed is a static flow model and at the moment we are working on a new dynamic flow model designed to better represent the real operations that have to be performed in humanitarian aid distribution.

020-0550 A Fuzzy Stochastic Approach for Pre-Positioning and Distribution of Emergency Supplies in Disaster Management

Saiedeh Tofighi, University of Tehran, Iran (Islamic Republic of)
S. Ali Torabi, University of Tehran, Iran (Islamic Republic of)
Afshin Mansouri, Brunel University West London, United Kingdom

Efficient management of humanitarian relief chains (HRC) is crucial due to the increasing number and intensity of natural disasters around the globe. In this paper, a fuzzy scenario-based stochastic programming (FSBSP) model is proposed for HRC-related logistical problems which are characterized by inherent uncertainty in their input data. The FSBSP model is an extension to an existing stochastic programming (SP) model. It determines optimal policies to deal with pre- and post-disaster events in two stages. The first stage identifies the location of warehouse(s) and inventory levels of emergency supplies. The second stage proposes a set of actions in response to the disaster scenarios. Application of the proposed model is demonstrated through a case study adapted from the literature. In addition, a number of test problems are solved to verify its performance. The results show promising performance of the proposed fuzzy model in comparison with the SP model.

020-0080 An Operational Mechanism Design for Fleet Management Coordination in Humanitarian Operations

Alfonso Pedraza Martinez, INSEAD, France
Sameer Hasija, INSEAD, Singapore
Luk Van Wassenhove, INSEAD, France

We study incentive alignment for the coordination of operations in humanitarian settings. Our research focuses on transportation, the second largest overhead cost to humanitarian organizations after personnel. Motivated by field research, we study the fleet size problem from a managerial perspective. In terms of transportation, an equity focused agent (the Humanitarian Program) has private information which affects the balance between equity and efficiency intended by the principal (The Humanitarian Organization Headquarter). The incentive alignment issue is complex because traditional instruments based on financial rewards and penalties are not considered to be viable options. This problem is further complicated by information asymmetry in the system due to the dispersed geographical location of the parties. We design a novel mechanism based on an operational lever to coordinate incentives in this setting. This study contributes to two streams of literature, humanitarian logistics and incentives in operations management.

95 Saturday, 08:00 AM - 09:30 AM, Tuscan 7 *Track:* PDI, 5 *Chair:* Sriram Narayanan
Session: Knowledge Flows in R&D Environments

020-0696 The Architecture of Partnering Alliances in R&D Projects: The Role of Partnering Size, Focus and Integration on Quality

Anant Mishra, George Mason University, United States
Alan MacCormack, MIT Sloan School of Management, United States

Why are some partnering alliances more successful than others? And how should firms structure their partnering alliances? We examine these questions using data on partnering alliances from 172 R&D projects. Specifically, this study has a two-fold research agenda. First, we examine the micro-structure of partnering alliances by introducing the concept of partnering architecture, which captures the nature and extent of interdependencies between a firm and its partners in an R&D project. Three key elements characterize the partnering architecture of a project: partnering size, partnering focus and partnering integration. Next, we examine how these different elements interrelate with each other to influence quality in R&D projects. The analysis results indicate that improvements in quality occur as the extent of "fit" between the different elements of partnering architecture increases. These results call for greater managerial attention towards the elements of partnering architecture in designing effective partnering alliances for R&D projects.

020-0303 Experience Diversity, Turnover and Productivity: An Empirical Analysis in a Knowledge Intensive Environment

Sriram Narayanan, Michigan State University, United States
Jayashankar Swaminathan, University of North Carolina at Chapel Hill, United States
Srinivas Talluri, Michigan State Universtiy, United States

We examine the roles of diversity as separation and diversity as variety in determining team level productivity in the context of a software maintenance environment. Utilizing a proprietary data set of corrective maintenance tasks sourced from a large software services firm, we investigate the role played by experience heterogeneity in improving productivity in a collocated environment. Our analysis focuses on two key diversity metrics: diversity as separation and diversity as variety. In addition, we examine how different attributes of diversity assist (or deter) team level productivity when turnover occurs.

020-0277 The Benefits of Collocating Manufacturing and R&D: Evidence from the Pharmaceutical Industry

Enno Siemsen, University of Minnesota, United States
John Gray, Ohio State University, United States
Gurneeta Vasudeva, University of Minnesota, United States

Should manufacturing plants and R&D facilities be collocated, or should they be kept in dislocated organizational networks? It is well known that integrating manufacturing and R&D activities is beneficial for Product Development. But what is the impact of manufacturing and R&D collocation on manufacturing quality performance? Combining patent data with quality audit data from the Food and Drug Administration, we empirically analyze this question.

020-0175 Managing Product Transition under Technology Uncertainty

Karthik Ramachandran, Southern Methodist University, United States

Sreekumar Bhaskaran, Southern Methodist University, United States
Ankur Goel, Case Western Reserve University, United States

Sequential innovation, where a new product is developed to replace an existing product, creates several logistical challenges for innovating firms. Often, the end-of-life inventory decision for an existing product must be made before the technology uncertainty surrounding the new product is resolved. We jointly model these decisions, and consider the effects of product architecture, development capability and operational flexibility on the inventory decision. Our results also provide an alternative view of inventory as a hedge against development uncertainty that is inherent to product development. In a competitive setting, we show that the optimal policy can be characterized as competitively overstocking or understocking, based on the inventory level relative to a rival's time of entry.

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96 Saturday, 08:00 AM - 09:30 AM, Tuscan 8 *Track:* ERS, 5 *Chair:* Anupam Agrawal
Session: Empirical Research in Supply Chain Management

020-0114 Organizing for Quality Improvement

Anupam Agrawal, University of Illinois at Urbana Champaign, United States

In this paper, we posit that enhanced quality control and consequently, lower defect levels could be achieved through developing organizational structures dedicated to foster trust and commitment between a buyer firm and its suppliers. Our study shows that over a long period of time, improvement in incoming quality of components in the car division of an automotive firm was significantly better than that in its truck division, even when the procurement was from exactly the same set of suppliers. This difference was significantly influenced by the way the car division chose to organize itself for quality improvement.

020-0830 Manufacturing Flexibility Through Outsourcing: Impact of Contingencies

Gopesh Anand, University of Illinois at Urbana Champaign, United States
Maike Scherrer-Rathje, Institute of Technology Management, University of St. Gallen, Switzerland
Patricia Deflorin, Institute for Strategy and Business Economics, University of Zurich, Switzerland

Despite the growing prevalence of outsourcing in manufacturing organizations, research examining how outsourcing impacts different types of manufacturing flexibilities is considerably lacking. This study seeks to advance our understanding of this relatively unexplored relationship by examining how outsourcing influences product, process, volume, and labor flexibilities. A mixed case study approach with ten manufacturing companies that outsourced some portion of their product development or manufacturing activities is used. Our findings indicate that contingencies such as the speed of learning, the accuracy of transfer of learning, absorptive and desorptive capacities, and the distribution of power between the procuring and provider companies determine whether the effects of outsourcing on manufacturing flexibility are positive, negative, or if the type of flexibility is not affected at all. A company that decides to outsource must therefore carefully analyze the possible consequences of outsourcing on different flexibility types and in relation to multiple contingencies.

020-0329 Knowledge Creation in NPD Projects for High Technology Organizations: A Multi-method Study

Aravind Chandrasekaran, The Ohio State Universtiy, United States
Kevin Linderman, University of Minnesota, United States

NPD projects in high technology organizations bring together diverse knowledge domains and quickly integrate them to create new products and processes. The fast paced context of high technology organizations makes it challenging to effectively create new knowledge and efficiently solve complex problems. Managing these NPD projects requires understanding both the mechanisms and type of knowledge created to achieve project objectives. This research conducts a two phased multi-method approach to understand knowledge creation in NPD projects. Results from this work find that NPD projects benefit from two types of knowledge - objective and intuitive. In addition, knowledge creation occurs through both differentiation and integration mechanisms. Differentiation involves bringing together different knowledge domains through a diversified team, and integration entails creating a self-managed psychologically safe team environment. These mechanisms lead to higher levels of knowledge which in turn affects NPD project performance.

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97 Saturday, 08:00 AM - 09:30 AM, Tuscan 9 *Track:* BOM, 5 *Chair:* Kenneth Schultz
Session: Customer and Worker Behavior

020-0998 Habitual Citizenship Behavior and Hand Hygiene

Raidar Hagtvedt, University of Alberta, Canada
Kenneth Schultz, University of Alberta, Canada
Sarah Forgie, , Canada

Infections in hospitals cost a great deal of lives, money, and suffering. Much of the problem would be solved with proper hand hygiene. Rates of hand hygiene compliance are usually about 1/3 of regulated standards. Campaigns are usually based on the Theory of Planned Behavior and focus on knowledge, rather than behavior. We think the behavior is more habitual than planned. Understanding the behavior and the the patters of compliance should lead to population growth.

020-1023 A Model of a Queue where Servers Behave Adaptively

Mohammad Delasay, School of Business, University of Alberta, Canada
Armann Ingolfsson, School of Business, University of Alberta, Canada
Bora Kolfal, School of Business, University of Alberta, Canada

Recent research indicates that in some real queueing systems, servers adapt their service rate in response to the system load and to overwork. We present a queueing model that includes such adaptive behavior. Servers work faster as the system load increases. The speedup is temporary as the overwork and associated fatigue effect causes the servers to eventually slow down. We present a two-dimensional state-dependent Markov chain, where the first dimension tracks the number of customers and hence, the system load. The second dimension quantifies overwork as the number of customers served so far in the current busy period. We allow the service rate to depend on both state variables and thus the model can capture the empirically-observed effects of load and overwork. Our aim is to approximately reduce the two-dimensional model to a tractable one-dimensional model by replacing overwork with the conditional expected value of overwork, given the system load.

020-1025 The Effect of Multi-Tasking on Worker Productivity

Diwas Kc, Emory University, United States

We examine the effect of multi-tasking on worker productivity and output quality using micro-level operational data from a busy emergency department. By drawing on recent findings in the experimental psychology literature and the nascent work in cognitive neuroscience we develop several hypotheses for the effect of multitasking on worker productivity. We find that the level of multi-tasking is driven by the level of system workload, as well as the number of physicians concurrently on staff. Multi-tasking also has implications for the service encounter, including patient flow time and quality of care. Finally, we find that multi-tasking increases the productivity up to a certain extent. After this limit is exceeded, there are decreasing returns to productivity.

020-0174 The Impact of Physical Changes on Customer Behavior

Mark Mobach, University of Groningen, Netherlands

Imagine waiting in line for goods or services, and at the same time, being immersed in a shopping area. Would such a physical environment seduce you to take a look around and to purchase the displayed products, and at the same time perhaps make the wait even more palatable? A re-furnishing of waiting areas in shops was used to assess its influences on waiting behavior, customer satisfaction, and sales in a field experiment. Customers were assigned to a waiting area with shopping facilities or to waiting areas that were almost empty. In comparison with the emptier waiting areas, waiting customers in a waiting area with shopping facilities had significantly higher rates of interaction with the physical environment and higher satisfaction with the prompt taking of orders than customers in emptier waiting areas. Moreover, these customers produced higher net sales when compared with waiting customers in emptier waiting areas.

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98 Saturday, 08:00 AM - 09:30 AM, Tuscan 10 *Track:* ICM, 5 *Chair:* Wenjing Shen Xinxin Hu

Session: Retail and Manufacturing Inventory

020-0178 Lot Sizes in Serial Production Lines with Random Yield and AR Demand

Matthew Sobel, Case Western Reserve University, United States
Volodymyr Babich, Georgetown University, United States

The following make-to-stock manufacturing process is shown to have an optimal lot-size policy which is myopic and easily computed. Workstations are arranged in series with buffer inventories, the yield at each station is random (with the expected yield proportional to, and distribution of yield deviation from the expected value independent of, the lot size). Non-defective items move through the stations to enter a finished goods inventory. The demand process is autoregressive and excess demand is backlogged. There are convex costs of finished goods inventory and linear costs of work-in-process inventories and lots processed at workstations. The decision variables are the lot sizes at the workstations and the criterion is to minimize either the expected present value of the time stream of costs or the long-run average cost per period. The same lot-size policy can be shown to be optimal for both finite and infinite-horizon models.

020-0544 A Model for Retail Inventory Management with Freshness-Dependent Demand

Zhengliang Xue, IBM T.J. Waston Research Center, United States
David Yao, Columbia University, United States
Markus Ettl, IBM T.J. Waston Research Center, United States

We study optimal depletion and replenishment strategies in an inventory system with perishable products and freshness-dependent demand. Fresh products are sold at full price. Aged products can either be sold at full price in the primary retail channel, or at a discounted price in a secondary channel. Expired products are discarded. Customer demand depends on product freshness which in turn has an impact on customer loyalty and brand reputation. In each period, the retailer decides a depletion amount for aged products which is to be sold in a secondary channel, and a replenishment quantity for fresh products. The goal is to maximize the total expected discounted profit in concern with the freshness requirement. We investigate the impact of product freshness on inventory decisions, and discuss managerial insights.

020-1056 Shelf Loathing: Cross Docking at an Online Retailer

Kyle Cattani, Indiana University, United States
Gilvan Souza, Indiana University, United States
Shengqi Ye, Indiana University, United States

At an online retailer's fulfillment center, there might be opportunities to fill customer orders earlier than the due date through cross-docking transactions. Rather than picking the item from inventory on the warehouse shelves, in a cross-docking transaction the item moves directly from the receiving dock to the shipping dock. While the cross-docking transaction reduces shelving and picking costs, it potentially risks changing the customer's expectations for how soon a product will be delivered. We analyze the basic trade-offs inherent in the cross-docking transaction. Given random customer order arrivals and a cost (or benefit) for shipping a product early, we characterize the structure of the optimal decision as to whether to cross dock a replenishment item to fulfill demand not immediately due, or to wait to (hopefully) cross dock in a later period. We formulate the problem as a Markov decision process and provide the structure of the optimal policy.

020-0443 A Production-Inventory System with both Patient and Impatient Demand Classes

Mohsen Elhafsi, University of California, United States
Saif Benjaafar, University of Minnesota, United States

We consider a production-inventory system with two customer classes, one patient and one impatient. Orders from the patient class can be backordered if needed while orders from the impatient class must be rejected if they cannot be fulfilled from on-hand inventory. Orders backordered incur a backorder cost while orders rejected incur a lost sales cost. The objective is to minimize the sum of inventory holding cost and the costs of backorders and lost sales. We formulate the problem as a Markov decision process and use this formulation to characterize the structure of the optimal policy. We show that the priority in inventory allocation among the two classes is not static and instead depends on the backorder level from the class of patient customers. We also describe an effective heuristic that retains the essential features of the optimal policy but is significantly simpler to implement.

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99 Saturday, 08:00 AM - 09:30 AM, Tuscan 11 *Track:* REV, 3 *Chair:* Nikolay Osadchiy

Session: Behavioral Issues in Revenue Management

020-0952 Revenue Management with Lifetime Value Considerations

Anton Ovchinnikov, Darden School of Business, University of Virginia, United States

This paper is an attempt to integrate revenue management (RM) and Customer Relationship Management (CRM). To do so, we consider a CRM-focused firm that operates with limited capacity and maximizes its long-term profitability by making personalized retention offers to current customers and non-personalized efforts to acquire new customers. We characterize the firm’s optimal dynamic offers and discuss the role that customer lifetime value plays in determining the firm’s strategy, both as it grows towards the capacity limit and when it is already at capacity, optimizing customer mix. We then compare the optimal behaviors derived from the dynamic program with the behaviors of human subjects who faced the problem of managing customers’ acquisition and retention in an online simulation that we designed. We document the regularities in the observed behavior and develop insights that can help firms in retention situations better manage their revenues while taking customer lifetime value into account.

020-0102 A Laboratory Investigation of Rank Feedback in Procurement Auctions

Wedad Elmaghraby, University of Maryland, United States
Elena Katok, The Pennsylvania State University, United States
Natalia Santamaria, The Pennsylvania State University, United States

A popular procurement auction format is one in which bidders compete during a live auction event, observing only the rank of their own bid. We investigate the

performance of auctions with rank feedback in a simple setting for which analytical benchmarks are available. In the lab, we compare the performance of auctions with rank feedback to auctions with full price feedback, and to sealed-bid auctions. We find that average quality-adjusted prices in auctions with rank-based feedback are higher than sealed-bid prices, but lower than full feedback prices. We identify two behavioral reasons for the difference. First, when rank information is not useful, bidding is more competitive under rank feedback than under full price feedback. Second, even when bidders have the same quality, so rank feedback is useful, bidder impatience causes bidders to place jump bids, that result in average lower prices.

020-0432 An Empirical Study of Performance-based Scheduling in Restaurant Revenue Management

Tom Tan, Wharton Business School, University of Pennsylvania, United States
Serguei Netessine, INSEAD, France

Published studies on restaurant revenue management tend to focus on the optimization of the table mix to increase revenues. In this paper, we offer a first empirical analysis of the revenue impact of optimizing server schedules. We show that individual servers at a restaurant have dramatic differences in performance as measured by sales and customer satisfaction (gratuity). We therefore analyze the revenue impact of arranging server schedules according to their performance using POS data for a small restaurant chain. We quantify the consequences of allocating best tables and best shifts to best servers in a restaurant and we discuss challenges associated with implementing such performance-based scheduling. Our findings indicate that sizable profit increases can be achieved with little or no extra cost.

020-0849 Are Consumers Really Strategic? Implications from an Experimental Study

Nikolay Osadchiy, Emory University, United States
Elliot Bendoly, Emory University, United States

Novel retail practices are being explored in today's highly information rich marketplace. One emerging practice involves selling a product at a regular price while giving consumers an option of placing a non-withdrawable reservation to get an item at a lower price at the end of the selling season, provided that it has not sold out before. We conduct an experiment involving such a setting with an interest in gaining a better understanding of consumer choice dynamics and the extent to which retailers can expect rational behavior from clientele in these settings. We find that generally the subjects are particularly sensitive to whether information regarding the riskiness of reservation options is provided. Moreover, we find that individual sensitivity to other pieces of contextual information is augmented by the presence of such risk information. Implications for managerial practice in these emerging settings are discussed.

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Saturday, 08:00 AM - 09:30 AM, Roma 1,2 *Track:* NCC, 3 *Chair:* Haresh Gurnani
Session: Session 3

020-0250 Supply Risks, Guarantees, Competition and Information Asymmetry

Haresh Gurnani, University of Miami, United States
Mehmet Gumus, McGill University, Canada
Saibal Ray, McGill University, Canada

We model a supply chain consisting of a single buyer and two unreliable suppliers who face risk of supply disruption. One supplier is comparatively more reliable but more expensive, while the other unreliable one is cheaper but faces higher risk of supply disruption. Moreover, the risk level of the unreliable supplier may be private information and this lack of visibility further contributes to the buyer's purchasing risk. In such settings, the unreliable supplier often offers a price and quantity (P&Q) guarantee to the buyer as part of her contract terms. Our objective is to study the underlying motivation for such a guarantee offer and its effects on the competitive intensity and the performance of the chain partners.

020-0588 Motivating Suppliers in a Dynamic Moral Hazard Environment

Hongmin Li, Arizona State University, United States
Hao Zhang, University of Southern California, United States
Charles Fine, Massachusetts Institute of Technology, United States

We study a supply chain triad with a risk-neutral manufacturer (the principal) and two risk-averse suppliers (the agents) who can make private efforts to improve the quality of their supplies. We consider two incentive structures over an infinite horizon: rewarding suppliers with higher profit margins or greater business volumes. We show that in both cases there exist certain trapping positions in terms of future arrangements. The suppliers are motivated to make high efforts at present to secure a favorable position for future rewards.

020-0568 Sourcing for Quality: Pricing, Inspection, and Collaboration

Hsiao-Hui Lee, University of Connecticut, United States
Cuihong Li, University of Connecticut, United States

The product quality provided by a supplier is an important concern in the design of a buyer's sourcing strategy. Different instruments may be used by a buyer to manage the product quality: the buyer may offer a higher unit price to motivate the supplier to exert greater quality improvement effort, or perform more stringent inspection to identify bad quality products with better accuracy. In addition, the buyer can spend her own resources to collaborate with the supplier to improve the product quality, e.g., by improving the product design or providing engineering support. In this paper, we analyze the buyer's sourcing strategy in terms of the pricing, inspection and collaboration decisions, identifying the structure of the decisions in different environments.

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Saturday, 08:00 AM - 09:30 AM, Sorrento 1,2 *Track:* QPJ, 4 *Chair:* Milton Vieira Junior
Session: Session 4: Process Improvement (1)

020-0030 Statement of Losses Caused by the Presetting of Tools by the Manual Method

Milton Vieira Junior, UNINOVE, Brazil
Ivan Correr, GeoTecno Soluções em Automação, Brazil
José Alves Silva, UNINOVE, Brazil
Diego Silva, UNINOVE, Brazil
Alan Costa, UNINOVE, Brazil

In the search for competitiveness, machining companies seek to qualify as being able to run processes of World Class Manufacturing, with the application of concepts of lean manufacturing. Among such concepts is the fast setup, essential for the elimination of losses in the process. However, most business users of CNC machines still face a significant barrier in this field: the presetting of tools is usually performed manually, and requires high times for the preparation of the machines. In this paper these times are associated with losses in production, showing not only the result in terms of delays generated in the setup operations of machines, but also reductions in the utilization rates of CNC machines. In addition, the paper also presents a method for calculating those losses that can be easily accessed via the Internet by users of CNC machines in order to calculate the losses in their existing production systems.

020-0031 A Comparison Between Presetting Times: Manual and Authomatic Methods

Milton Vieira Junior, UNINOVE, Brazil
Ivan Correr, GeoTecno Soluções em Automação, Brazil
Everton Fardin, UNINOVE, Brazil
Luciano Da Silva, UNINOVE, Brazil
Wagner De Oliveira, UNINOVE, Brazil

The time spent with the operations of presetting of tools on CNC machines represents a significant portion of the setup times of the machines. With each change of batch or tools that may be required during production, new adjustments must be performed again and the time of presetting influences the use of machinery and production lead time. Since most companies rely on presetting of tools manually, using the machine as measuring equipment, these times become increasingly significant and responsible for the low utilization rates of the CNC machines. In this paper we present the reasons why companies use the manual method for pre-setting tools. The article also reveals, from an experiment performed on a machining center, the time difference between manual operations and those performed with the use of a laser Toolsetter (automatic measurement tools), pointing to the possible losses that may result in the manual method.

020-0029 Solving Actual Production Problems through Monte Carlo Simulations

Wagner Lucato, UNINOVE, Brazil
Milton Vieira Junior, UNINOVE, Brazil
José Dos Santos, UNINOVE, Brazil

The objective of this paper is to propose the utilization of the Monte Carlo simulation technique as a tool to solve actual production problems. This is done through a case study of a three station assembly line arranged to produce flat iron thermostats in a housewares manufacturing facility. Initially designed to generate an output of 3,500 assemblies per week, actual production could hardly meet 85% of that value. A motion and time study was conducted and the results were used as a base to simulate the existing line operation using the Monte Carlo method. This initial simulation enabled the identification of the key problems responsible for restraining the output. Subsequent simulations were conducted to test different assembly line arrangements. As a result a new assembly line design eliminating current problems could be proposed and implemented which made actual output reach the initially desired values.

102 Saturday, 08:00 AM - 09:30 AM, Sorrento 3,4 *Track:* SAP, 3 *Chair:* Rui Yin
Session: Operations Management Models with Consumer-Driven Demand

020-0183 Strategic Purchase with Counterfactual Payoffs and Misperception of Availability

Yanchong Zheng, Stanford University, United States
Ozalp Ozer, The University of Texas at Dallas, School of Management, United States

We study strategic interaction between a firm and its consumers when consumers' purchase decisions are impacted by counterfactual payoffs and misperceived product availability. The firm sells a product over two periods and determines inventory level given a pre-announced markdown policy. Consumers experience counterfactual payoffs in both early and late purchase. In addition, they cannot accurately assess the probability of stockout in the second period. We show that both counterfactual payoff of late purchase and misperception in product availability make it less necessary for the firm to adopt inventory rationing, whereas counterfactual payoff of early purchase encourages rationing. We also demonstrate that the firm can gain a substantial profit if it correctly takes account of these behavioral issues on the consumer side when making its operational decisions.

020-0431 Strategic Customers and Commitments in a Decentralized Supply Chain

Ali Parlakturk, University of North Carolina at Chapel Hill, United States
Mustafa Kabul, SAS Institute, United States

We consider a decentralized supply chain serving forward-looking consumers in two periods. The supplier and the retailer dynamically set the wholesale and retail price to maximize their own profits. The consumers are strategic in deciding whether and when to buy the product. We find that while a centralized system always benefits from making price and quantity commitments, this is not true for a firm in a decentralized supply chain due to how the other firm reacts to such commitments.

020-0265 Dynamic versus Static Pricing in the Presence of Strategic Consumers

Gerard Cachon, The Wharton School, United States
Pnina Feldman, Haas School of Business, UC Berkeley, United States

Dynamic pricing can be used to align supply with demand. Our paper shows that there is a limitation to dynamic pricing - by imposing price risk on consumers, they might not even consider purchasing, thereby lowering the firm's potential demand. Although static pricing does not react to demand, we show that it may be better than dynamic pricing. An even better policy is "constrained dynamic pricing" where the firm reacts to demand with moderate price adjustments. The constrained dynamic pricing policy can be implemented by committing to only mark down. While many assume a firm should avoid markups, we provide a justification for such a policy.

020-0054 Managing Product Rollover with Strategic Customers

Rui Yin, Arizona State University, United States
Chris Tang, UCLA, United States

We consider a retailer who sells two generations of a product. Customers are strategic in the sense that they may take future purchasing opportunities into consideration when they make their current purchasing decisions. We examine the impact of this strategic purchasing behavior on the seller's product rollover decisions.

103 Saturday, 08:00 AM - 09:30 AM, Naples 2 *Track:* GEN, 5 *Chair:* John Park
Session: Risk management

020-0293 The Management of Information to Identify Supply Chain Disruption Risk Can Be Explored Using Push and Pull Concepts

Amrik Singh, Aston University, United Kingdom
David Bennett, Aston University, United Kingdom

Supply Chain Risk Management (SCRM) has become a popular area of research and study. This coupled with the realisation by companies that SCRM strategies are required to mitigate the risks that they face, makes for challenging research questions. The strategy is not only to identify the types of risks that they face, but also to assess the management of information that allows them to gather information which will allow them to mitigate that risk before any

disruption to the supply chain occurs. Information management (IM) is the collection and management of information from one or more sources and the distribution of that information to one or more audiences. Two focus groups were conducted within an aerospace organisation to assess the views of individuals on whether the organisation should use a push or pull information management system with regard to gathering information for SCRM.

020-0792 Toward an Understanding of Risk in Process Industries

Monique French, University of Colorado at Colorado Springs, United States

This paper presents an investigation into risk and its applications to process industry decision- making. There are many areas where uncertainty introduces risk into managerial decisions. New product introductions, supply uncertainty, raw material variability, process yield variability, and returns and reprocessing decisions are just a few of the areas impacted. The many faces of risk - risk perception, risk propensity, and risk attitudes of the decision-maker - all play a role in decision-making. And then there are the different sources of risk to consider. This paper is part of a project initially aimed at measuring the perceived risk of different types of product returns in process industries, which, once begun, led to the realization that there is no “simple” measure of risk.

020-0127 Trends in Operations Management - A Latent Semantic Analysis

Shailesh Kulkarni, University of North Texas, United States
Uday Apte, Naval Postgraduate School, United States
Nicholas Evangelopoulos, University of North Texas, United States

In this study we conduct a Latent Semantic Analysis of thirty years of research published in the International Journal of Operations and Production Management (IJOPM). Our methodological approach is novel as compared to other studies that typically use Citation/Co-citation Analysis. However, the more interesting and important aspect of our work lies in contrasting our findings with recent studies that longitudinally review a combination of premier North American journals with or without IJOPM. Finally, we map IJOPM side-by-side with premier North American journals in a condensed research space. This provides some insights into the relative "distance" among European and premier North American journals in terms of research topics and methodological paradigms.

020-0996 Logistics Clusters and Economic Development

Yossi Sheffi, MIT, United States

The literature concerning the formation and advantages of industrial clusters is vast. Advantages include increase in productivity; knowledge sharing; availability of specialized labor pool; and knowledge creation centers, such as universities, consulting firms, and think tanks. In addition to those, logistics clusters exhibit other characteristics which make them unique in terms of cluster formation and their contribution to economic growth. Logistics formation cluster formation is fed by economics of scope and scale in transportation, in addition to economics of frequency and density. Such clusters provide a range of employment opportunities - from moving boxes to executive, IT and other professional jobs; and they diversify the economic basis since they support many other industries, such as manufacturing as well as a range of others.

104 Saturday, 08:00 AM - 09:30 AM, Naples 1 *Track:* OMF, 2 *Chair:* Brian Jacobs
Session: Session 2: Operations and Financial Market Performance I

020-0185 Measuring and Comparing Volume Flexibility across Indian Industries Using Financial Statement Analysis

Sahil Bansal, Indian Institute of Management, Lucknow, India
Samir Srivastava, Indian Institute of Management, Lucknow, India

Volume Flexibility is the ability of a firm to operate profitably at varying output levels. It can also be defined as the capacity to quickly expand the capabilities of a given product mix (Cox, 1989). It can be an important source of competitiveness for both manufacturing and service firms (Sethi and Sethi, 1990). So, volume flexibility is an important operating capability of a firm and could be an important overall performance measure. In this paper, we formulate measures to evaluate the volume flexibility of firms in the Indian context. Financial and operating data for various publically listed companies in India is collected and analyzed on the formulated performance measures. Finally, we develop a framework of evaluating the operating performance of Indian firms using commonly available financial data to understand the relative standing of firms in their respective industries and compare industries with each other.

020-0471 The Effect of National Quality Awards on Stock Markets: Evidence from China

Xia Pan, Sun Yat-sen University, China
Jingyi Guo, Petro China Co. Ltd., China

The China National Quality Award is the highest honor of the quality field in China. The award-winning companies are recognized as the leading companies in the market. This paper explores the effect on the stock performance of the publically-listed companies that won China's National Quality Award from 2001 to 2007. Using the method of event study, we examine the cumulative abnormal return (CAR) and buy-and-hold abnormal return (BHAR) of 29 months before and after the quality award announcements. The results show that China National Quality Award announcements do not have a short-term effect, but have a positive impact on the long-term stock performance.

105 Saturday, 08:00 AM - 09:30 AM, Naples 3 *Track:* OMM, 9 *Chair:* Xuying Zhao
Session: Risk and Uncertainty

020-0034 Customer Return Policies and Pricing for Competitive Firms

Wenjing Shen, Drexel University, United States
Gulay Samatli, Drexel University, United States
Avijit Banerjee, Drexel University, United States
Seung-lae Kim, Drexel University, United States

Customers may not know their valuation of a product at the time of purchase. To encourage purchasing, retailers often allow return and refund. We consider two competing firms selling substitutable products to customers, and evaluate the equilibrium pricing decisions and refund policies. We find that a full refund policy does not necessarily increase profit, depending on a number of factors such as cost, salvage value, average valuation, and product differentiation, etc.

020-0658 Managing Risk in Global Market Selection Using Diversification

Steve Leon, North Dakota State University, United States

The U.S. global airline industry is characterized by highly cyclical and inconsistent operating profits, razor-thin profit margins and unimpressive passenger yields. The industry is routinely affected by uncertain economic, political and environmental crises that are nearly impossible to predict. Furthermore, the air transport industry operates under a maze of international regulations and bilateral agreements that severely limit operational and strategic flexibility.This research develops a new approach to allocating resources to global regions by employing a risk mitigation model using portfolio theory in which diversification is used to minimize risk and operating losses while maximizing operating profits. First, a portfolio of available seat miles distributed to global regions is determined using

the mean-variance approach. Next, a second portfolio approach is used by which the mean-variance method is modified and is now the mean-VaR (value-at-risk) approach. Lastly, a comparison is made between the two approaches.

020-0537 Pricing Strategy in Advance Selling

Xuying Zhao, University of Notre Dame, United States
Pang Zhan, lancaster University, United Kingdom

When consumers participate in advance selling, they are uncertain about product valuation and also selling season price. In order to eliminate consumer incentives to wait, a newsvendor retailer may adopt various pricing strategies for the selling season price and pre-order price. This study compares dynamic pricing, committed pricing, and price matching strategies. We provide insights and guidance for newsvendor retailers on which pricing strategy to offer in advance selling.

020-0159 Does Uncertainty Impact on the Inconsistency between Profit Maximization and Customer Satisfaction?

Hisashi Kurata, University of Tsukuba, Japan

After-sales services are considered a key strategic tool in the durable consumer product market for both a manufacturer and a retailer to capture more sales and profit. It is less understood, however, how the uncertainty of the customer's needs for after-sales services influences after-sales service decisions. This research explores the effect of uncertainty on after-sales service decisions by comparing several information structures in a two-stage supply chain. Our model demonstrates that uncertainty may temporally alleviate the discrepancy between the customer's optimal service level and the firm's service decision based on profit-maximization but, in the long run, uncertainty will never resolve such an inconsistency. In addition, we develop the model where the fully personalized after-sales service is offered and then compare this with the segmented service model. Based on the analytical results, we also provide a practical insight for business.

106 Saturday, 08:00 AM - 09:30 AM, Naples 4 *Track:* CSC, 5 *Chair:* Gary Gaukler
Session: RFID in Operations Management I

020-0112 Emergency Ordering Based on Pipeline Visibility

Gary Gaukler, Texas A&M University, United States

In this paper I discuss the potential impact of order tracking updates on inventory replenishment decisions. I examine a stylized global supply chain, in which a retailer faces stochastic lead times for order fulfillment from a distant supplier. The retailer may release emergency orders in response to information about the status of her resupply pipeline.

020-0213 The Effect of Collaborative Demand Planning on Tier 1 Supplier Responsiveness

Sang Ho Chae, Yonsei University, Korea, Republic of (South Korea)

As the market changes more frequently, many firms in the fast-changing consumer electronics industry are trying to sustain their competitive advantage by improving their responsiveness to customer demand. This research project investigates the effect of a collaborative demand planning process-Collaborative Planning, Forecasting, and Replenishment (CPFR)-on supplier responsiveness by conducting a single case study of Samsung Electronics. By having a theoretical background based on the resource based view and social capital theory, this research project proposes a conceptual model on why firms adopt CPFR and how it improves supplier responsiveness. The findings suggest that the customer-facing inter-firm collaboration process is adopted to combine the benefits of lean and agile supply chains. It is also found that CPFR improves forecast accuracy, which has positive effects on supplier responsiveness. In addition, this research project reveals that socialization mechanisms positively moderate the effect of forecast accuracy on supplier responsiveness.

020-0313 Value of Information for Intermodal Transportation of Perishable Goods

Michael Ketzenberg, Texas A&M University, United States
Rob Zuidwijk, Erasmus University, Netherlands

An important parameter in the transport of perishables is the remaining shelf life of the product. This parameter is often uncertain, so transport decisions are guided by "the sooner, the better", leaving truck transport as the main alternative. We explore the possibilities of using other transport modes that are slower but cheaper and more environmentally benign. We consider policies under various levels of information and incorporate product price levels that depend on remaining shelf life.

107 Saturday, 08:00 AM - 09:30 AM, Naples 6 *Track:* SOM, 12 *Chair:* Karuna Jain
Session: Service Quality

020-0572 How Much Control Does a Company Have Over Customer Satisfaction?

Ryan Buell, Harvard Business School, United States
Dennis Campbell, Harvard Business School, USA
Frances Frei, Harvard Business School, USA

In this paper, we will decompose the variance of 349,995 face-to-face transactions conducted by customers of a nationwide retail bank, quantifying the relative importance of customer, employee, process, location and market-level effects on the satisfaction customers experienced. We will also explore how the magnitude of each effect responds to moderating factors, such as customer tenure, customer value and whether resolving a service problem motivated the transaction. While well-developed streams of the service operations and marketing literatures explore means of driving and measuring customer satisfaction and its antecedents, no empirical work has quantified the relative importance of each dimension. Insights from this work will help firms improve service investment decisions, produce more efficient service designs and highlight opportunities for future research.

020-0733 Application of Lean to Enhance Service Quality: A Framework

Narendra Lakal, Shailesh J Mehta School of Management, Indian Institute of Technology, Bombay, India
Karuna Jain, Shailesh J Mehta School of Management, Indian Institute of Technology, Bombay, India

The service sector has been contributing substantially to world economy. Measuring and enhancing Service Quality (SQ) is becoming critical for service providers. This has motivated many researchers to focus on doing research in the area of SQ. Service research literature with marketing perspective focuses more on service quality measurement and other related issues. Service research literature with operations perspective deals with operational effectiveness and issues related to variability. There is very little attention given in the literature to examine service delivery processes and its impact on service quality. This paper is an attempt to address this research gap. The aim of this work is to understand service characteristics and delivery processes and apply Lean principles to improve service delivery processes. To ensure effective adaptation of lean principles, we have used unified services theory (UST). We then propose a conceptual framework which maps lean principles with the dimensions of service quality.

020-0983 Quality of Work Is Not Quality of Service: Applied Quality Management For The Small Field-based Service Firm

Joyce Hoffman, Saginaw Valley State University, United States
Danilo Sirias, Saginaw Valley State University, United States

Many small field-based service organizations are continuously challenged for survival due to management's lack of understanding of customer expectations, the source of these expectations, and the implementation necessary to fulfill these expectations. This research focuses on the gap between customer expectations and management's understanding and the gap between implementation and expectation. Using a case study/interview methodology and an instrument based on SERVQUAL format and the gap model of Zeithami et. al, the gaps are investigated and a checklist/prescription for consistently managing quality is presented.

020-0848 Amplification of Service Failure Severity according to Consumer Contact Level on the Purchase Behavior

Woohyun Cho, University of Maryland, United States

Customers experiencing service failures tend to be dissatisfied and are less likely to purchase the same service again. How the customers experience and evaluate service failures helps predict the customer's future behaviors, whether to stay with or leave the service provider. However, the previous studies limitedly examined the customers that already used the services and measured only the 'one side' of the service failure impact. The behaviors of the customers who recognize a negative impact of potential service failures even before experiencing the service and decide not to purchase it haven't been explicitly examined yet. In fact, the extant research suggests that the potential risks associated with the services (Rust et al, 1999) may influence the customer's purchase behaviors. This study attempts to acknowledge the impact of the expected service failures on customer's behaviors, which is moderated by the customer contact level to services. The study implies the existence of a negative signal from firms due to potential service failures that will reduce the future demand.

111 Saturday, 11:15 AM - 12:45 PM, Tuscan 1 *Track:* HOM, 6 *Chair:* Brian Rothman

Session: Improving Efficiency of Operating Rooms

020-0092 Adding Process Alerts and Push Notifications to Static Display Boards and Information Aggregator Applications

Paul St. Jacques, Vanderbilt University School of Medicine, United States

Many hospitals still use manual schedule boards and procedures to post OR & procedure schedules. We implemented an electronic system to present complete surgical case information on large LCD status boards installed in decision-making and information-consuming locations. We deliver patient- and OR-readiness indicators using colored icons and text to indicate room, patient and system status. Status updates are collected from routine electronic documentation in the admitting, preoperative holding, OR, and PACU areas (no additional effort required). These systems appear useful, especially because information can be automatically pushed 'over the horizon' to secondary services such as labs, blood bank and recovery room. However, Dexter's work indicates that provision of status information may not ensure sound process decisions. Specifically, clinicians increase the work performed in an individual OR, but decrease the overall OR suite efficiency. Thus, we are now refining automated "best practice" recommendations, supplementing raw information from electronic status boards.

020-0093 Mobile Device Applications to Improve Operating Room Safety and Efficiency through Transparency and Situational Awareness

Brian Rothman, Vanderbilt University School of Medicine, United States

Anesthesiologists supervise 2-4 anesthetic sites as a dominant practice model. The VigiVU mobile app for operating room situational awareness delivers real-time information to all personnel regardless of location in a secure fashion. The combination of live video, summary problem list, detailed history and physical, graphical vital signs, and communication support provides a mobile situational awareness solution. VigiVU provides operating room workflow transparency by graphically presenting patient status changes as they move through the perioperative process. Staff at all levels report that VigiVU facilitates communication, safety, and efficiency, and decreases reliance on desktop computers. Our surgical and nurse management teams have also reported similar benefits. However, providing instant, accurate, easy-access information in perioperative settings is challenging. Pushing usable information is data- workflow- and device-dependent. If poorly integrated, data delivery is delayed, inaccurate, or incomplete. Decision support algorithms guiding action and notification escalation are still needed.

020-0094 Near-OR Perioperative Interventions to Decrease Hospital Length of Stay

Rajnish Gupta, Vanderbilt University School of Medicine, United States

Randall Malchow, Vanderbilt University Medical Center, U.S.

Manipulating length of stay (LOS) can reduce congestion and improve flow in post-surgical hospital units. Reducing LOS is financially beneficial in a DRG-driven payment system. Narcotic based pain management increases LOS in orthopedic surgery. Pain control with peripheral nerve blocks and catheters may reduce LOS. We (1) moved orthopedic operations to our outpatient surgery center (facilitated by peripheral nerve catheters and discharging patients home with disposable local anesthetic pumps) and (2) used peripheral nerve catheters in complex cases performed at the main hospital. LOS data indicate that single shot blocks produce better results than no block and peripheral nerve catheters show the greatest benefit. We perform roughly 3600 peripheral nerve blocks and catheters annually, saving roughly 0.5 hospital day per inpatient block. One hospital day costs about $2000, yielding estimated annual savings of $2,500,000 through the use of peripheral nerve blocks and catheters.

020-0852 Understanding the Dynamics of Delays in Operating Rooms: A Brazilian Hospital Case

André Luís Duarte, Insper Instituto de Ensino e Pesquisa, Brazil

Guilherme Martins, Fundação Getúlio Vargas, Brazil

Operating room management is a critical issue in many hospitals, not just because of its high costs, but also because of its complexity. The two objectives of this paper are: (1) Understanding the reasons and the dynamic of delays in a Surgery Center;and (2) Suggesting recommendations to improve the scheduling process. This study used the case method (Yin, 2009) and a simulation tool (MedModel) to achieve those objectives. A Surgical Center in a Brazilian hospital was analyzed during three months in order to understand the process of scheduling in an uncertain and variable environment. A vicious cycle was identified: the efficiency of a Surgery Center is affected by other areas' efficiencies and vice-versa. Unbalanced scheduling of the operating room area causes demand fluctuations in other areas and increases the uncertainty. In response to this, the paper proposes a new approach based on critical chain schedule principles (Goldratt, 1997).

112 Saturday, 11:15 AM - 12:45 PM, Tuscan 2 *Track:* ACL, 6 *Chair:* Avraham Shtub

Session: Teaching Project Management

020-0437 Teaching Project Management with PTB Project Team Builder

Avraham Shtub, Technion, Israel

This tutorial presents a new tool for the teaching of Project Management-a tool that can easily integrate with traditional teaching based on any course or textbook available on the market. The Project Team Builder software tool combines an interactive, dynamic case study and a simple yet effective Project Management System. The Project Team Builder (PTB) won the Project Management Institute (PMI) 2008 Professional Development Product of the Year Award. It is designed to support teaching of project management at the graduate and undergraduate level as well as for training professionals. PTB is the basis of a new book published by Springer titled "Project Management Simulation with PTB Project Team Builder". The PTB provides an environment for hands-on experience in project scheduling, resource and budget planning, risk management and project control.

113 Saturday, 11:15 AM - 12:45 PM, Tuscan 3 *Track:* SCH, 3 *Chair:* Charles Munson

Session: Production Scheduling

020-1036 The Fast Scheduling Method for a Make-to-Order Production Line

Takahiro Nakano, Hitachi, Ltd. Production Engineering Research Laboratory, Japan

Youichi Nonaka, Hitachi, Ltd. Production Engineering Research Laboratory, Japan

Hisaya Ishibashi, Hitachi, Ltd. Production Engineering Research Laboratory, Japan

Satoshi Nagahara, Hitachi, Ltd. Production Engineering Research Laboratory, Japan

Production plan parameter error to actual manufacturing data is significant subject for make-to-order production because of little process repeatability. To reduce the error, production scheduling must be placed in a very short cycle even though the make-to-order production condition has huge scheduling solution space. The practical scheduling cycle must be shortened from the current conventional methods. In this research a fast scheduling method is proposed by Background Manufacturing Knowledge-based Solution Space Reduction (BMK-SSR). We place the BMK-SSR classified scheduling problem into two phases, first is production line characterization for solution space reduction, and second is a local search that generates neighborhood using the BMK-SSR. Some practical experiments reveal that the proposed method reduced calculation time by about 70% compared to conventional 2opt local search.

020-0337 Understanding and Managing Product Line Complexity through Detailed Production Scheduling

Zhili Tian, Washington University, United States
Panos Kouvelis, Washington University, United States
Charles Munson, Washington State University, United States

We analyze a complex scheduling problem at a company that uses a continuous chemical production process. We develop a detailed mixed-integer programming model for scheduling the expansive product line, which can save the company an average of 1.5% of production capacity per production run. Furthermore, using the model, we generate data based on real production runs to create regression equations that can estimate both capacity usage and material waste generated by the product line complexity of a particular production run. These regression models can then be used to estimate the complexity costs imposed on the system of any particular product or customer order.

020-0701 Balancing Production, Inventory, and Delivery Costs in Paper Manufacturing

Neil Geismar, Texas A&M University, United States
Nagesh Murthy, University of Oregon, United States

Previous studies of production planning in the paper industry have focused on the assignment of orders to different plants and subsequently minimized production costs. We consider the operations of a single plant that serves multiple clients by producing paper of various basis weights. A typical customer's order contains multiple jobs, each of which specifies paper of a certain weight and width. The plant combines jobs within each weight into sets. Costs are reduced by minimizing the number of sets produced. The high cost of transitions between weights encourages long production runs at each weight. However, such long runs lead to high finished goods inventory holding costs because no delivery is made until a rail car is filled with one customer's jobs. The uncertainty of rail cars' availability further complicates the problem. We minimize the sum of production, inventory, and delivery costs.

020-0478 A Multi-Objective Dynamic Location-Routing Problem for Patrol Coverage

Shirley (Rong) Li, University of Alabama, United States
Burcu Keskin, University of Alabama, United States

This paper addresses the problem of coverage effectiveness for state troopers. At the beginning of a day, a fixed number of state trooper cars are based at some given state trooper posts (depots). Each car is dispatched to an intermediary potential station (IPS) and patrols critical locations with high crash frequencies. Each day has three shifts. Each car may or may not come back to the same IPS or the depot at the end of the shift. For this problem, we develop a mixed integer linear programming model with the objectives of maximizing the coverage benefit and minimizing assignment, vehicle utilization, and routing costs. Since locations are only critical at certain times, our problem generalizes a dynamic multi-depot team orienteering problem with time windows. We solve this model via custom-built heuristics. The solution methods are capable of solving real-life instances from the state of Alabama.

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114 Saturday, 11:15 AM - 12:45 PM, Tuscan 4 *Track:* ESO, 6 *Chair:* Vishal Agrawal
Session: Consumer Behavior and Sustainability

020-0476 The Effect of Remanufacturing on New Products

Vishal Agrawal, Georgetown University, United States
Atalay Atasu, Georgia Institute of Technology, United States
Koert Ittersum, Georgia Institute of Technology, United States

We experimentally investigate the effect of remanufactured products on the perceived value of new products. We find that the perceived value of an OEM's new product depends on who sells the remanufactured product: in our experiment, the perceived value of new products decreases when the OEM sells the remanufactured product, but this decrease is smaller when the remanufactured product is sold by a third-party remanufacturer. We incorporate this effect to analytically investigate an OEM's strategy in the presence of competition from third-party remanufacturers and show that an OEM may not always benefit from preempting third-party remanufacturers.

020-0361 Design, Governance and Effectiveness of Environmental and Social Labelling Schemes

Pavel Castka, University of Canterbury, New Zealand
Charles Corbett, UCLA, United States

Labelling schemes (such as Fair Trade, FSC for sustainable forestry, MSC for sustainable fisheries) provide frameworks to manage social and environmental issues in supply chains. There is a growing number of such schemes, which can differ widely in design, scope and governance. The link between the structure of such labelling schemes and their ultimate success and effectiveness is not well-understood. In this paper we address part of that question by investigating the link between the governance of labelling schemes, the media coverage they receive, and the breadth and depth of their adoption.

020-0787 Effects of Buyer Actions and Supplier Asset Specificity on Supplier Investment in Environmental Technologies

Markus Biehl, York University, Schulich School of Business, Canada
Olga Kaminer, York University, Canada
Murat Kristal, York University, Canada
Ashwin Joshi, York University, Canada

Increasingly, manufacturing firms are working with their suppliers to minimize the environmental footprint of the manufacturing firm’s supply chain as a whole. Prior research has identified two buyer actions - evaluation and collaboration - as key to fostering supplier investment in pollution control and pollution prevention technologies. In this research we explore possible mediation and moderation roles of buyer specific investments in the relationship between buyer activities and supplier environmental investments. Based on cross-sectional data of plants from 3 primary SIC codes, our results show that supplier asset specificity moderates the effect of buyer evaluation on supplier investment in pollution prevention technologies, and that it both mediates and moderates the effects of buyer collaboration on supplier investment in both pollution control and pollution prevention technologies. Practical and research implications are discussed.

020-0405 Scar or Scratch? An Empirical Investigation of the Effect of Ethics Quality Management Crisis on Firm Performance

Ying Fan, University of Colorado at Colorado Springs, United States
Mingming Zhou, University of Colorado at Colorado Springs, United States

Ethics quality management concerns taking into consideration the well-being of all the stakeholders for the products or services provided. Recent corporate crises, such as the BP’s Deepwater Horizon disaster and Toyota’s vehicle recall, revealed that a firm’s reputation and performance can be damaged dramatically due to unethical quality management practices. Typical unethical practices include knowingly passing defective products or services to customers, failure to disclose potential quality problems, or violating quality management procedures to avoid higher costs and shipping delay. Although it is intuitive to expect that unethical practices will result in negative effects, the existing literature does not provide documentation regarding the magnitude of the impact. This research

seeks empirical evidence of the effect of an ethics quality management crisis on firm performance using event study approach. Firms with ethics quality management problems from 2000 to 2010 are identified and analyzed using LexisNexis, Compustat and CRSP database.

115 Saturday, 11:15 AM - 12:45 PM, Tuscan 5 *Track:* OEE, 4 *Chair:* Samir Srivastava Manish Shukla

Session: Risk Management in Emerging Economy Supply Chains

020-0084 Benchmarking Indian Insurance Companies for Health Checks

Avishek Ray, IIM Lucknow, India
Samir Srivastava, IIM Lucknow, India

The Indian insurance market is the 5th largest in Asia. With increasing liberalization and foreign participation, the risk of insolvency among Indian insurance firms has gone up substantially. This paper focuses on the solvency of eight private general insurance companies in India using firm data and macro data separately. The aim is to determine key parameters (financial, marketing and operational) to gauge the health of Indian insurance firms. We collect, compile and analyse the key financial, operational and business data of these insurance companies to generate the industry benchmark metrics in the Indian context. We first decide on initial firm-specific economic variables, use linear regression and logit and thereafter calculate the selected ratios to classify these Indian insurers.

020-1068 DECISION AND INFORMATION SYNERGY MODEL FOR FLEXIBLE PRODUCT RETURN SYSTEM

Jitendra Madaan, Indian Institute of Technology, Roorkee, India
Shalinee Jolly, Deustche Bank,NJ, United States

Around the world enterprises are employing value capturing practices from product returns to overcome global competition, heightened environmental concerns and profits making opportunities. In addition to the inherent cost and complexity of recovery process are due to multidimensional factors and relationships associated with the quality, variety, timeliness, demand changes, and logical processing of returns. Product recovery system in an Enterprise System (ES) perspective will give us a scope to develop it as a flexible system that can handle products with various options and greater return volume and variability. RES explores the various recovery functions, product lifecycle stages and suggests some key business and performance measurement strategies that can be employed to be successful in returns handling. This paper proposes a semi/partially flexible decision model that facilitates synergies between decision and information sharing functions from the perspective of an enterprise engaged in or to be engaged in product recovery processes.

020-1071 An Artificial Immune System Approach to Manage Fresh Produce Inventory

Manish Shukla, Indian Institute of Management Kozhikode, India
Sanjay Jharkharia, Indian Institute of Management Kozhikode, India

This paper presents an Artificial Immune System (AIS) approach to manage fresh produce inventory. Literature has provided some insights about the behavior and complexity of the inventory system. But, the assumptions such as instant replenishment and stationary demand, taken to model the inventory systems, are not practically feasible. This paper presents a mathematical model for the replenishment policy incorporating practically important factors such as fresh produce deterioration rate, stochastic demand, and retrieval policy. This approach is explained by a problem which is complex in nature and finding all possible solutions in real time is computationally prohibitive. Thus, meta-heuristic AIS is applied to explore and exploit the search space to find the optimal solution. The performance of the applied algorithm is evaluated by applying it on few simulated problems of varying complexity. The results show that AIS performs better than Genetic Algorithm and Simulated Annealing for the simulated problems.

116 Saturday, 11:15 AM - 12:45 PM, Tuscan 6 *Track:* HOC, 4 *Chair:* Zhaohui Wu

Session: Humanitarian Supply Chains

020-1010 Agile Supply Chains and Responsive Organizations: The First Phase of Disaster Management

Kate Hughes, Macquarie Graduate School of Management, Australia

During the first weeks immediately following a rapid-onset disaster, there is a need for organizations to quickly deliver goods and services to people, communities, and businesses in order to reduce further loss of life and to provide the basic necessities for survival. Humanitarian aid is an incredibly complex management situation and in this first phase after a disaster most resources are delivered by responsive organizations via agile supply chains. These humanitarian supply chains are similar to their commercial counterparts in the emergency services, such as Fire and Ambulance Departments, as they carry excess capacity that is not necessarily deployed at all times. The organizations that respond most effectively during this period are designed to provide high flexibility of delivery in situations with volatile demand. This concept paper explores the characteristics of the "typical" supply chains and organizations involved in the initial stage of disaster response.

020-0948 Supply Chain Management at Humanitarian Organizations - A Structuring Framework for Sustainable School Feeding

Andreas Kretschmer, WHU - Otto Beisheim School of Management, Germany
Stefan Spinler, WHU - Otto Beisheim School of Management, Germany
Luk Van Wassenhove, INSEAD, France

SCM plays a key role for the success of humanitarian interventions. In the area of development aid logistics school feeding is a prime example integrating multiple objectives, for example, education, nutrition and local development. School feeding programs are established interventions operating with various modalities in different geographies and different stages of sustainability. Depending on the local context and setup several objectives are pursued through these programs.We propose a theoretical framework structuring the main internal and external factors of school feeding and linking them with the objectives and performance of school feeding. The framework is validated by experts in the field and applied for an exemplary analysis of secondary data and case studies on school feeding programs.This paper will contribute to humanitarian logistics research in the area of development aid logistics and program transitioning. Furthermore, it forms the basis for the primary data collection of a longer-term research project.

020-0421 Humanitarian Supply Chain Management: Adapting Commercial-sector Approaches to Managing Disruptions

Ron McLachlin, University of Manitoba, Canada
Paul Larson, University of Manitoba, Canada

A core activity of humanitarian supply chain management is preparing for and responding to disasters. During the past decade, there has been an increasing amount of academic literature aimed at understanding supply chain disruptions, risk mitigation and response. However, this literature primarily focuses on the commercial sector. The humanitarian sector tends to lag behind the commercial sector in the application of various supply chain approaches. As well, humanitarian supply chains operate in quite different environments, have different objectives and face many unique challenges. Thus, the insights and approaches from the academic literature that are relevant to commercial supply chains do not necessarily translate directly to humanitarian supply chains. This paper addresses the potential adaptation and application of these approaches to humanitarian supply chains.

020-0953 Supply Chain Planning for the Outbreak of Catastrophic Foot-and-Mouth Disease in Korea

Hokey Min, Bowling Green State University, United States

With the re-emergence of Foot-and-Mouth disease in Korea, the Korean government has increased its relentless efforts to prevent the outbreaks of FMD epidemics throughout Korea. Such efforts include the mass slaughter of infected cattle, large-scale vaccination, cattle trade bans, and extensive quarantines. Despite such efforts, FMD epidemics in Korea show little sign of abatement and have begun to spread to different parts of Korea. One of the biggest challenges for coping with FMD epidemics is a difficulty in tracing back the sources of FMD epidemics and identifying the cattle ranches vulnerable to next hits due to a complexity of the agricultural supply chain in Korea. This paper uncovers the labyrinths of a Korean agricultural supply chain by developing a comprehensive supply chain map. Based on this supply chain map, this paper proposes various supply chain strategies that can control FMD epidemics and minimize agricultural/retail food supply chain disruptions.

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117 Saturday, 11:15 AM - 12:45 PM, Tuscan 7 *Track:* PDI, 6 *Chair:* Bilal Gokpinar

Session: Diversity and Experience in the Product Development Process

020-0900 The Impact of Economic Downturns on Technology Trajectories and the Careers of Scientists

Eyiwunmi Akinsanmi, Carnegie Mellon University, United States
Ray Reagans, MIT Sloan School of Management,
Erica Fuchs, Carnegie Mellon University, United States

This research explores the relationship between the telecommunications bubble burst and the quantity, direction and locus of U.S. innovation. We focus on optoelectronics, a general purpose technology with applications in energy, biomedical, telecommunications, computing and military. Leveraging USPTO patents and inventor CVs, we analyze how inventors' pre-bubble career tenure, productivity, mobility, and technical specialization influence these same post-bubble and thereby the national trend. Here, specialization is the proportion of an inventor's patents in "integration" - an emerging technology that facilitates optoelectronics' application to markets outside telecommunications. Our preliminary results suggest that inventors with long careers and specialization in integration are more likely to continue patenting in the field post-burst, and that inventors that stay in the field post-burst on average increase their productivity and focus in integration. Future work will explore whether these increases in productivity and specialization are associated with inventors switching out of telecommunications into other market applications.

020-0709 Outsourcing Decisions in Pharmaceutical and Biotechnology Firms

Bilal Gokpinar, University College London, United Kingdom

Due to the high cost of drug development and operating pressures to launch new products faster and more efficiently, many pharmaceutical and biotechnology firms outsource their development and manufacturing activities. Although firms may benefit from outsourcing immensely, the inherently specialized nature of biotech/pharma development and manufacturing may also bring new risks and challenges such as keeping the intellectual property (IP), quality considerations, coordination problems, technology transfer and licensing. In this study, collaborating with a major contract manufacturer in the pharmaceutical/biotech industry, we develop a framework to analyze critical outsourcing decisions by pharmaceutical and biotechnology firms. Specifically, examining a large set of development projects in the emerging field of regenerative medicine, we model the major trade-offs faced by pharmaceutical and biotechnology firms. Our model provides insights into partner selection, timing, and nature of outsourcing decisions.

020-0286 Diversity Effects on Project Evaluation

Nektarios Oraiopoulos, Judge Business School, Cambridge University, United Kingdom
Stylianos Kavadias, Georgia Institute of Technology, United States

New product development teams are often prone to two types of errors: terminating too early a project that would have been successful, or continuing a project that eventually fails. Our work studies how the corresponding probability for each type of error changes as the team members become more diverse with respect to their preferences. Unlike previous studies, we allow for strategic considerations that might lead a team member to vote against their individual preferences.

020-0535 Managing Service Encounters Over Time

Ioannis Bellos, Georgia Institute of Technology, United States
Stylianos Kavadias, Georgia Institute of Technology, United States

Service offerings present a unique challenge: customers actively participate and co-create the value of the outcome. Usually, such co-production relates to identifying and matching the exact customer needs. The subjective and intangible nature of most services (i.e., lack of prototypes) amplifies the information asymmetries present in the provider-customer relationship. In this paper we model the strategic interactions (service encounters), between a customer and a service provider. Motivated by the practices of successful design firms (e.g., IDEO, live|work), we envision the service delivery as a process comprised of distinct steps. At each step the service provider decides on the effort she exerts and on whether to ask the customer to commit to a price. The customer’s dilemma evolves around whether to continue (and eventually commit to a price) or abandon the service process. Our results identify the main drivers behind successful management of such encounters.

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118 Saturday, 11:15 AM - 12:45 PM, Tuscan 8 *Track:* ERS, 6 *Chair:* Saravanan Kesavan

Session: Empirical Research in Supply Chain Management II

020-0211 Information Transmission and the Bullwhip Effect: An Empirical Investigation

Robert Bray, Stanford, GSB, United States
Haim Mendelson, Stanford, GSB, United States

The bullwhip effect has yet to be empirically verified. We investigate the phenomenon in a sample of 4,689 public U.S. companies over 1974-2008. The average bullwhip measures 15.9% of total demand variability, and drops by a third between the 1974-1994 and 1995-2008 periods. Studying the phenomenon in the context of an MMFE demand process, we decompose the bullwhip by information lead time: the bullwhip, we demonstrate, equals an infinite sum of lead-l bullwhips (l = 0, 1, 2, ...), the variance amplification of demand signals with l-period information lead times. Estimating the lead-l bullwhips with a two-stage estimator, we find that signals firms observe with less than one quarter's notice drive 51% of the bullwhip, but those firms observe with more than three quarter's notice drive 30%: firms can anticipate much, but not all, of the bullwhip. Bullwhips come in several flavors.

020-0198 An Empirical Investigation of Supply Chain Managers and the Market Value of the Firm

Kevin Hendricks, Wilfrid Laurier University, Canada
Manpreet Hora, Georgia Institute of Technology, United States
Vinod Singhal, Georgia Institute of Technology, United States

Several firms are appointing managers with supply chain expertise in senior positions or in their top management executive teams. We collect announcements related to appointment of supply chain managers over a 10-year period to empirically examine the association between these appointments and shareholder

value and operating performance. We also investigate how different types of appointments and firm characteristics affect performance.

020-0728 Inventory Productivity and Financial Performance in the U.S. Retail Sector

Vishal Gaur, Cornell University - Johnson School of Management, United States
Yasin Alan, Cornell University - Johnson School of Management, United States

We examine the impact of inventory turnover performance of US publically-listed retailers on their stock returns. We present results from three models - a contemporaneous regression model based on financial accounting, a time-series linear factor model of asset pricing, and a cross-sectional factor model of asset pricing. Our analysis controls for the correlation of inventory turnover with other firm-level performance variables discovered in past research, such as gross margin, capital intensity, and sales surprise. We show that inventory turnover has a consistent positive correlation with stock returns, risk adjusted stock returns, and value of the firm.

020-0197 Upstream Sourcing Networks and the Sourcing Hub

Anupam Agrawal, University of Illinois at Urbana Champaign, United States
Luk Wassenhove, INSEAD, France

In this paper, we explore how firms can create more value by assimilating knowledge that exists within their supply chain network. We base this exploration on the experiences of four firms in four different countries in the automotive industry, who are in the process of improving their supply-chain partnerships. We study upstream sourcing of these firms: their suppliers and their suppliers' suppliers, and focus on identifying the knowledge and cost related parameters with appropriate theoretical explanations. Synthesizing the learning from these case studies, we propose the concept of the Sourcing Hub, a collaborative center involving the firm, its suppliers and raw material suppliers, as the principal alignment mechanism for managing value in upstream sourcing. Our research shows that deploying a sourcing hub can help firms create value by better management of upstream sourcing related knowledge.

119 Saturday, 11:15 AM - 12:45 PM, Tuscan 9 *Track:* BOM, 6 *Chair:* Karen Brown Brad Morrison
Session: Performance Improvement and Behavioral OM

020-0007 Lean on Me: Empowered Workforces in Post-Lean Engineering Organizations

Harriet Jevon, Loughborough University, United Kingdom
Susan Morton, Loughborough University, United Kingdom
Helen Wagner, Loughborough University, United Kingdom

Lean philosophies developed in Japan are utilized in Western manufacturing to facilitate business improvements through various quality management and improvement systems and strategies, which have been documented comprehensively. But to what degree empowerment of the workforce results from Lean implementation is a new research subject: most research in this area has concentrated on the objective, organizational benefits accrued. This paper focuses on the concept of Lean, what quality management and improvement systems and strategies are implemented, to what extent empowerment can be defined as lying within this context, and questions whether Lean philosophies have a positive effect on workforce empowerment. Results from a case study undertaken in a large UK plant of a global manufacturing organization are analyzed, initial findings discussed, and recommendations made to take the subject area forward and thus add to knowledge and practice for the benefit of both academia and industry.

020-0400 Operational Excellence: The Significance of Human Behavior on System Performance

Richard Tree, University of Texas at Arlington, United States
Kimberly Whitehead, University of Texas at Arlington, United States

Operations Management research tends to focus on identifying constraints in production and distribution functions, and proposing optimization techniques to improve performance and maximize profits. These research efforts are undergone in pursuit of operational excellence. This paper suggests that the traditional models used by OM are limited in their ability to provide managerially relevant conclusions. This is because they are limited to research based upon observables and rarely take into account influences such as human inputs and/or managerial and organizational subsystems. In pursuit of operational excellence and competitive advantage, the only organizational resource that is not readily duplicable by a competitor is the company's personnel (Barrier 1996). Accordingly, this paper suggests that alternative models such as Game Theory be used in the pursuit of operations research in order to reconsider the traditional optimization techniques in OM from the human decision maker perspective.

020-0436 Building Factory Fitness

Kasra Ferdows, Georgetown University, United States
Fritz Thurnheer, Hydro Aluminum Extrusion Group, Switzerland

A factory can become too lean but never too fit. This paper introduces the notion of fitness in production as something different from leanness and other manufacturing improvement programs. The focus in a fitness program is on strengthening a factory’s core production capabilities, even if such capabilities are not directly needed to meet the factory's current competitive priorities. The research is based on a study of a program for improving capabilities of 42 factories of the Hydro Aluminum Extrusion Group on five continents between 1986 and 2001. The fitness model used in this case was based on the “sand cone model” suggested by Ferdows and DeMeyer, with some modification. The model proved to be effective. We found that a production fitness regimen helped factories become leaner, but the opposite was not always true.

020-1027 The Transition Challenge in the Implementation of Process Improvement

Brad Morrison, Brandeis International Business School, United States

Organizations use a wide range of approaches to process improvement, and the track record of success is rather inconsistent. This paper uses an ethnographic study of the implementation of lean manufacturing processes to inform the development of a system dynamics model that examines the interaction between the workplace characteristics of process improvement and the behaviors of the front line workers and their support personnel. We find that the feedback structure of process improvement, when learning is needed, is prone to tipping dynamics. Facing increasing workloads from process improvement activities, support personnel cope in ways that undermine learning. Simulation analysis characterizes a tipping point that distinguishes a pattern of premature demise in the process improvement activity from a pattern of enduring success in which the organization successfully transitions to sustained superior performance.

120 Saturday, 11:15 AM - 12:45 PM, Tuscan 10 *Track:* ICM, 6 *Chair:* Chee Chong Teo Seyed Mehdi Zahraei
Session: Managing Capacitated System

020-0353 A Planning Model for a Supply Chain with Tradeoffs between Lead Times, Production Capacities and Safety Stock

Chee Chong Teo, Nanyang Technological University, Singapore
Seyed Mehdi Zahraei, Nanyang Technological University, Singapore

We develop a safety stock planning model for a supply chain that is subject to demand uncertainty. We model the supply chain as a network of stages, each stage operating with a periodic review base-stock policy. The utmost downstream stages serve exogenous stochastic demand while other stages fulfill internal orders. The model captures a general supply chain network with capacitated production and allows the stages to have different review periods. Key assumptions are that each production stage produces according to a linear smoothing rule and service of both production and inventory are guaranteed, although penalty costs are incurred in times of capacity and inventory shortfall. The model characterizes the total expected penalty cost and inventory holding cost, which allows one to analyze the fundamental tradeoffs of lead times, production capacities and safety stock in a supply chain.

020-0694 A Capacitated Production-Inventory Model with Set-up Costs and a Mixture of Constant and Poisson Demand

Remco Germs, University of Groningen, Netherlands
Nicky van Foreest, University of Groningen, Netherlands

Presman and Sethi (POM, 2006) prove that (s,S) policies are optimal for an inventory model with a mixture of constant and Poisson demand. In their model the ordering capacity is unlimited. In many production systems, however, this capacity is restricted. We study a method to incorporate constraints on the production capacity such that similar elegant policies are optimal. We consider a production-inventory system with finite production rate, rather than production amount, and with set-up costs incurred each time production is switched on. We derive conditions under which (s,S) policies are average-cost optimal in case demand is the sum of a constant demand rate and a compound Poisson process. Our model thereby generalizes the classical Economic Production Quantity model as well as the production-inventory models with Poisson demand. Furthermore, we provide an efficient numerical procedure for computing the parameters of the optimal policy.

020-1032 The Joint Replenishment Problem with Capacity Restrictions

S. Viswanathan, Nanyang Business School, Nanyang Technological University, Singapore

We consider the joint replenishment problem (JRP) with a capacity constraint on the total quantity of all items replenished together in a major setup. We first derive a lower bound for this capacitated JRP. We then develop heuristics based on power-of-two policies (POTP) for the problem. Unlike the JRP without capacity constraint, efficient POTP based heuristics involve exploiting bin-packing features and therefore a stylized bin packing problem as a sub-problem. We show that asymptotically, the cost of the solution generated by the POTP based heuristic differs from the lower bound by at most a few percentage points. Computational testing on randomly generated problems of moderate size reveals that the heuristic obtains solutions that are near-optimal.

020-0427 Optimal Decision Policy Development in a MTS-MTO System

Feng-Yu Wang, Singapore Institute of Manufaturing Technology, Singapore
Piplani Rajesh, Nanyang Technological University, Singapore
Yan-Guan Lim, Singapore Institute of Manufacturing Technology, Singapore
Eng-Wah Lee, Singapore Institute of Manufacturing Technology, Singapore

A MTS-MTO system is designed for a supply chain where standard semi-finished items are shared by various finished products in customization. The system can take advantage of economies of scale of production in MTS and flexibility in MTO; but its performance decreases when the capacity becomes restrictive, according to the literature. One way of dealing with the problem without jeopardizing system service levels is to limit the customer orders accepted. An experiment was created using Markov Decision Process (MDP) whereby the inventory position of semi-finished items and WIP in MTO are reviewed periodically; the optimal decision policy with regards to order acceptance is found using dynamic programming. Following the optimal policy, a perceived interrelationship between inventory policy, WIP, and the order acceptance decisions is shown; the cost results can facilitate the decision of optimal inventory policy. This study extends current MTS-MTO system research to a new stage concerning operational decisions.

121 Saturday, 11:15 AM - 12:45 PM, Tuscan 11 *Track:* REV, 4 *Chair:* Nicole DeHoratius
Session: Innovative Applications of Revenue Management

020-0962 Modeling Energy Policy by Incorporating Uncertainty in Learning-By-Doing and R&D

Ekundayo Shittu, Tulane University, United States
Xiaoyue Jiang, Tulane University, United States

We study firms' incentives to invest in a portfolio of energy technologies under imperfect competition in outputs and prices and different environmental policy instruments. In this analysis, we pay particular attention to the representation of the technologies in the portfolio, because the representation of technological change has different and crucial implications not just for policy, but also for the underlying market structure. We model the energy technology portfolios to capture their exact impacts on the marginal costs of pollution abatement. We demonstrate a set of intriguing and surprising results that describe how technology investment incentives are shaped by the strategic interactions between firms, market structures and environmental policy choices.

020-0679 A Network Mapping Approach to Understanding High Value Manufacturing: A Case Study of the Norwegian Maritime Cluster

David Kirkwood, University of Cambridge, United Kingdom
Karolis Dugnas, Moreforsking Molde, Norway
Oddmund Oterhals, Moreforsking Molde, Norway
Jagjit Srai, University of Cambridge, United Kingdom

Governments and industrialists in developed and developing nations have increasingly recognized that High Value Manufacturing (HVM) is a vital source of value capture. This sits in the context of a complex and rapidly evolving global system of manufacturing and innovation, which is characterized by compounding effects of continuing fragmentation of manufacturing value chains and increasing pace of innovation.Using a structured industrial value chain mapping methodology which considers the interactions between the enabling ecosystem and the core actors in an HVM environment, this work examines the impact of network configuration, and reconfigurability, on the profit margins and growth rates within the highly specialised Norwegian maritime cluster. From an integration of case studies with key actors and complementary secondary financial data from the cluster, a framework is presented which allows possible industry evolutionary paths to be mapped, including the distribution and partitioning of value between partners.

122 Saturday, 11:15 AM - 12:45 PM, Roma 1,2 *Track:* NCC, 4 *Chair:* Lauren Xiaoyuan Lu
Session: Session 4

020-0262 Supply Diversification with Unreliable Supplies and Responsive Pricing

Tao Li, UT Dallas, United States
Suresh Sethi, UT Dallas, United States
Jun Zhang, UT Dallas, United States

We study a firm's sourcing problem with unreliable supplies and responsive pricing. We characterize the impacts of supplier capacity correlation and uncertainty

on the firm's sourcing decisions. Supplier competition is also considered.

020-0308 Managing Dual Distribution Channels under Uncertainty

Gokce Esenduran, Ohio State University, United States
Lauren Lu, University of North Carolina at Chapel Hill, United States
Jayashankar Swaminathan, University of North Carolina at Chapel Hill, United States

In the U.S. automobile industry, manufacturers sell products through both dealers and rental agencies. When rental agencies sell used rental cars to consumers directly, competition between new cars and used rental cars reduces dealers' profits and leads to channel conflicts between the two intermediaries. In response, manufacturers repurchase used rental cars from rental agencies and redistribute them through dealers. Prior academic research demonstrates that this buyback channel structure alleviates channel conflicts. Two interesting characteristics of buyback channels have not been studied: uncertainty in the residual value of used cars and the timing policy on when to set the buyback price. Incorporating these characteristics we aim to understand a durable-good manufacturer's channel management decisions. Our results show that with no uncertainty buyback price commitment reduces the manufacturer's profit. In the presence of uncertainty price commitment enhances buyback channel's ability to alleviate channel conflicts, underscoring the importance of taking uncertainty into account.

020-0035 Lateral Transshipment with Customer Switching

Wenjing Shen, Drexel University, United States
Xinxin Hu, Indiana University, United States
Yi Liao, Drexel University, United States

We consider a lateral transshipment problem between two retailers where an uncertain fraction of the unfulfilled demand may switch to another retailer with inventory. We show that the firm with surplus inventory may not transship all request inventory and identify conditions when full, partial or no transshipment takes place. We provide sufficient conditions for a unique Nash equilibrium and evaluate the impact of customer switching behavior on inventory decisions and equilibrium profits.

020-0344 Clearing Capacity through an Opaque Reseller: Posted Price vs. Name-Your-Own-Price Mechanisms

Paolo Roma, University of Palermo, Italy
Esther Gal-Or, University of Pittsburg, United States
Rachel Chen, University of California at Davis, United States

We consider a simple, two stage model to study the channel selection decisions for competing service providers, who face both leisure and business customers. Since business demand is stochastic and has a higher willingness to pay, providers find it optimal to reserve capacity for sale in the second stage, after selling to some leisure travelers in the first stage. Using opaque intermediaries can help clear any unsold capacity in the second stage. We found that with a single reseller, competing service providers prefer that this reseller uses the posted price instead of the Name-Your-Own-Price model. Also, despite the potential benefit of using an opaque reseller to price discriminate between business and leisure customers, providers may prefer direct selling to customers.

123 Saturday, 11:15 AM - 12:45 PM, Sorrento 1,2 *Track:* QPJ, 5 *Chair:* Yoshiki Matsui
Session: Session 5: Kaizen

020-0715 Empirical Study on Transferability of Kaizen Practices

Phan Anh, Yokohama National University and Vietnam National University, Japan
Jing Zeng, Yokohama National University, Japan
Yoshiki Matsui, Yokohama National University, Japan

Kaizen is a Japanese business strategy that calls for never ending effort for improvement involving everyone in the organization, from managers to workers. This study examines the transferability of Japanese continuous improvement in different national and organizational cultures. Utilizing the High Performance Manufacturing (HPM) Project database, we start by examining the link between five Kaizen practices - small group problem solving, 5S, employee suggestion, autonomous maintenance, and statistical process control - and different cultural dimensions in Japanese manufacturing. The good fit between the Kaizen practices and Japanese cultural aspects might explain the successful implementation of Kaizen practices in Japan. Then, we continue to test whether Kaizen is successfully transferred to other environments such as Germany, Korea, Sweden, and the United States. The findings of this study indicate that the implementation of Kaizen practices is strongly related with such cultural dimensions as uncertainty avoidance, power distance, and collectivism.

020-0963 The Implementation of Lean Production and Quality Methods at the Shop Floor - Case Studies in the Household Appliance Industry

Alessandra Rachid, Federal University of São Carlos, Brazil

The purpose of the proposed text is to analyze the implementation of different methods from lean production and other quality methods at the shop floor of three companies of household appliances in Brazil.The research involved interviews with managers and supervisors of production, quality, and human resources departments, and also with shop floor workers from different production areas, in order to find out the operations management methods adopted and the workers' involvement in their use. Many methods related to lean production foresaw the involvement of workers or even that they would be primarily responsible for their use. However, practices adopted more recently, such as Six Sigma, don't have the same emphasis on employees involvement compared to practices adopted in previous decades.The proposed text will examine how this issue has evolved in literature and at the companies surveyed, exploring also some potential explanations for the observed limitations.

020-0322 Exploring the Changing Culture: The Effectiveness of Quality Practices in China

Sarah Wu, Fordham University, United States
Dongli Zhang, Fordham University, United States

Quality Management practices have been introduced to China for decades. However, quality issues are still among the top concerns for made-in-China products. Quality problems have become a concern not only to Chinese manufacturers, but also to those Western companies that utilize a global supply chain and the manufacturing capabilities from China. The purpose of this study is to explore the possible adaptation of Chinese culture and how these changes influence quality management practices. Specifically, how does national culture drive the choice of effective quality management practices? This study finds that after 30 years of reform and opening up policy, the current Chinese national culture profile is dramatically different from the estimate made by Hofstede in 1994. By differentiating quality practices into exploitative-oriented and explorative-oriented, this study finds that overall the exploratory quality practices are more effective than the exploitative practices under the changing national culture.

020-0393 Implementation of Survey Technique for Analysis and Description of Quality Management Practices in Industrial Cluster of Sertãozinho-SP

Jeniffer de Nadae, UNESP - Universidade Estadual Paulista, Brazil
José de Oliveira, UNESP - Universidade Estadual Paulista, Brazil

Otávio de Oliveira, UNESP - Universidade Estadual Paulista, Brazil

This paper aims at analyzing and describing the quality management practices implemented by small and medium-sized companies (SMEs) from the industrial clusters of Sertaozinho. Data was collected by means of a survey applied to local companies. The results highlight the importance of the local governance agency for the cluster as a whole. Furthermore, it was found that local companies do not realize the benefits of quality management and are unaware of most quality tools and certifications, especially the ISO 9000 series. This research portrays the current cluster's environment in which companies still need to be enlightened about the benefits and barriers associated with quality management practices and programs. Based both on the literature review and on the survey results, the paper suggests that future research should formulate a method for the implementation of integrated quality management practices in industrial clusters.

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124 Saturday, 11:15 AM - 12:45 PM, Sorrento 3,4 *Track:* SAP, 4 *Chair:* Guillaume Roels

Session: Capacity Management in Supply Chains

020-0139 Channel Returns Policies for Durable Products

Mehmet Gumus, McGill University, Canada
Saibal Ray, McGill University, Canada
Shuya Yin, University of California, United States

Channel returns policies have been an integral part of a number of supply chains. However, the recent growth of used goods markets has brought to light new issues - specifically, how such markets would affect returns policies as well as the performance of chain partners. The objective of this paper is to address these issues.

020-0194 Project-based Supply Chains with Uncertain Demand Timing and Changing Technological Requirements

Hugo Mora, Stanford University, United States
Warren Hausman, Stanford University, United States
Hau Lee, Stanford University, United States
Carlos Amaro, Lockheed Martin Corporation, United States

A project-based supply chain is often faced with uncertainties in the timing as well as changing technological requirements of the order. Such uncertainties introduce added complexities in coordinating the supply chain with multiple partners. We consider a stylized supply chain model consisting of a buyer, a manufacturer, and a tier-1 supplier producing a critical subassembly with long production leadtime. We analyze the incentive conflict between the supplier and the manufacturer when the buyer considers a possible change in schedule and/or technological requirements that directly affects the supplier's subassembly. The supplier faces rework and holding costs if she produces early and a change is made, but the manufacturer is exposed to penalty costs for late delivery if the supplier produces late. We design profit sharing contracts that achieve coordination in the decentralized case under asymmetric information regarding both the order forecast and the rework and holding costs.

020-0565 Operational Strategies for Supply Chains Encountering Gray Markets

Foaad Iravani, University of California at Los Angeles, United States

The legal business of diverting goods from authorized distribution channels to unauthorized distribution channels known as parallel importation or gray markets has become a challenge for many companies. While gray markets may damage the brand value and cannibalize the demand for authorized goods, it has been shown that they can actually help manufacturers access more customer segments and increase their total profits. The existing literature has mainly focused on how a manufacturer should adjust its prices to cope with gray markets. In reality, the demand for a product also depends on other factors, such as quality of the product and the level of services offered by the manufacturer. In this research, we analyze the pricing and service strategies of a manufacturer that serves two markets and faces competition from gray markets.

020-0028 Coordinating Risk-Pooling Capacity Investments in Joint Ventures

Guillaume Roels, UCLA Anderson School of Management, United States
Philippe Chevalier, CORE, Universite Catholique de Louvain, Belgium
Ying Wei, CORE Universite Catholique de Louvain, Belgium

In this paper we study how to structure a joint-venture contract between two firms so as to align their incentives to pool together their resources and hedge their profits against demand variability. Specifically, we propose two contractual arrangements, which lease the capacity of the joint venture to the partners either in proportion to their respective capacity usages (Total Capacity Leasing) or only to eliminate capacity imbalances (Partial Capacity Leasing), so as to coordinate the firms' capacity investments and production decisions while ensuring their participation in the joint venture. We study the coordinating properties of both contracts, characterize the structure of the resulting capacity investments, and discuss their ease of implementation. Our analysis sheds light onto the strategic interactions that arise in joint ventures that leverage the risk pooling effect across different markets, and offers contractual recommendations depending on the joint-venture's characteristics.

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125 Saturday, 11:15 AM - 12:45 PM, Naples 2 *Track:* GEN, 6 *Chair:* Shashank Rao

Session: Information systems in operations

020-0801 The Customer Consequences of Returns in Online Retailing - An Empirical Analysis

Shashank Rao, Nova Southeastern University, United States

This study investigates the customer consequences of return incidents in online retailing. A return incident is defined as "a customer originating contact with the retailer in order to return a purchased product." In this context, return incidents can be of two types: complete and incomplete. A "complete return" incident is one where the customer does indeed return the product to the retailer, while an "incomplete return" incident is one where the customer chooses to not proceed with the physical act of returning the product to the retailer (after expressing initial desire to do so). Using archival data gathered by collaborating closely with a moderately sized online retailer of printed material, the study demonstrates that post completed return, subsequent order frequency and average order dollar value increase, while the exact opposite effect is observed for incomplete returns, i.e. subsequent order frequency and average order dollar value decrease.

020-0887 Traditional vs. On-line Retailers: Are Internet Sales Recession-proof?

Roula Michaelides, The University of Liverpoool Management School, United Kingdom
Zenon Michaelides, The University of Liverpoool Management School, United Kingdom
Fazlay Patel, The University of Liverpool Management School, United Kingdom

Recent figures from UK high street retailers during the recession show that a marked drop in sales through traditional channels was offset by an increase in on-line sales for the same period (Financial Times, 2010). In terms of retailers who use both the above types of sales channels, this has been particularly prevalent

and has led to questions as to whether on-line sales channels are less prone to recessionary effects than traditional sales channels. Gauging by the rise in discount supermarket sales over more traditional retailers, it is evident that people are seeking cost-effective alternatives, including their day-to-day shopping requirements, by shopping online.This paper describes the case of a traditional discount retailer that introduced an on-line sales channel in order to offset decreased sales in its traditional channels, in an attempt to maintain its market share. The research compares the two sales channel methods and draws comparative conclusions.

020-0454 Meat Supply Chain Management: Traceability System Based on Iris

Shengnan Sun, Institute of Systems Engineering, Southeast University, China
Lindu Zhao, Institute of Systems Engineering, Southeast University, China
Xinping Wang, Institute of Systems Engineering, Southeast University, China

Whole chain traceability is a growing requirement for many governments and private organizations today, particularly those impacted by product recalls due to contamination. China is trying to establish and expand a traceability system for meat supply chain, which aims to provide safe meat products to consumers. Although many technologies have been introduced to establish effective traceability systems for food supply chain, there exist pros and cons in practice. This paper proposes a traceability system based on iris technology for meat supply chain, which is valuable for both supply chain management and food security.

020-0646 Metrics for Data Accuracy Improvement in a Production Scheduling Software: An application in the Meat Industry

Eduardo Rücker, UNISINOS - Universidade do Vale do Rio dos Sinos, Brazil
Luis Rodrigues, PPGEPS/UNISINOS - Universidade do Vale do Rio dos Sinos, Brazil
Daniel Lacerda, PPGEPS/UNISINOS, Brazil

This article presents a method for improving the data accuracy for production scheduling in the meat industry. The proposition was based on a case study in a company that produces food based on chickens, turkeys and pork. The method proposed consists of a series of processes and KPIs that would drive for a continuous improving on data quality. The proposal offered a contribution to the discussion of data quality in the production scheduling of meat foods.

126 Saturday, 11:15 AM - 12:45 PM, Naples 1 *Track:* OMF, 3 *Chair:* Yoon Hee Kim
Session: Session 3: Data Driven Research

020-0220 The Effect of Power on Cooperation and Financial Performance: Supplier's Perspective

Yoon Hee Kim, Unversity of Western Ontario, Canada
Urban Wemmerlov, University of Wisconsin-Madison, United States

In the last decade, there has been an enormous interest in the value of effective supply chain management practices to a firm's success. The literature suggests that a move towards to a close customer-supplier relationship through cooperation is mutually beneficial for both parties. Yet, the benefits of close supplier-manufacturer relationships accruing to supplier firms have not been well documented. In this study, we empirically assess the effects of power on cooperation such as information sharing and joint decisions between suppliers and customers and, in turn, on the financial performance of the suppliers. Cross-sectional data are collected by survey from suppliers in the manufacturing industry. We empirically test the direct and mediated relationships among the power-dependence relation, the supplier-manufacturer cooperation, and the financial performance of suppliers using structural equation modeling.

020-0649 Foreseeing Iron Ore Prices using System Thinking and Scenario Planning

Maria Isabel Morandi, GMAP/UNISINOS, Brazil
Luis Rodrigues, PPGPES/UNISINOS, Brazil
Daniel Lacerda, PPGPS/UNISINOS, Brazil

In commodity markets, the ability to plan alternative scenarios and foresee pricing behavior represents a competitive advantage. This research aims to build a method that uses a systemic approach to understand the key factors that impact in commodities pricing, in order to visualize prices in different future scenarios. Based on Systems Thinking and Scenario Planning (STSP), it proposes a method with three steps to be applied in the iron ore market. First, it leads to a collective awareness of the main variables related with pricing. Second, this knowledge is transferred to the dynamic system model. Third, it is used to visualize prices behavior in future scenarios. Along with quantitative evaluation, interviews with the participants give the input to accept and improve the proposed method. The achieved results, acquired knowledge and practical uses identified for the model indicate that the proposed method provides, through STSP, the basis for commodity pricing awareness.

127 Saturday, 11:15 AM - 12:45 PM, Naples 3 *Track:* OMM, 10 *Chair:* Jun Zhang
Session: Supply Chain Management

020-0901 Optimizing Shipping-fee Schedules to Maximize E-tailer Profits

Jennifer Shang, University of Pittsburgh, United States
Y. Jiang, Hefei University of Technology, China

Shipping-fee charges by online retailers have been known to impact customers' order incidence and cart size. While the importance of managing shipping fees is well documented, few studies have provided normative guidelines for e-tailers to determine optimal shipping-fee schedules. This paper provides two nonlinear mixed-integer programming models to optimize e-tailers' shipping-fee charges for single and multiple product transactions. Given e-tailers' cost information and heterogeneity across consumers' reservation prices and delivery time requirements, our models aim to concurrently determine the optimal shipping-fee schedules and product selling prices. To solve the sophisticated models in real-time, we develop search techniques. Numerical studies indicate that the proposed methods offer attractive product prices and low shipping charges. The proposed models not only meet the online requirement of instant response time, but also draw more customers and enhance e-tailer profitability.

020-0352 Measuring Internal Supply Chain Integration

Chuda Basnet, University of Waikato, New Zealand

Internal supply chain refers to the chain of activities within a company that concludes with providing a product to the customer. This process involves multiple functions within companies - sales, production, and distribution. It is obvious that these functions need to be integrated in order to provide good customer service. However, there is no consensus yet on how integration is to be defined and measured. Many authors consider collaboration as synonymous with integration; other authors have variously offered coordination, communication, information exchange, harmony, interaction, or teamwork as the essence of integration. This paper presents research that was conducted with the goal of developing an instrument for the measurement of internal supply chain integration. Scale items were identified from current literature and the resulting survey instrument was sent out to a sample of New Zealand manufacturers. Exploratory factor analysis was carried out to develop and validate an instrument.

020-0351 Retailer Bundling and Supply Chain Performance

Qingning Cao, University of Texas at Dallas, United States
Xianjun Geng, University of Texas at Dallas, United States
Jun Zhang, University of Texas at Dallas, United States

This paper studies a supply chain where a retailer procures one product from a manufacturer, and has two retail options: bundling this product with another product or retailing it alone. When the wholesale price is exogenously given, the retailer is never worse off with the bundling option (as compared to having no bundling option), while the manufacturer can be either better off or worse off. When the manufacturer strategically sets the wholesale price, however, we show that interactions between the supply chain members yield a number of interesting results. First, compared to the case of no bundling option, bundling can lower retailer profit. Second, the manufacturer may benefit from downstream bundling. Third, even when the retailer chooses not to bundle, its bundling option can still affect wholesale price and profit sharing. Finally, retailer bundling can either improve or lower supply chain efficiency depending on the manufacturer's production cost.

020-0660 Risk Management in Supply Chains with Business Interruption Insurance

Lei Xie, McGill University, Canada
Tamer Boyaci, McGill University, Canada
Mehmet Gumus, Mcgill University, Canada
Saibal Ray, McGill University, Canada
Dan Zhang, McGill University, Canada

The business interruption insurance is introduced to reduce risk exposure of the supply chain. We study how the use of the business interruption insurance to manage supply chain risks like disruption. We consider a supply chain with one manufacturer and one retailer. Both of them are risk-averse. We prove that it is optimal for the manufacturer or the retailer to purchase the business interruption insurance if the expected gain of the insurance company is below a threshold value. The business interruption insurance improves the effeciency of the supply chain, but it may lead to decreased expected profit of the supply chain with less variability.

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Saturday, 11:15 AM - 12:45 PM, Naples 4 *Track:* CSC, 6 *Chair:* Sean Handley W.C. Benton
Session: Managing Sourcing and Procurement

020-0095 Supply Arrangements for Acquiring Cores in Remanufacturing Supply Chains

Toyin Clottey, Iowa State University, United States
W.C. Benton, The Ohio State University, United States
Rajesh Srivastava, Florida Gulf Coast University, United States

We consider a manufacturer that also acts as a remanufacturer. An important problem faced by the manufacturer-remanufacturer is ensuring a sufficient supply of cores to support remanufacturing operations. We propose supply arrangements to account for uncertainty in the quantity, quality, and timing of returns and investigate the costs of the arrangements at different levels of acquisition plan accuracy. Extension of the supply arrangements to the coordination of the remanufacturing supply chain is a possible area for future research.

020-0104 Antecedents of Buyer Reliance on Mediated Supply Chain Power with Outsourcing

Sean Handley, Rutgers University, United States
W.C. Benton, The Ohio State University, United States

The popular press is replete with examples of firms wielding their power to control the behaviors or influence the decisions of other members of the supply chain. Moreover, significant contributions in the marketing channels and supply chain literatures offer consistent evidence that the use of mediated power has a negative impact on the quality of inter-organizational relationships. Yet, there is a dearth of empirical research investigating the conditions under which the use of mediated power is more or less prevalent. Utilizing dyadic data collected on 102 outsourcing relationships, this study evaluates how the buying firm’s dependence on the service provider, asserted importance of the outsourced activity, and difficulties with other inter-organizational control mechanisms are related to their reliance on mediated power.

020-0166 Tangible and Intangible Resources and NPD Capabilities

Younsuk Lee, Korea University Business School, Korea, Republic of (South Korea)
Hojung Shin, Korea University Business School, Korea, Republic of (South Korea)

New product development (NPD) plays an important role in growth and sustainability of the firm. Firms invest considerable resources into NPD projects, but large R&D expenditures do not guarantee success. Indeed, not all the products succeed in the market, and a high failure rate has been reported. In this paper, we focus on a group of key capabilities which can be determinants for successful NPD projects. Specifically, we investigate the causal relationships among tangible and intangible resources, and NPD capabilities. We collect data from the auto industry and a panel data analysis method is adopted. The preliminary results indicate that firms’ tangible resources positively affect intangible resources, and both tangible and intangible resources directly affect NPD capabilities. It was also found that the effect of investment on tangible resources to improve NPD capabilities is mediated by intangible resources.

020-1069 Optimization under Uncertainty for Integrated Tactical and Operational Planning of the Oil Supply Chain

Adriana Leiras, Pontifical Catholic University of Rio de Janeiro, Brazil
Silvio Hamacher, Pontifical Catholic University of Rio de Janeiro, Brazil

The competitive nature of the refining business is a driving force for improvements in the planning process. Decisions at the oil chain differ in range of activities (spatial integration) and planning horizon (temporal integration). This work addresses the problem of the oil chain integration under uncertainty. Mathematical programming models are proposed. The tactical model maximizes the supply chain profit, whereas the operational model maximizes the profit of each refinery. Uncertainty is incorporated in price and demand at the tactical level and oil supply and process unit capacity at the operational level. Spatial integration is discussed at the tactical level, whereas temporal integration is discussed in the interaction between the two levels. Two temporal integration approaches are proposed: hierarchical (information flows from the tactical to the operational model), and iterative (that considers a feedback loop). A study using data from the Brazilian oil industry was conducted to discuss the integration benefits.

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Saturday, 11:15 AM - 12:45 PM, Naples 6 *Track:* ICM, 12 *Chair:* Yaghoub Khojasteh Ghamari
Session: Managing Warehouse and Distribution

020-0371 A Queueing-Inventory Model with Rework, Backorders, and Poisson Demand

Rasoul Haji, Sharif University of Technology, Iran (Islamic Republic of)
Alireza Haji, Sharif University of Technology, Iran (Islamic Republic of)
Ehsan Khodabandeh, Sharif University of Technology, Iran (Islamic Republic of)
Babak Haji, University of Southern California, United States

In this paper we consider a queueing-inventory system having a supplier with infinite capacity, one rework center with a single server, one warehouse, and Poisson demand. The warehouse replenishment policy is one-for-one, that is, as soon as a demand arrives he orders a unit to the supplier. A certain fraction of the produced items are defective and must be reworked at the rework center before going to the warehouse. If the warehouse is out of stock, demand will be backordered. We assume that the processing time at both supplier and rework center are exponential. This paper first derives the long run joint probability of "outstanding orders in the supplier" and "the queue size of the rework center." It obtains the average on hand and backorder of the warehouse, and derives the long run unit total cost of the system. Finally, it obtains the optimal inventory position of the warehouse.

020-0534 Managing Production and Distribution for Supply Chains in the Processed Food Industry

Julia Miyaoka, San Francisco State University, United States
Katy Azoury, San Francisco State University, United States

We develop and evaluate a model for a supply chain problem in the processed food industry that faces several complicating factors. These factors include multiple products, multiple warehouses, production constraints, high transportation costs, and limited storage at the production facility. This problem is motivated by the supply chain at Amy's Kitchen, one of the leading producers of natural and organic foods in the U.S. We propose a modeling approach for making the production and inventory replenishment decisions in this supply chain. We validate our model using actual data from one factory at Amy's Kitchen and compare the performance of our model to that of the actual operation. Our model significantly reduces both inventory levels and stockouts relative to those of the actual operation. We also identify a lower bound on the optimal inventory holding and shortage costs and show that our model compares very well to the lower bound.

020-0917 Order Picking Problem in Multi-aisle Automated Warehouses

Yaghoub Khojasteh Ghamari, Temple University, Japan Campus, Japan

In this research, we address an order picking problem in a unit load multi-aisle Automated Storage and Retrieval System (AS/RS), in which a single Storage/Retrieval (S/R) machine performs storage and retrieval operations, and each item can be found in several storage locations. The objective is to propose algorithms that minimize the total time traveled by the S/R machine to complete the retrieval process of orders. First, we present a mathematical formulation for the problem. Then, we develop a genetic algorithm and an ordinary heuristic, and provide a performance comparison between them. A large set of problems is used to derive numerical results.

020-0731 Making Better Fulfillment Decisions on the Fly

Jason Acimovic, Massachusetts Institute of Technology, United States
Stephen Graves, Massachusetts Institute of Technology, United States

Relative to traditional retailers, e-tailers can offer more options to customers, with respect to both inventory and service times. But they also manage a complicated distribution network with more decision options. Furthermore, e-tailers may not stock each item at every location in the network, reflecting the large percentage of low volume items in their catalogs. What is the best way to fulfill each order when customers have different service requirements? We partner with an e-tailer to find the value of the improvement gap by comparing a greedy strategy with an ex post optimization for a set of orders. We develop an approximate dynamic program and evaluate its performance on toy and actual examples. We find that the improvement gap is on the order of a few percent, and that about half this gap can be captured for single-season items using our heuristic.

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131 Saturday, 11:15 AM - 12:45 PM, Capri 1 *Track:* CSC, 25 *Chair:* Amr Farahat

Session: Inventory Management & Pricing of Substitutable Products

020-0152 The Mediating Role of Fill Rate in the Relationship between Service Variety and Sales

Xiang Wan, University of Maryland, United States
Martin Dresner, University of Maryland, United States
Philip Evers, University of Maryland, United States

Service management in supply chains has been analyzed by an extensive body of literature. High service variety facilitates sales, while it raises the efficiency in logistics management. This paper proposes a framework to investigate the influence of service variety on logistics and sales performance, as well as the mediating role of logistics factors (such as fill rate) in the relationship between service variety and sales. Two dimensions of services - ordering and delivery - are studied in this research. The results indicate that the influence of service variety on logistics and sales performance depends on variety in both the degree and dimensions.

020-0720 Joint Pricing and Inventory Decisions Under Stockout-based and Price-dependent Substitution

Sandra Transchel, The Pennsylvania State University, United States

We study a joint pricing and inventory problem of two vertically differentiated and partially substitutable products. Demand substitution is stockout-based and price-dependent, i.e., customers have a first choice and only if this product is not available they may decide to substitute, however, the substitution probability depends on the price of the substitutable product. Two major research questions are addressed: 1) How do price management and stocking decisions interact with each other given that demand and substitution rate are price-dependent?, 2) How does the optimal pricing and stocking policy of our proposed policy perform in comparison to the use of more simple decentralized planning approaches? We analyze the performance and structural properties of an integrated planning of price and inventory levels compared to decentralized approaches where either price and inventories (division-individual) or both products (product-individual) are planned by separate decision units.

020-0043 The Multi-Product Newsvendor Problem with Customer-Driven Substitution

Amr Farahat, Cornell University, United States
Joonkyum Lee, Cornell University, United States

We study the stocking problem faced by a newsvendor offering multiple substitutable products where a customer's probability of choosing any given product depends on the set of available products at the time of purchase. We present a tractable method, based on customer type decomposition, that is guaranteed to yield an upper bound on the optimal expected profit. Numerical tests show that the true expected profits of the solutions obtained typically lie within a few percentage points of the upper bound and often outperform benchmarks.

020-0402 Coordination in Two-period Stochastic Inventory Model with Production Cost Volume Learning

Xiuli He, UNC-Charlotte, United States
Tao Li, UT-Dallas, United States
Suresh Sethi, UT-Dallas, United States

Consider a situation in which the production cost declines due to production volume learning. In a decentralized channel, the manufacturer and the retailer may benefit differently from the cost reduction opportunities. Assume that the retailer has two buying opportunities. We consider both a far-sighted retailer and myopic retailer. A farsighted retailer takes into account the impact of Period 1 production on the cost in Period 2 while the myopic retailer does not. We show that revenue sharing contracts can coordinate the supply chain with endogenous retail and wholesale prices when the cost learning is either deterministic or stochastic. Our numerical example suggests revenue sharing contracts can significantly increase the channel profit.

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133 Saturday, 01:30 PM - 03:00 PM, Tuscan 1 *Track:* HOM, 7 *Chair:* Vikram Tiwari

Session: Data Driven Models of Scheduling & Staffing in Healthcare

020-0808 Identifying Predictors of Vascular Surgeries Case Duration Times

Vikram Tiwari, University of Houston, United States
Panagiotis Kougias, Baylor College of Medicine / MEDVAMC Houston, United States

Efficacy of the surgical schedule, and in turn the efficiency of operating rooms, is dependent on the accuracy of prediction of surgical case durations. Previous research has shown that surgeon, anesthesia type, procedure(s), and patient characteristics influence case duration times. In this research, data on consecutive patients marked as potential surgery patients for either Aneurysm Repair or Infrainguinal Open Bypass procedures was monitored from the time of their initial visit to the preoperative clinic to their final surgery. Additional factors, such as revised cardiac risk index, medication and substance abuse history, etc. were included in the multivariate models. Initial results are encouraging and show good predictive power. Surgeon experience and specificity of surgical procedure appear to influence case durations more than patients' physical, demographic and physiological characteristics.

020-0823 Operating Room Planning and Scheduling in Hospitals

Srimathy Mohan, WP Carey School of Business, Arizona State University, United States
John Fowler, School of Computing, Informatics, and Decision Systems Engineering, ASU, United States
Qing Li, Microsoft Corp., United States
Mohan Gopalakrishnan, Arizona State University, United States

Planning and scheduling the operating room (OR) is important for hospitals to improve efficiency and achieve high quality of service. In this research, we study the general OR planning and scheduling problem which is complex due to the conflicting objectives and the uncertain nature of surgeries. • We first develop a mixed integer programming framework. The objectives include reducing staff overtime, OR idle time & patient waiting time, as well as satisfying surgeon preferences and regulating patient flow from OR to the Post Anesthesia Care Unit (PACU). • Next, we develop heuristics and a random keys genetic algorithm (RKGA) to be used in the scheduling phase and compare the results with the optimal solutions. • We also investigate interacting effects between planning and scheduling. • The effectiveness of the approach is evaluated using real data.

020-0540 Optimal Staff Scheduling for Emergency Rooms

Subhamoy Ganguly, University of Colorado at Boulder, United States
Stephen Lawrence, University of Colorado at Boulder, United States

In the face of high staffing costs, uncertain patient arrivals and care requirements, and the risks of keeping ER patients waiting for extended periods, the staffing of emergency rooms (ERs) is a vexing issue. Using historical patient arrival and service data from three different hospitals over three years, we develop an integer goal-programming model to provide an optimal staffing schedule by provider type that minimizes overall costs and satisfies desired service-level constraints for each of several patient care-categories. A unique aspect of our approach is that we aggregate patient demand into discrete time buckets during a clinic day and model the stochastic distribution of aggregate patient demand within these buckets, which considerably reduces the complexity of the ER scheduling problem without significantly reducing model fidelity. Our results provide an optimal staffing schedule for different provider categories and facilitate sensitivity analysis related to different staffing policies and mix of provider types.

020-0109 Data Driven Appointment Scheduling in the Presence of No-Shows

Michele Samorani, Leeds School of Business, University of Colorado at Boulder, United States
Linda LaGanga, Mental Health Center of Denver, United States

Efficiently scheduling clinic appointments in the presence of no-shows leads to better resource allocation and ultimately to lower health care costs. Our mathematical formulation schedules appointments in order to increase the overall clinic performance by 1) using the overbooking strategy proposed by LaGanga and Lawrence (2007), 2) using data mining to predict whether each patient will show or not 3) allowing appointments to be scheduled within a fixed number of days. We analyze the impact on the clinic performance of using none, one, two, or all three strategies at the same time, and we present the cases where each configuration should be used. Computational tests performed withreal world data indicate that our method leads to a better schedule than using overbooking alone. Furthermore, it allows the user to express a preference towards visiting a higher number of patients orlimiting waiting time and overtime.

134 Saturday, 01:30 PM - 03:00 PM, Tuscan 2 *Track:* GOS, 2 *Chair:* Qingxia Kong Xiaole Wu

Session: Outsourcing

020-0717 Managing Outsourcing in the Apparel Manufacturing Fashion - MCF

Francisca Mendes, Faculdade Belas Artes, Brazil
João Mendes, FAAP - Faculdade Armando Álvares Penteado, Brazil
José Sacomano, UNIP - Universidade Paulista, Brazil
José Paulo Fusco, UNESP - Universidade Estadual Paulista, Brazil
Romy Tutia, FMU - Faculdades Metropolitanas Unidas, Brazil

This paper aims to describe the dynamics of the Textile Supply Chain with a focus on the business of Manufacturing Clothing Fashion - MCF - and its main features, with the management of outsourcing in a fashion company. This is an analytical framework of the competitive strategies described by several authors in the globalized and borderless world, the limits of creation to production reaching faraway areas. Soon after the "pret a porter" in the mid-twentieth century, specializing in the garments followed the trends of Parisian fashion. The preparation before a vertical company that performed all the productive chain, starts to flatten its production process. However, the positive response to the return on this investment will come only if accompanied by strategic plans approriate to the production, development of a proper relationship with suppliers (national and international), and therefore Management Outsourcing.

020-0628 A Study of the Factors Influencing Governance and Location Distance Choice in Services Outsourcing

Martina Gerbl, University of Ulster, Ulster Business School, United Kingdom
Ronan McIvor, University of Ulster, Ulster Business School, United Kingdom
Paul Humphreys, University of Ulster, Ulster Business School, United Kingdom

Services outsourcing has gained increasing importance in today's global economy. This paper focuses on the factors influencing governance and location distance choice in services outsourcing. Governance choice refers to the level of ownership in an outsourcing arrangement, and includes outsourcing to a captive or independent vendor. Location distance choice involves local, nearshore, and offshore outsourcing, and refers to the distance between the customer's home nation and location of the outsourced operation. As well as being influenced by economic factors, the combination of governance and location distance choice is driven by operations factors such as service quality, service design, and performance management. Based upon a study of German companies, this paper presents a framework that outlines key influences on governance and location distance choice, which were both found to be highly interrelated. This paper

contributes to existing theory, and enhances our understanding of the factors influencing the international services outsourcing decision.

020-0098 Multiple Joint Ventures as a Cure for Moral Hazard

Qiang Fu, National University of Singapore, Singapore
Qingxia Kong, National University of Singpore, Singapore

A foreign firm enters a market by establishing joint ventures with local partners. The productivity of a joint venture depends on the efforts expended by the local partner. However, partial ownership causes diverging interests, leading to the local partner supplyingless effort. The foreign firm can decide to establish a single joint venture or two joint ventures with two independent local partners. The latter is labeled the “multiple-joint-venture” (MJV) strategy. The competition between the two joint ventures squeezes the profit margin and dissipates the foreign firm’s monopolistic rent, while theMJV strategy has indirect effects on local partners’ incentives to supply effort. The MJV strategy could discipline local partners and mitigates moral hazard. Hence, the MJV strategy may enable the foreign firm to increase its profits. We identify sensible conditions under which the MJV strategy is more likely to succeed. Our analysis sheds light on the ways in which Volkswagen and General Motors (GM) operate in China.

020-0786 An Outsourcing Game with Demand Information Updating

Xiaole Wu, Washington University in St. Louis, United States
Fuqiang Zhang, Washington University in St. Louis, United States

This paper studies the tradeoff between sourcing cost and lead time in a competitive setting. Specifically, we study a duopoly game where each player may either source from a fast supplier with high cost or a slow supplier with low cost. With a fast supplier, the player can gather better demand information when making its quantity decision. We characterize the equilibrium of such a game and derive some managerial insights that may help explain the recent trend of back -shoring in the U.S.

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Saturday, 01:30 PM - 03:00 PM, Tuscan 3 *Track:* OMM, 3 *Chair:* Joao Santos
Session: Empirical and sample study

020-0514 Marketing Communication in Educational Institutions: Case Study: UNASP - Centro Universitario Adventista de São Paulo

Joao Santos, Methodist University of Sao Paulo, Brazil
Mariana Sa, Adventist University of Sao Paulo, Brazil
Eduardo Santos, Methodist University of Sao Paulo, Brazil

This case study of UNASP - Centro Universitario Adventista de São Paulo - analyzes marketing communication and its importance for educational institutions. Given the changes in the scenario of the educational market and the intensification of competition, it is necessary to keep the target audience informed of the interest actions undertaken by the institution. For a long time the educational institution refused to use marketing tools to disclose its programs, its structure, its brand and other information that the market demanded. Currently the use of marketing strategies is a critical factor for the success of the institution, given the emergence of new competitors and changes in the profile of students, who are increasingly demanding and conscientious of the quality of their education. The educational institutions have perceived the importance of marketing tools that seek to know the needs and desires of their customers.

020-0318 Identifying the Customers along the Supply Chain - A Sample Study

Claude Machline, EAESP-FGV, Brazil
Fernando Serson, EAESP-FGV, Brazil

The objective of this paper is to help companies to identify with more precision which are their customers along the supply chain. The increasingly pervasive concept of supply chain compels all companies to review the notion and, even the definition, of what is a customer, in order to be able to allocate more rationally their selling, marketing and relationship efforts. This revision might lead the firm to reach the conclusion that all the business units situated downstream along the supply chain are its customers. Moreover, inside each unit, there is a large variety of customers, namely: the final consumer, the consumer’s family, the opinion maker, the decision maker, the advisor, payer, inspector, controller, and the government officer who certifies and authorizes the transaction. Apart from a horizontal series of businesses along the supply chain, which are customers, there is, therefore, a vertical heap of customers inside each of these businesses.

020-0060 Mass Customization Challenges in the Service Sector: A Case Study of Direct Mail Marketing

Soroosh (Sam) Saghiri, Kingston University London, United Kingdom

This paper addresses the implementation of mass customization in the service sector. Mass customization has been widely discussed in the manufacturing sector. However, there is less research on service mass customization. This paper focuses on a case study in service operations, and through a series of semi-structured interviews explores the mass customization challenges in service operations. It also investigates techniques which can support the implementation of service mass customization. The case study addresses a direct mail and marketing company. Direct marketing is an advertising method which tries to reach the customer with personalized materials such as promotional letters, fliers, catalogues, trial CDs, and pre-approved credit cards. The outcomes of this exploratory research indicate that the use of multi-task machines, re-consideration of the product design and development, and choice of in-house operations over outsourcing are some of the key decisions which can support mass customization.

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Saturday, 01:30 PM - 03:00 PM, Tuscan 4 *Track:* ESO, 7 *Chair:* L. Beril Toktay
Session: Environmental Initiatives and Firm Performance

020-0147 Product Reuse in Innovative Industries

Tamer Boyaci, McGill University, Desautels Faculty of Management, Canada
Michael Galbreth, University of South Carolina, Moore School of Business, United States
Vedat Verter, McGill University, Desautels Faculty of Management, Canada

We consider a firm that produces a modular product in an industry that experiences technological innovation over time. Innovation affects consumer valuations of products as well as firm costs to keep up with technological changes over time. By investing in the reusability of its products, the firm develops the option of acquiring used items for reuse as inputs into future production. Our model explicitly considers key including additional costs incurred to make products reusable and the rate of technological innovation over time. As for reuse strategies, we consider the possibility of remanufacturing used products as well as the additional option to upgrade used products (by replacing components) to incorporate the innovation that has occurred since the item was originally produced. We examine both profit and environmental impact. In an extension, we also show how uncertainty in the rate of innovation influences investment in product reusability.

020-0078 Link between Environmental Initiatives and Environmental Performance

Manpreet Hora, Georgia Institute of Technology, United States
Ravi Subramanian, Georgia Institute of Technology, United States

As part of sustainability undertakings, firms announce initiatives to reduce the environmental impacts of their products and processes. However, it is unclear whether these initiatives positively associate with environmental performance. In this study, using different portfolio-matching methods, we examine the association between announcements of firm-level environmental initiatives and performance as measured by toxicity-weighted pollutant releases.

020-0409 Investment in Energy Efficiency by Small and Medium-Sized Firms

Suresh Muthulingam, Cornell University, United States
Charles Corbett, UCLA, United States
Shlomo Benartzi, UCLA, United States
Bohdan Oppenheim, Loyola Marymount Univesity, United States

We investigate the adoption and non-adoption of energy efficiency initiatives using a database of over 100,000 recommendations provided to more than 13,000 small and medium-sized manufacturing firms. Even though the average payback across all recommendations is just over one year, many of these profitable opportunities are not implemented. We identify several factors that influence firms' decisions of which energy-efficiency initiatives to implement. First, we find that adoption of a recommendation depends not only on its characteristics but also on the sequence in which the recommendations are presented. Adoption rates are higher for initiatives appearing early in a list of recommendations. Second, adoption is not influenced by the number of options provided to managers. Third, adoption rates are higher for recommendations that require lower managerial attention. We draw implications for enhancing adoption of energy-efficiency initiatives and for other decision contexts where a collection of process improvement recommendations are made to firms.

020-0498 Impact of Environmental Technological Decisions on Manufacturing Performance

Iuri Gavronski, UNISINOS, Brazil
Robert Klassen, University of Western Ontario, Canada
Stéphane Vachon, HEC Montréal, Canada
Luis-Felipe Nascimento, PPGA/EA/UFRGS, Brazil

This paper relates the manufacturing performance with environmental technologies. We assessed manufacturing performance in some of its dimensions: price, quality, and delivery. Environmental technologies are investments that aim at increasing the environmental performance of an operation, such as product modifications, process modifications, environmental management systems, end-of-pipe pollution controls, and pollution remediation. We designed a cross-sectional survey study, directed at the managers of plants in the following industries: manufactured metal products, machinery, electrical appliances, and electronics. Results show that moderate investments in product modifications are positively related to cost and delivery dimensions of performance, while above average investments in process modifications are positively related to cost performance, and above average investments in end-of-pipe pollution controls are negatively related to the cost and delivery dimensions of operations performance, as hypothesized. Contrary to our expectations, we have found that above average investments in environmental management systems are also negatively related to delivery performance.

137 Saturday, 01:30 PM - 03:00 PM, Tuscan 5 *Track:* OEE, 5 *Chair:* Andrew Finger S. Samar Ali
Session: Logistics Network and Transportation Management

020-0968 Developing A Freight Model to Retalinize Trucks: A Case of Uflex India Pvt Ltd.

Sadia Samar Ali, JK Business School, India

Since India's independence, the number of motor vehicles in the country has been increasing rapidly. The major challenge is to develop a generic freight model for road, which is one of the most dominant modes of transportation in India. The Truck Industry which is principal mode of transportation and is regarded as the lifeline of the Indian Logistics sector which is the most neglected sector, and the lack of institutional framework has given birth to the adjective "Unorganized Sector" for this Industry. A case of Uflex India Private Ltd. has been taken to develop an optimal empirical model to minimize the freight charges. The key findings include that total freight cost depends on three types of cost: physical transport, fixed cost and variable cost. Moreover, the factors affecting the basic freight include fuel cost per trip per tonne, fixed cost per trip per tonne, max tonnage, toll tax and puncture cost.

020-0911 Strategic Alliances in International Freight Forwarders: A Brazilian Perspective

Danielle Pozzo, PUCRS, Brazil
Andrew Finger, Unisinos, Brazil

International Freight Forwarders (IFFs) are companies hired by importers and exporters to coordinate the logistic process, from one country to another. These intermediators generate partnerships to enable services worldwide. Their participation and performance are crucial to supply chain management, considering logistics as a determinant to a successful operational performance. The study aims to describe how strategic alliances are formed and maintained by IFFs. This exploratory research utilizes secondary data and in-depth interviews with responsible managers of five Brazilian IFFs. The results show that the establishment of new partners is guided mostly by indications from already active partners and the intention of long-term relationships. Contrary to the strategic concept, the IFFs don't evaluate performance of their alliances and or comprehend the partnership as strategic, which indicates that these forwarders have an operational view of the relationships and are not aware of the network's existent potential.

020-0637 A Multi-Commodity, Two-Stage Production-Distribution System Design Problem: The Impact of Different Customs Systems

Irineu Brito Jr, Universidade de São Paulo - Escola Politécnica and Fatec Prof Jessen Vidal, Brazil
Hugo Yoshizaki, Universidade de São Paulo - Escola Politécnica, Brazil
Patricia Belfiore, Universidade Federal do ABC - Departamento de Engenharia de Gestão, Brazil

This research studies the impact of customs system regime in a logistics network design for a manufacturer of commercial and military aircraft with plants installed in Brazil and abroad and with international activities in Harbin (China). We evaluate the changes in the logistics costs provided by two tax regimes: RECOF and Drawback. A location and transshipment model with multi-product is applied to optimize the logistics costs and to determine where the goods are consolidated. The use of facilities locations to transport different products from various sources to various destinations can provide economies of scale in transportation costs. Instead of making direct shipments, each source can ship in bulk to consolidation terminals. The results show that the tax regime significantly affects logistics costs and goods consolidation. Thus, it is crucial to understand the referred tax regimes, to avoid severe logistics network system sub-optimization.

020-0472 Aeronautical Maintenance Companies in Brazil: A Preliminary Study

Marcio Machado, Instituto Tecnológico de Aeronáutica, Brazil
Ligia Soto Urbina, Instituto Tecnológico de Aeronáutica, Brazil
Michelle Eller, Instituto Tecnológico de Aeronáutica, Brazil

This paper aims to expand knowledge about the aircraft maintenance industry in Brazil, with the main goal of building an overview which reveals the technical and geographic distribution of the capability niches, as well as identifies the profile of the certification cluster according to the technical domain of certification. This paper begins with an exposition of the basic concepts of maintenance activity in general and aviation in particular. The following is an exploratory research

carried out from secondary data in order to detect technical and location patterns. Within this focus, it is examined the distribution of businesses, considering the various types of certification, identifying gaps in the Brazilian technical capability, which could be filled by future investments. Finally, the study identifies the geographic distribution of aircraft maintenance companies in the country, whose concentration historically leans to the southeast region due to the heavy concentration of aircraft in this region.

138 Saturday, 01:30 PM - 03:00 PM, Tuscan 6 *Track:* HOC, 5 *Chair:* Paulo Goncalves
Session: Strategy and Planning for Humanitarian Relief

020-0168 Optimal Fleet Vehicle Procurement for Humanitarian Relief Operations

Mahyar Eftekhar, HEC Paris School of Management, France
Andreas Robotis, HEC Paris School of Management, France
Luk Van Wassenhove, INSEAD, France

Vehicle fleet sizing is a major challenge for humanitarian organizations. We present a finite time horizon MIP model. The parameters of our model are estimated based on real data provided by the International Committee of the Red Cross. We find that it is optimal to keep inventory leveled and avoid inventory variations. In the second step, we present a model to find the optimal procurement strategy at the aggregration level. Our closed form solution allows us to present some analytical discussions and to conclude with managerial insights.

020-0671 Competitive Disequilibrium Dynamics in Humanitarian Relief Efforts

Paulo Goncalves, University of Lugano, Switzerland

Sterman, Henderson, Beinhocker, and Lee (2007) show that "ignoring the role of disequilibrium dynamics and bounded rationality in shaping competitive outcomes" can lead to poor strategic prescriptions. In particular, the prescriptions from conventional normative models hold "when the industry moves slowly compared to capacity adjustment delays," however, they breakdown "when market dynamics are rapid relative to capacity adjustment." In this research, we explore situations where the disequilibrium dynamics and bounded rationality can have significant competitive implications. We focus our attention on unanticipated demand surges during natural disasters and how they influence the outcome of competing humanitarian organizations.

139 Saturday, 01:30 PM - 03:00 PM, Tuscan 7 *Track:* PDI, 7 *Chair:* Anant Mishra
Session: The Macro Structure of New Product Development

020-0399 Managing Client-Vendor Conflict in Globally Distributed Technology Projects: An Empirical Study

Anant Mishra, George Mason University, United States
Kingshuk Sinha, University of Minnesota, United States

Conflicts between a project client and project team pose a significant challenge to the execution of technology projects. With technology projects being increasingly executed in distributed project organizations that span firm and/or country boundaries, such challenges have grown considerably. This study has a two-fold research agenda. First, we undertake an empirical investigation to identify the relational antecedents of task conflict and relationship conflict in technology projects. The relational antecedents examined in the study include the type of project organization (Insourcing, Outsourcing, Offshoring, and Offshore -Outsourcing), the extent of face-to-face interaction, and shared context between the project client and the project team. Second, we develop a nuanced understanding of the performance consequences of conflict by studying the effects of task and relationship conflict on cost and quality in technology projects. The empirical analysis is conducted using primary data from a multi-country, multi-industry sample of 830 information technology and product development projects.

020-0766 Product Portfolio Strategies for Green Products

Arda Yenipazarli, University of Florida, United States
Asoo Vakharia, University of Florida, United States

“Green” is now markedly mainstream. Today, there are substantial numbers of consumers who are espousing environmental values and changing their shopping lists. Besides, a growing selection of green products is designed to deliver convenience, lower costs, and perform better than their brown counterparts. The analysis of green products that have scored market success in the past indicate that successful green products are able to either offer mainstream appeal or serve green market niche. In this paper, we analyze three green product development strategies and attempt to provide guidance to executives for crafting these strategies effectively.

020-0428 Benefits and Limits in Adoption of “Design Thinking” by Novice Multidisciplinary Teams

Sebastian Fixson, Babson College, United States
Victor Seidel, Oxford University, United Kingdom

Scholarly and practitioner literature have both described the potential benefits of applying “design thinking” methods in the development of novel concepts for innovations. Most design thinking studies are based on the work of experienced design professionals, but if design thinking is to be widely adopted, less-experienced members of organizations will be exposed to such methods. With limited research in this specific area, we collected data on how novice multidisciplinary teams made use of design methods, and contrasted results among eleven high performance and eleven low performance teams. We develop a model in which the successful adoption of design thinking practices relies on coupling formal methods with informal team practices, managing the transition to abandon certain practices at later stages, and how increased use of brainstorming methods may signal team difficulties. We discuss implications for organizations as well as for theories of design and innovation.

020-0509 Collaboration and Competition in Exploration and Exploitation Learning in Technology Ventures

Jennifer Bailey, Georgia Institute of Technology, United States
Cheryl Gaimon, Georgia Institute of Technology, United States

It has been recognized that organizations can derive significant benefits from simultaneously learning from exploration and exploitation in the innovation development process. However, there are various alternative approaches for accomplishing this objective. A technology venture must determine an optimal strategy for balancing these competing but also complementary activities, which both vie for the venture’s resources. Cohen and Levinthal (1990) propose a conceptual model of the incentives for investment in knowledge creation as a function of several factors including: (i) the amount of external knowledge available and (ii) the level of competitive interdependence. In this paper we extend earlier research on the dynamics of exploration and exploitation and examine the impact of these moderating factors. We provide normative insights for the venture manager who determines the dynamic allocation of resources invested in exploration and exploitation, while addressing the strategic imperatives of collaborating and competing within the innovation process.

140 Saturday, 01:30 PM - 03:00 PM, Tuscan 8 *Track:* ERS, 7 *Chair:* Ramnath Vaidyanathan

Session: Empirical Research in Supply Chain Management III

020-0419 Implementing Lean in a Cross-cultural Environment

Ravi Kumar, KAIST Business School, Korea, Republic of (South Korea)
Sriram Dasu, USC Marshall School of Business, United States
Michalle Barak, USC School of Social Work, United States
Dolores Reyes, UDLAP Industrial Engineering Department, Mexico

This presentation reports on a funded project that aimed to assist the Korean supplier of a global multinational in identifying and adopting effective Lean systems and processes for their plant located in Mexico. The objectives were to increase the competitiveness of the enterprise and to generate new knowledge in implementing Lean principles in a Korean-Mexican cross-cultural environment. The usual operational improvements that are documented in the literature were obtained: these improvements include reduction in work-in-process inventory, reduction in through-put lead times, improvement in quality and increase in average output per employee. But more importantly, lean group workers were shown to have a much higher intercultural communication competence, much better relationships with supervisor of the same culture and supervisor's supervisor who was of different culture compared to other workers, lower job stress compared to other workers, and lower intention to leave their employment compared to other workers.

020-0743 Revenue Management of Experience Goods: Linking Seat Value and Willingness to Pay

Ramnath Vaidyanathan, McGill University, Canada
Senthil Veeraraghavan, Wharton School, United States

Experience goods pose significant pricing challenges to firms: (a) the true value of the good is unknown prior to consumption, (b) consumers are heterogeneous in their willingness to pay for quality, and (c) even after consumption, the exact valuation of a good is only known imperfectly. In this paper, we consider the static pricing problem faced by a firm selling an assortment of experience goods to a deterministic population of consumers. We provide a methodology to estimate the distribution of willingness to pay (WTP) across consumers using consumer surveys and apply it to real data from a sports franchise to estimate the distribution of WTP and solve for optimal ticket prices across seat locations.

020-1037 Adoption of Service Process Innovation in Cardiac Surgery

Diwas Kc, Emory University, United States

Although diffusion of innovation has received considerable research interest, the adoption of service process innovation remains relatively unexplored. In this paper, we study the drives or adoption of a new service process innovation in cardiac surgery. Specifically, we examine whether hospital and physician level variables including teaching status, volume of cardiology practice, severity of the patient population and overall skill level of the physician impact the physician's choice of adoption.

020-0503 Vertical Mergers and Acquirers' Performance

Jing Zhu, McGill University, Canada
Tamer Boyaci, McGill University, Canada
Saibal Ray, McGill University, Canada

We empirically analyze the effects of vertical mergers on the performance of the acquiring firms. Our primary focus is on inventory-related supply chain metrics like inventory period, inventory productivity and inventory responsiveness. Accordingly, we concentrate on sectors where inventories play a significant role; i.e., manufacturing, wholesale and retail industries. By using accounting panel data from COMPUSTAT database and the data on vertical mergers/acquisitions from SDC Platinum database, we study how the post-merger inventory performance compares to that of the pre-merger level. We also investigate how vertical mergers impact other operating performance measures such as gross profit margin, sales efficiency and profitability. Moreover, a comparison is provided to show the difference between horizontal and vertical mergers.

141 Saturday, 01:30 PM - 03:00 PM, Tuscan 9 *Track:* BOM, 7 *Chair:* Joel Goldhar Bob Emiliani

Session: Integrating Behavioral Concepts and Theory into OM Courses

020-0714 Workshop on Behavioral Concepts Useful in OM Courses

Joel Goldhar, Illinois Institute of Technology/Stuart School of Business, United States
Bob Emiliani, Central Connecticut State University/School of Engineering and Technology, United States

This workshop will focus on specific Organizational Behavior concepts that have proven useful for OM practice, and that can be integrated into OM teaching. After a brief introduction based upon the organizer's experiences, the audience will participate in a general discussion and knowledge/experience exercise about the topic. The purpose of the workshop is to identify a wider range of OB/social science concepts useful in OM, and for teachers with similar interests to meet.

142 Saturday, 01:30 PM - 03:00 PM, Tuscan 10 *Track:* REV, 1 *Chair:* Yuri Levin

Session: Stochastic Models in Revenue Management

020-0130 Risk Considerations in Product Bundling

Mehdi Sheikhzadeh, Sharif University of Technology, Iran (Islamic Republic of)
Ehsan Elahi, University of Massachusetts, Boston, United States

We study the bundling problem of a retailer who has the option of selling a bundle of two products, or selling the products separately (bundling policy) while customers' reservation prices are randomly distributed. The retailer faces a product selection problem in which he can select a pair of complementary, substitutable, or independent products. We use a Mean-Variance approach to include retailer's risk through her profit variability when maximizing the expected value of profit. After deriving explicit relations for customer's purchasing probabilities, the expected value, and the variance of profit under each combination of policies and scenarios, we characterize the conditions under which a policy or scenario performs better than the others. Among other findings, we show that optimal price made by a risk-averse decision maker cannot be larger than the one made by a risk neutral decision maker for all cases except no bundling policy and perfectly negatively correlated scenario.

020-0207 Strategic Bidders Club: Implications for Consumer Learning

Yuri Levin, Queen's University, Canada
Tatsiana Levina, Queen's University, Canada
Jeffrey McGill, Queen's University, Canada

Mikhail Nediak, Queen's University, Canada

We develop a model of strategic consumer learning of bidding strategies in a market for opaque products, obtain the optimal strategies for the consumers, and study their properties. The effects of consumer cooperation on learning are examined and compared under the following scenarios: exchange of information only, exchange of information with coordinated bidding, and coordinated bidding with risk pooling in the form of outcome-contingent payment scheme.

020-0441 Network Revenue Management with Product-specific No-shows

Sumit Kunnumkal, Indian School of Busines, India
Kalyan Talluri, Universitat Pompeu Fabra, Spain
Huseyin Topaloglu, Cornell University, United States

Revenue management practices often include overbooking capacity to account for customers who make reservations but do not show up. In this paper, we consider the network revenue management problem with no-shows and overbooking, where the show-up probabilities are specific to each product. We propose a randomized linear program to jointly make the capacity control and overbooking decisions with product-specific no-shows. We establish that our formulation gives an upper bound on the optimal expected total profit and that this upper bound is tighter than a deterministic linear programming bound that appears in the existing literature. We describe how the randomized linear program can be used to obtain a bid price control policy. Numerical experiments indicate that our approach is fast, able to scale to industrial-size problems, and can provide significant improvements over standard benchmark methods.

143 Saturday, 01:30 PM - 03:00 PM, Tuscan 11 *Track:* SOM, 5 *Chair:* Boris Ansorge
Session: Services and Efficiency

020-0438 A Case-based Study of Shifting of the Efficiency Frontier in the Indian Services Industry

Sivakumar Srinivasan, Indian Institute of Management, Bangalore, India

Service economy is a booming sector in India and it currently constitutes greater than 50% of India's GDP. The traditional trade-off between operational excellence and customer intimacy as a strategic choice in services sector has started to erode over time with customers increasingly demanding higher levels of service at a lower cost. This change in context is driving a continuous change in the operational configuration of service systems that can be visualized as the "shift of the efficiency frontier" detailed by Hayes and Pisano. Service firms attain their desired configuration by a combination of structural and infrastructural elements (levers). In the wake of shifts in the efficiency frontier, my paper makes certain propositions about the levers that are used and the management response required from service businesses (of various quadrants in Schmenner's matrix) to manage this shift. We have validated these propositions by adopting a case-based research methodology.

020-0132 The Relationship Between Operating Efficiency and Service Quality: Are They Compatible?

Srinivas Talluri, Michigan State University, United States
Myung Kyo (M.K.) Kim, Michigan State University, United States
Tobias Schoenherr, Michigan State University, United States

Transferring and applying manufacturing principles and practices to improve both service efficiency and service quality is an important area of research in service operations. This paper advances this stream of research by examining the compatibility of operating efficiency and service quality. Specifically, our research addresses the following questions: (1) Do operating efficiency and service quality have to be traded-off, or can they exist in unison (are they compatible)? and (2) What aspects of service quality have a stronger association with operating efficiency? Additionally, our focus lies on a novel type of service industry where such research has been sparse. Specifically, we consider the South Korean service driving industry, which has experienced a rapid growth in recent years. We evaluate the relative operating efficiencies of service driving agencies based on actual transaction data and subsequently analyze differences in service quality dimensions based on efficiencies.

020-0611 Exploring Interdependencies of Innovation Systems

Boris Ansorge, Research Institute for Operations Management (FIR) at RWTH Aachen, Germany
Ralf Frombach, Research Institute for Operations Management (FIR) at RWTH Aachen, Germany

Companies are constantly searching for new solutions to customer needs. A major challenge in early development phases is predicting the future requirements. Besides this, a continuous change of the environment takes place during the development process: customer needs shift, laws tighten, etc. Thus it is obvious that by the end pre-defined requirements do not necessarily agree with requirements fitting future demands. Our paper presents a new approach to predict the alteration of the perpetual mutating requirements and a way to integrate the results in an innovation process. On the one hand, our model simulates future scenarios of the applicable environment. On the other hand, we present a modified process, thus enabling reduction of the increasing complexity which is realized by tightening the range for the requirements with each simulation iteration. Our model is currently successfully applied in the development of ICT-solutions for electric-mobility and new services in the construction industry.

020-0474 New Electronic Service (E-service) Channels: Strategic Definitions and IT Influence on Brazilian Companies

Antonio Santos, University of Sao Paulo, Brazil
Andre Dias Ferreira, University of Sao Paulo, Brazil
Fernando Laurindo, University of Sao Paulo, Brazil

Technological advances are creating a new set of services based on technology. These new services are changing the relationship between companies and customers. Also, electronic services (e-services) are showing importance not only in the field of electronic commerce (e-commerce) but also as a mechanism that builds a more pleasant service experience for customers. This study is intended to understand how Brazilian companies define their electronic service strategy, meaning when (under which circumstances) and how these companies consider the possibility to build a new service channel based on information technology (IT). In addition to that, this study also evaluates how IT areas in these companies are influencing decision and strategy. Three case studies, from three different companies (banking, telecommunications and an internet provider) will be used to confront theory and look for a deeper understanding. As a consequence, this study is presenting new information from a field that still needs investigation.

144 Saturday, 01:30 PM - 03:00 PM, Roma 1,2 *Track:* LOM, 3 *Chair:* Richard Monroe
Session: Logistics Trends and Public Sector Issues

020-0716 Recent Trends and Performance Issues in Multimodal Logistics

Richard Monroe, East Carolina University, United States

The international business environment today is characterized by supply networks which consist of suppliers and customers spanning the globe. This means that materials and products are moving extremely long distances in many cases and multiple modes of transportation are utilized. Containerization is a key element that makes international shipping possible in this environment. Given the dominant usage of containers in the shipping process, it is important to

evaluate multimodal shipping at three different levels: at the Port, on the Ground and with the Shippers. This paper will provide background information about recent trends and then discuss some of the ongoing performance issues at the three different levels.

020-0359 A Supply Network Approach to Integrating Consumer Choice in the Last Mile of Parcel Deliveries

David Kirkwood, University of Cambridge, United Kingdom
Jagjit Srai, University of Cambridge, United Kingdom

In the UK the significant failure rate associated with the last mile of parcel deliveries in densely populated urban areas has directly contributed to congestion, pollution, financial impact to the carriers, and has indirectly dissuaded consumers from using e-commerce. The logistics system which comprises the last mile has been analysed in terms of configuration of the supply network and the management of the interface with the consumer. Using case study interviews with public sector bodies and selected actors in the parcel delivery value chain, the business ecosystem and operational archetypes involved have been assessed. From this, a framework consisting of an integrated consolidation-based solution driven by informed consumer choice has been constructed and the implementation tested live on a pilot study. Preliminary data suggest potential benefit both to the consumer and to the environment, and these findings will form a key element of the future dissemination of the proposed solution.

020-1070 Service Quality Benchmarking of Ocean Container Carriers Using Analytic Hierarchy Process

Kannan Vanumamalai, Department of Management, Birla Institute of Technology, India

The purpose of this paper is to benchmark the service quality of ocean container carriers operating in India with a view to assist them in their marketing strategy formulation to ensure break through performance. On analysis, it was found that Indian shippers consider 48 criteria to evaluate the service quality of container carriers. Then, it was attempted to find out the benchmark container carrier out of the seven select container carriers using analytic hierarchy process (AHP). For AHP calculations, the Expert Choice 11.5 software was used. On analysis, Maersk emerged as the benchmark and thus it was set as the performance target for other container carriers. Then a gap analysis was taken up which helped to find out the areas of comparative strengths and weaknesses of each container carrier. This study has got several managerial and theoretical implications, and it has opened up enormous scope for future research as well.

145 Saturday, 01:30 PM - 03:00 PM, Sorrento 1,2 *Track:* QPJ, 6 *Chair:* Lynn Boyd
Session: Session 6: The Theory of Constraints

020-1013 Theory Development Using the Theory Of Constraint's CRT

Tony Patti, Macon State College, United States
Kevin Watson, Iowa State University, United States
Lynn Boyd, University of Louisville, United States

The subject of theory development has been discussed extensively in the literature. Much of the discussion revolves around what theory is, is not, and what constitutes a theoretical contribution and methods for developing theory. Clearly, the advancement of theory proposed by any manuscript must be underpinned by a sound methodology. The Academy of Management Journal's information for contributors cites "implementation of flawed research designs" as one of the two most frequent reasons for rejecting a manuscript. Thus, it is appropriate that scholars continue to invest their intellectual resources in developing new and refining existing methods for conducting and reporting research. The purpose of this article is to propose a new structured approach to developing theory - the Current Reality Tree (CRT). The approach takes an existing problem solving methodology and modifies it for use as a research method.

020-0069 How to Optimize Gains in the Machining Process: An Approach Based on the Theory of Constraints

Elesandro Baptista, UNINOVE - Universidade Nove de Julho, Brazil
Wagner Lucato, UNINOVE - Universidade Nove de Jujho, Brazil
Nivaldo Coppini, UNINOVE- Universidade Nove de Julho, Brazil
Emily Haguihara, UNINOVE - Universidade Nove de Julho, Brazil

The conventional calculations of the machining cutting speeds assume that the direct manufacturing costs vary in direct proportion to the produced volumes, but usually do not take into consideration the selling price of the parts being made. This paper proposes a different approach for determining the machining cutting speeds based on the performance measures considered by the Theory of Constraints (TOC). It starts by defining the cutting parameters and their relationship to the machining costs. Also, TOC principles are examined in relation to the financial gains obtained as a result of the bottleneck analysis. Finally, this paper proposes a way to combine both set of concepts in such a way that a relationship between financial gains and cutting speed is established. A graphical solution enables the identification of the cutting speed that maximizes the financial gains for a given part. A practical example shows how the suggested procedure can be implemented.

020-0673 An Approach to Process Improvement Using Value Stream Mapping and Theory of Constraints Thinking Process

Tatiane Librelato, UNISINOS - Universidade do Vale do Rio dos Sinos, Brazil
Daniel Lacerda, PPGEPS/UNISINOS, Brazil
Luis Rodrigues, PPGEPS/UNISINOS, Brazil

This work was performed in a Speakers manufacturing company using the Value Stream Mapping Method - VSM and Theory of Constraints Thinking Process. The article aims to analyze, simultaneously, the wastes and the undesired effects in the company's value aggregation process, which were combined in order to support the decision making, and consequently, the process of improvement. The work contribution is the proposition of the practical combination of these two theoretical approaches, something yet to be further explored in the literature. This mixed approach seemed to be very effective and enlightening in showing some leverage points to improve the company performance. Though the approach is in its initial application, it has proven to be robust and the results very promising.

146 Saturday, 01:30 PM - 03:00 PM, Sorrento 3,4 *Track:* SAP, 5 *Chair:* Matteo Kalchschmidt
Session: Risk in Sourcing and Procurement

020-0148 An Empirical Assessment of the Influence of Risk Conditions and Resilient Capabilities on Supply Risks

Jury Gualandris, Università degli studi di Bergamo, Italy
Matteo Kalchschmidt, Università degli studi di Bergamo, Italy

Several contributions have tried to effectively evaluate supply risk sources but none of them empirically investigates the current corporate response and the effectiveness of supply chain risk management practices in reducing the perceived upstream vulnerability. We aim to increase the understanding of which factors influence the firm perception of supply risk by exploring the relationships among risk conditions (contingent drivers increasing vulnerability and its perception), resilient capabilities (adoption of risk management practices) and firm perception of supply risk (i.e., supplier default, purchase unavailability). In order to answer the research questions we conducted a survey analysis on 54 Italian companies from the manufacturing industry. Preliminary results show that some resilient capabilities mitigate the effect of risk conditions on the companies' perception of supply risk. Furthermore, the paper provides a better understanding of which

practices are more effective in reducing the perceived risk under different environmental conditions.

020-1031 Supply Diversification: A Stochastic Model for Supply Selection using Conditional Value at Risk

Cigdem Gurgur, Purdue University, United States

Procurement decisions play vital roles in a firm's value creation. Disruptions due to supply inadequacies could have a major impact on profitability. In this study we consider supplier selection and quantity allocation decisions for a firm facing supply unreliability and demand uncertainty. The benefit of having a large supplier pool is expressed in the form of reduced risk against supply disruptions. Using a single source, on the other hand, provides cost savings due to better partnership with the supplier. We also explicitly address the strategic behavior of suppliers in pricing decisions. Using a game theoretic framework, we find how the pricing decisions of the suppliers change in response to procurement decisions. We also show that when suppliers are not price takers and they have significant market power, the optimal strategy for the firm is to raise the number of suppliers.

020-0453 The Influence of the Chinese Supplier Relationships Management Paradigm on Global Supply Chain Management

Mihalis Giannakis, University of Warwick, United Kingdom

This paper reports the preliminary results of a study that examines how multi-national firms in China can establish successful relationships with Chinese suppliers. A survey has been conducted that investigates several factors that inhibit and enable effective SRM between western organizations and Chinese suppliers. The research highlights the importance of the social control side of governance structure and stresses that both social and formal control mechanisms should be implemented for more effective relationships with Chinese suppliers. It also demonstrates the need for western companies to recognize the importance of Guanxi in SRM.

147 Saturday, 01:30 PM - 03:00 PM, Naples 2 *Track:* HOC, 10 *Chair:* Jamison Day

Session: Humanitarian and Disaster Relief Supply Chain Initiative

020-0055 Humanitarian and Disaster Relief Supply Chain Initiative

Jamison Day, LSU, United States
Edward Davis, University of Virginia, United States
D Whybark, University of North Carolina, United States
Steven Melnyk, Michigan State University, United States
Omar Helferich, Central Michigan University, United States

On November 8-10(2010), a group of 35 Humanitarian/Disaster Relief professionals from a variety of government, defense, commercial and non-profit organizations, as well as academia, met at the University of Virginia's Darden School of Business to discuss ways of improving disaster relief operations. The group focused on issues surrounding demand signal visibility and information management during catastrophic events, with the objective of discussing current practices and developing new approaches to make disaster response more effective and efficient. We will explore the insights and actions generated from this meeting and open the floor to participants in this session for an open discussion.

148 Saturday, 01:30 PM - 03:00 PM, Naples 1 *Track:* OMF, 4 *Chair:* Ehsan Bolandifar Xin Zhai

Session: Session 4: Supply Chain Risks

020-1038 Risk-Aversion Happens: Why Risk-Neutral Manufacturers Ought to Hedge Commodity Material Purchases

Ehsan Bolandifar, Washington University in St. Louis, United States
Panos Kouvelis, Washington University in St. Louis, United States
Danko Turcic, Washington University, United States

We study a linear two-stage supply chain made up of a profit-maximizing supplier (component manufacturer) selling to a profit-maximizing manufacturer (intermediate or final good assembler). Both firms rely on credit, require commodity inputs and face some operational and financial frictions. Although both firms are risk-neutral, we find that they both have an economic incentive to hedge their commodity material purchases after agreeing on a wholesale contract (ex post). If hedging increases assembler's price elasticity of demand then both firms do even better by hedging before agreeing on a wholesale contract (ex ante). A dominating wholesale contract involves hedging ex ante and centralizing commodity material purchases for the entire supply chain at the downstream. The empirical implication of this finding is that the downstream firm, the assembler, has an economic incentive to hedge and coordinate raw material procurement in the entire supply chain.

020-0442 Optimal Purchasing Strategies Based on Integration of Spot Market and Contract Market

Qiao Wu, Zhejiang University, China
Nan Liu, Zhejiang University, China

In the era of economic globalization, materials price in spot market is affected by many factors such as production costs, demand, supply, exchange rate, etc. Spot market offers buyers materials with flexibility; however, spot prices fluctuate frequently due to changes of different factors. On the contrary, contract market gives buyers a choice to fix the procurement price of materials in advance, so that purchasing costs of materials can be locked. Spot market and contract market can be integrated to reduce procurement costs and maximize profits. In this paper, we propose a two-period model for a manufacturer with risk-aversion in the present of price and demand risk. Optimal procurement strategies are then provided in different scenarios to maximize the manufacturer's utility. In addition, a numerical analysis is conducted to gain some managerial insights. Our results are supposed to help decision-makers manage the procurement process effectively.

020-0583 Option Pricing and Production Ratio: A Joint Decision

Zhongyi Liu, Peking University, China
Xin Zhai, Peking University, China
Rong Li, Singapore Management University, Singapore
Lihua Chen, Peking University, China
Wentao Qi, TSK&F, GlaxoSmithKline, China

We consider a single-product, two-echelon supply chain consisting of a manufacturer and a buyer facing stochastic demand. The manufacturer offers both a long -term contract and an option contract to the buyer. Before the selling season starts, the manufacturer chooses her option exercise price and production ratio of option. The buyer determines order quantity with the supplier via the long-term contract at a pre-determined fixed price as well as the quantity of options he'd like to purchase from the manufacturer. When the selling season starts and demand is realized, if the quantity ordered via the long-term contract couldn't satisfy customer demand, the buyer chooses to exercise his option and/or purchase from the spot market. If the buyer chooses to exercise his option, the manufacturer delivers the product and pays the default if necessary. The goal of this research is to find the optimal option exercise price and production ratio for the

manufacturer.

020-0662 Modeling Breach of Contract Risk through Bundled Options

Cagri Haksoz, Sabanci University, Turkey
Koray Simsek, Sabanci University, Turkey

In order to model breach of contract risk, we design and value a bundled option that is composed of contract abandonment and price renegotiation. We show numerically that the bundled option is more valuable for the contract than either of the options, i.e., contract abandonment and price renegotiation, in isolation. This value increases monotonically as the spot price becomes more volatile. The value of the bundled option is less than the sum of the individual option values, hence showing the sub-additive property. We demonstrate that in the presence of high spot price volatility, the bundled option is more valuable when the renegotiation date is selected to be closer to the half-life of the contract. We also show that early contract abandonment probability goes down in the presence of a renegotiation option.

020-1009 A Stochastic Model for Supply Selection Using Conditional Value at Risk

Cigdem Gurgur, Purdue University, United States

Procurement decisions play vital role in firms' value creation. Disruptions due to supply inadequacies could have a major impact on profitability. In this study we consider supplier selection and quantity allocation decisions for a firm facing supply unreliability and demand uncertainty. The benefit of having a large supplier pool is expressed in the form of reduced risk against supply disruptions. Using a single source, on the other hand, provides cost savings due to better partnership with the supplier. We also explicitly address the strategic behavior of suppliers in pricing decisions. Using a game theoretic framework, we find how the pricing decisions of the suppliers change in response to procurement decisions. We also show that when suppliers are not price takers and they have significant market power, the optimal strategy for the firm is to raise the number of suppliers.

149 Saturday, 01:30 PM - 03:00 PM, Naples 3 *Track:* PRF, 1 *Chair:* Jayashankar Swaminathan Anna Lindholm
Session: Session 1

020-0026 Estimation of Revenue Loss Due to Disturbances on Utilities in the Process Industry

Anna Lindholm, Department of Automatic Control, Lund University, Sweden
Hampus Carlsson, Perstorp AB, Sweden
Charlotta Johnsson, Department of Automatic Control, Lund University, Sweden

Disturbances on utilities, such as steam and cooling water, often cause large economic losses at industrial sites. Utilities are often shared between production areas, and a disturbance on a utility is therefore likely to affect a large part of the production site. In addition, production areas are often coupled by the product flow at the site. Obtaining a dynamic model of a site, with respect to utilities, is therefore both hard and time-consuming. In this paper, a method for quickly obtaining an estimate of the profit losses different utilities cause is presented. The method uses a simple modeling approach, where the production areas at the site are modeled as either operating or not operating, i.e. on/off. The strength of this method is that utilities can be ordered according to the revenue loss they cause with very little modeling effort. The method is applied to an industrial site at Perstorp AB.

020-0314 Supply Network Reorganization in the Tanning Industry: An Action Research Project

Pamela Danese, University of Padova, Italy
Laura Macchion, University of Padova, Italy
Andrea Vinelli, University of Padova, Italy
Guido Zilli, Dani Group, Italy

The aim of this research is analyzing how supply networks operating in the tanning industry can be redesigned to make production processes efficient and environmentally safe. Very strict environmental laws force tanning companies to regulate sewage water reuse and purification, and reduce the chemicals used in production. These laws motivate the search for new tanning technologies that comply with the standards of emission required by the environmental legislation. An action research project developed in collaboration with Dani Group, one of the largest Italian tanneries, is conducted to understand how the supply network of a tanning company could be redesigned, in order to reduce the environmental impact of tanning production processes. Preliminary findings provide new insights on how increased collaboration among leading supply chain partners allows implementation of innovative technologies that show a low environmental impact, on the one side, and help to reduce throughput time, on the other.

150 Saturday, 01:30 PM - 03:00 PM, Naples 4 *Track:* CSC, 7 *Chair:* Lihua Chen
Session: Coordination and Information Sharing

020-0485 Feasibility of Vendor Inventory Management (VMI) Implementation among Firms within the Same Corporate Group

Jackson da Silva, UNINOVE, Brazil
Rosangela Vanalle, UNINOVE, Brazil
Milton Vieira Junior, UNINOVE, Brazil

An efficient integration of the supply chain has become a critical factor for companies to remain competitive. To achieve this objective, the organizations seek new technologies and business initiatives that generate lower costs, optimize the supply process and manage their inventories in a more automated way. One of these business initiatives is the VMI (Vendor Managed Inventory), in which the supplier is responsible for keeping inventories at adequate levels for the client, generating multiple benefits for both. The aim of this paper is to verify the feasibility of implementing a VMI system between firms within the same corporate group or business unit, checking for technical advantages, economic and competitive outcomes through a case study conducted in a large multinational conglomerate company.

020-0647 Coordination via Price Self-adaptive Strategy for High-tech Manufacturers

Lihua Chen, Peking University, China
Zhongyi Liu, Peking University, China

In this research, we design a capacity reservation contract with price self-adaptive strategy for high-tech manufacturers and OEM customers in order to achieve the centralized decision by exploiting the Stackelberg model. We use the manufacturer's price-making priority to adjust the customer's reservation decisions automatically so that they could share the market risk. Firstly, we examine one high-tech manufacturer and one OEM customer system, then extend to the system with one high-tech manufacturer and more than one OEM customer whose reservations and orders look like the high-tech manufacturer's virtual capacity pool inside which they are both competing for orders and sharing their reservations. Then, we use the bilevel optimization methods to get the Stackelberg equilibriums of both systems. Finally, in addition to finding the characteristics of the capacity pool, we make a comparison between our proposed contract and a well-known contract used in supply chain management.

020-0638 Horizontal Information Sharing in the Cluster Supply Chain

Lihua Chen, Peking University, China
Wei Wang, Peking University, China
Tianxiao Gong, Peking University, China
Bin Xu, Peking University, China

Cluster supply chain is a supply chain network system based on the industry clusters, which had developed rapidly in theory and practice in China recently. Characteristics of the cluster, such as geographical proximity and the existence of social networks, enable its participants to communicate quickly and obtain large amount of information. However, the fierce competition between these homogeneous companies within the cluster often leads to the pollution of the information transmission environment by outdated, overlapped, or false information. This paper studied the horizontal technical information sharing problem in the cluster supply chain based on the Cournot competition model. Unlike prior studies' conclusion that there is no incentive for companies with horizontal competition to voluntarily share their private information, our analysis showed that information sharing can be achieved between companies within the cluster through the reputation mechanism and cooperative innovation mechanism.

020-0622 VMI Based on Information Sharing in Cluster Supply Chain

Lihua Chen, Guanghua School of Management,Peking University, China
Liying Wang, Guanghua School of Management,Peking University, China
Jian He, Guanghua School of Management,Peking University, China

Nowadays, industrial cluster has become a worldwide economic phenomena. For better responding to the uncertain markets, one or some enterprises try to integrate some resources in supply chain due to the cluster environment. In this paper, we design a vertical information-sharing model for VMI in cluster supply chain and get an optimal solution under three level of full information sharing. We then propose a VMI model with which one or some enterprises integrate and manage the clustered inventory resources based on information-sharing mechanisms. With the model, we show that three levels of full information sharing is more beneficial to VMI in cluster supply chain. Finally, we perform some numerical experiments to compare the profits of the whole supply chain in the different scenarios assumed.

020-0617 Properties of Supply Chain with Resource Pool

Lihua Chen, Peking University, China

With complicated political and economic environments in China, one or some enterprises can integrate and control some resources which usually form a network. We refer the resource network as resource pool and the corresponding supply chain as the supply chain with resource pool. In the paper, we will present that:(1) The supply chain with resource pool will be one of main supply chain structures with China. (2) The supply chain with resource pool can be mainly classified into 4 types--contract-based, relational, responsibility-based and institutional. (3) The responsiveness to markets of the supply chain with resource pool can be sped up. (4) The production capacity and scale can be virtually expanded with the resource pool. (5) The uncertainty of markets is reduced with resource pool. (6) A dominant company with resource pool can develop a better ability to exert influence over other members in the supply chain than usual.

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151 Saturday, 01:30 PM - 03:00 PM, Naples 6 *Track:* CSC, 18 *Chair:* Kamalini Ramdas

Session: Supply Chain in Developing Economies

020-0776 A Platform to Share Information and Gain Visibility of Transportation Processes in Colombia's Supply Chain

Julian Lasso, Center for Latin-American Logistics Innovation (CLI), Colombia
Camilo Soto, Center for Latin-American Logistics Innovation (CLI), Colombia

In Colombia, freight companies do not have complete and integrated traceability of the vehicles during the transportation and distribution processes. This situation is mainly generated by the existence of a large number of information providers, dearth of use of ICTs (Information and Communication Technologies), and lack of cooperation between the parties to share data that support the decision processes. This paper presents a collaborative platform that integrates the information of the transportation and distribution processes of the supply chain, formalizing the communication channel between parties and generating opportunities to reduce costs. This platform is based on three technologies: RFID, GPS/GPRS, and cellular communication. The benefits are measured through several operational indicators such as waiting times and load/unload times. A case study of a Colombian third party logistics is provided to illustrate the methodology.

020-1049 Inventory Monitoring in Micro-Retailing

Margaret Pierson, Harvard Business School, United States
Garrett van Ryzin, Columbia Business School, United States

Micro-retail supply chains in developing economies face many operationalchallenges. One major concern of manufacturers is the lack of visibilityinto product availability at the store level and the consequences forlost sales. We propose a novel method for estimating out-of-stock statususing only sales transaction data. The method is tested on data from apilot project using handheld point-of-sale technology at micro-retailersin Colombia.

020-0805 Identifying Strategies to Align Complex Potato Supply Chains with the Objectives of Bogota's Mayor's Food Supply & Security Master Plan

Andres Baquero, Center for Latin-American Logistics Innovation (CLI), Colombia
Gonzalo Mejia, University of Los Andes, Colombia

Since 2006, the local government of Bogota (Colombia) has been executing the actions included in the Food Supply and Security Master Plan, an initiative that seeks to improve overall food intake and quality in the city, particularly for low income groups. These actions, though executed independently of one another, should contribute to the creation of a new food supply system that efficiently fulfills the food and nutrition needs of the citizens. This paper discusses possible outcomes of the Master Plan's current execution strategy, based on the analysis of a system dynamics model of the supply chain that provides potatoes to the city. The paper concludes with some recommendations on how a few changes to the strategic and institutional arrangements may improve the pace at which the Plan achieves its goals.

020-0951 Impact of a New Information Service on Product Supply Chains in India

Christopher Parker, London Business School, United Kingdom
Nicos Savva, London Business School, United Kingdom
Kamalini Ramdas, London Business School, United Kingdom

Traditionally, Indian farmers, unlike farmers in more industrialized economies, have had little information base on which to decide where to take their produce to sell, and when, resulting in inefficient markets and wasted produce. A new information service offered by Reuters in India provides farmers with prices of crops at nearby wholesale markets and other information via daily cell phone text messages. We examine how this service has affected farmers' selling behaviour and market outcomes, and whether these effects vary systematically with crop and supply chain characteristics. We use information on daily market prices and volumes at wholesale produce markets for a wide range of crops over time, signup for this service, location of subscribers and markets, and crop characteristics. Understanding the impact of this information service has implications for organizations that are using information as a way to reduce inefficiencies in rural supply chains.

155 Saturday, 03:30 PM - 05:00 PM, Tuscan 1 *Track:* HOM, 22 *Chair:* Mark A. Vonderembse
Session: CHOM Best Paper Award Session

020-1074 Design and Optimization Methods for Elective Hospital Admissions

Jonathan Helm, University of Michigan, United States
Mark Van Oyen, University of Michigan, United States

Dysfunctional elective hospital admission policies drive highly variable occupancy, negatively impacting safety, cost and access. We use a Poisson-arrival-location and a new deterministic-arrival-location model to analytically characterize patient flow for incorporation into a mixed integer program to, for the first time, optimize elective admissions to control and smooth hospital occupancy.

020-1075 Effect of Multi- Tasking on Worker Productivity

Diwas Kc, Emory University, United States

We examine the effect of multi-tasking on worker productivity and output quality using micro-level operational data from a busy emergency department. By drawing on recent findings in the experimental psychology literature and the nascent work in cognitive neuroscience we develop several hypotheses for the effect of multitasking on worker productivity. We find that the level of multi-tasking is driven by the level of system workload, as well as the number of physicians concurrently on staff. Multi-tasking also has implications for the service encounter, including patient flow time and quality of care. Finally, we find that multi-tasking increases the productivity up to a certain extent. After this limit is exceeded, there are decreasing returns to productivity.

020-1076 Now or Later? How Clinic Capacity Management and Patient Treatment Adherence Affect HIV Incidence

Jessica McCoy, Stanford University, United States
M Johnson, Dartmouth University, United States

The health delivery supply chain in a resource-limited region potentially creates or removes barriers for patients seeking regular treatment. For example, the funding and capacity development strategy of a clinic has an impact on the progression of an epidemic in the catchment area. We develop an optimization model to help a clinic maximize the number of infections averted in its catchment area by controlling the creation of treatment slots in each period. Since adherence to HIV treatment is a predictor of viral suppression and impacts transmission rates, we model the impact of adherence behaviour on capacity decisions. We find that a constant adherence function leads to unrealistic funding allocation strategies, and that if the clinic instead uses a linear adherence function, it will develop a more balanced funding strategy.

020-1073 Patient Streaming as a Mechanism for Improving Responsiveness in Emergency Departments

Soroush Saghafian, University of Michigan, United States
Wallace Hopp, University of Michigan, United States
Mark Van Oyen, University of Michigan, United States

We analyze a new patient flow design in which ED beds and care teams are segregated and patients are streamed based on predications of their final disposition. We investigate whether streaming can improve the performance of EDs, where it is effective, and how it should be implemented for maximum performance.

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156 Saturday, 03:30 PM - 05:00 PM, Tuscan 2 *Track:* GOS, 3 *Chair:* Martin Lockström
Session: Global Sourcing

020-0326 Cooperative Purchasing in SMEs: Evidence from China's Retail Sector

Wantao Yu, School of Applied Management & Law; Buckinghamshire New University, United Kingdom

This paper investigates the typical advantages of cooperative purchasing for SME retailers and critical success factors for managing a purchasing group, using a case study of a purchasing group established by four Chinese SME retailers. The case study identifies that a successful purchasing group can help SME retailers to survive in today's competitive marketplace. The main advantages of cooperative purchasing for SME retailers are lower purchasing prices, quality improvement and information sharing. The success factors for SME retailers to manage a purchasing group are similar characteristics of group members, similar personality traits of top executives, trust and effective communication among group members, and organizational cultural integration. This seems to be the first empirical study to investigate the practices of cooperative purchasing in SMEs in China's retail sector.

020-0097 The Role of Resources and Capabilities in Global Sourcing: An Empirical Study Using Structural Equation Modeling

Martin Lockström, China Europe International Business School, China

This study empirically investigates how firm-specific capabilities and resources acquired through global sourcing activities affect process performance. The underlying research model was based on the resource- and capability-based view of the firm. In order to test the model, an empirical study was conducted through structured telephone interviews with Chief Procurement Officers and Purchasing Managers of 200 large-sized companies in five European countries. The results showed that process performance was strongly influenced by the level of external resources in control, which in turn were very strongly related to the extent of global sourcing capabilities of the firm. The overall conclusion is that global sourcing capabilities help firms in getting access to a larger resource pool, which in turn positively affects performance in terms of effectiveness and efficiency.

020-0618 Analysis of Strategic Decisions and the Export Performance of Industrial Companies

Cristina Crespam, Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul, Brazil
Flavia Scherer, Santa Maria Federal University, Brazil
Clandia Gomes, Santa Maria Federal University, Brazil

The study aims to characterize the profile of exporting companies in the state of Rio Grande do Sul, in Brazil, and present their strategic decisions and performance with regard to foreign markets. A descriptive research was conducted with the application of a survey, and the results show that the most companies have identified themselves as prospectors in regard to strategic positioning. This shows that companies believe that they are venturing into investments that will make them become pioneers in the market, which is characteristic of companies that have a continuous interest in the search for market opportunities and regularly experience potential responses to emerging environmental trends. This result seems to confirm that companies that internationalize their operations are those who continually seek new opportunities. As it is usual for pioneering companies that continuously engage in the search for new opportunities, the loss in profitability is one of its main characteristics.

020-0975 Vehicle Routing Applied in Automatic System Order Proceedings - Application in Multinational Telecommunications

Ana Carolina Dias Jordan, Universidade Nove de Julho, Brazil

Elesandro Baptista, Universidade Nove de Julho, Brazil
Milton Vieira Junior, Universidade Nove de Julho, Brazil

Automated routing processes have become in recent years one of the areas of research of great theoretical and practical development around the world, in terms of operational and mathematical modeling. Research and development of new models for solving this kind of problem which allow a more realistic representation of the process involved has contributed to increasing the efficiency, effectiveness and level of services of moving people or equipment. Therefore, this article aims to demonstrate a real case using the theory of routing to optimize the deployment of telecommunications technicians in servicing customers, using a system of georeference adapted in several Latin American countries, according to the particularities of each geographical area. The results of the functionality presented brought financial gains and efficiency in the relocation of the technicians. It was concluded that this case can be used as a benchmark for other companies and institutions that need to optimize the logistics of their actions.

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157 Saturday, 03:30 PM - 05:00 PM, Tuscan 3 *Track:* SCH, 4 *Chair:* Mili Mehrotra
Session: Novel Scheduling Applications in Manufacturing and Service Operations

020-0066 Impact of Inventory Status on the Recommender Systems for Subscription-based Rental Systems

Emre Demirezen, Texas A&M University, United States
Subodha Kumar, Texas A&M University, United States
Milind Dawande, University of Texas at Dallas, United States
Vijay Mookerjee, The University of Texas at Dallas, United States

We consider a subscription-based rental organization. Netflix and Blockbuster are canonical examples. In these environments, the satisfaction of customers depends on the availability of the requested products. Hence, it is important for these firms to satisfy as much demand as possible. Recommender systems, in a DVD-rental context, are typically used to help customers in finding the right movies for them. However, offering relevant movies is not the single objective for these firms. Recommendations can be utilized to shift the demand among movies considering the inventory level and future demand to increase profitability. We address this issue by incorporating the inventory status in the recommendation process. We formulate a nonlinear MIP for this problem, show the NP-hardness, and propose an efficient heuristic. We present several analytical results that could be utilized by the managers. Our results also show that the proposed approach may improve profitability of the rental firms substantially.

020-0533 Analysis of Revenue Maximization Under Two Movie-Screening Policies

Tharanga Rajapakshe, University of Texas at Dallas, United States
Milind Dawande, University of Texas at Dallas, United States
Chelliah Sriskandarajah, University of Texas at Dallas, United States
Inna Drobouchevitch, Korea University, Korea, Republic of (South Korea)

We consider the problem of the selection and screening of movies for a multiplex to maximize the exhibitor's cumulative revenue over a fixed planning horizon. The release times of the movies that can potentially be selected during the planning horizon are known a priori. If selected for screening, a movie must be scheduled through its obligatory period, after which its run may or may not be extended. We investigate two basic and popular screening policies: preempt-resume and non-preempt. We show that optimizing under the preempt-resume policy is strongly NP-hard while the problem under the non-preempt policy is polynomially solvable. We develop efficient algorithms for the problem under both screening policies and show that the revenue obtained from the preempt-resume policy can be significantly higher as compared with that from the non-preempt policy.

020-0103 Inventory Models for Medium-size Depository Institutions Under the New Federal Reserve Policy

Yunxia Zhu, The University of Texas at Dallas, United States
Milind Dawande, The University of Texas at Dallas, United States
Chelliah Sriskandarajah, The University of Texas at Dallas, United States

We study two new multi-period models -- designed specifically to capture the operations of a medium-size Depository Institution -- that emerge from its objective to minimize the total cost incurred in managing the inventory of cash over a finite planning horizon under the new Federal Reserve policy. We develop several managerial insights from a comprehensive test bed and demonstrate a procedure to easily adapt the optimal solutions based on projected data to near-optimal real-time solutions.

020-0488 A Heuristic with an Improving Method to Solve Larger Scale Shipper Collaboration Problems

Rafael Rosin, Escola Politécnica da USP, Brazil
Enrico Ferri, Escola Politécnica da USP, Brazil
Hugo Yoshizaki, Escola Politécnica da USP, Brazil

More efficient transport operations reduce costs and greenhouse gas emissions. Collaborative Transportation can help in achieving this goal. For full truck load operations, companies may come together to minimize truck repositioning (deadheads). To find out lanes from different shippers which minimize deadheading, the Cardinality Constrained Lane Covering Problem (CCLCP) can be used: given a set of lanes, the goal is to cover them through closed loops such that the cardinality of the cycle is respected (maximum number of lanes and deadheads). This problem is NP-Hard and heuristics have been proposed with satisfactory results and times. This paper presents a new local search heuristic. The local search uses previous constructive heuristics to find an initial solution. Its results are compared to literature, with gains up to 7% better when compared to former methods, and was able to solve all sets of instances in reasonable times.

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158 Saturday, 03:30 PM - 05:00 PM, Tuscan 4 *Track:* ESO, 8 *Chair:* Marios Bisilkas
Session: Carbon Footprint I

020-0406 Management Involvement in the Adoption of Energy Efficiency Projects

Vered Doctori-Blass, UCLA, United States
Magali Delmas, UCLA, United States
Charles Corbett, UCLA, United States
Suresh Muthulingam, Cornell University, United States

The Energy-Efficiency literature grapples with the question "Why are many profitable energy-efficiency opportunities not adopted?". Substantial research using different perspectives has attempted to address why profitable energy-efficiency opportunities are often overlooked. However, the role of the decision maker in an organization on the adoption decision has been largely unexplored. In this study, we investigate how the involvement of managers in the energy assessment process influences the adoption and rejection of energy-efficiency improvement opportunities.Our results suggest that adoption of energy efficiency improvement opportunities is influenced by who leads the assessment and implementation efforts. We further evaluate potential barriers to adoption such as organizational barriers. Our findings shed new light on the involvement of managers in the adoption of energy saving opportunities.

020-0822 Squeezing the Balloon: Carbon Leakage Under Regionally Asymmetric Emissions Regulation

David Drake, INSEAD, France

Existing emissions regulation applies carbon costs to domestic production only - imports entering the region fall outside the regulatory regime. This regulatory asymmetry provides facilities located off-shore with a substantial cost advantage, potentially enabling foreign competitors to further penetrate the emissions regulated market. We study this unintended consequence of emissions regulation, termed carbon leakage, through two-stage Cournot competition with a domestic (emissions regulated) and offshore (not emissions regulated) firm vying for the domestic market. Firms select capacities in stage one, uncertainties realize between stages, and firms execute their production decisions in stage two. A second version of the model provides a comparative baseline by applying a border adjustment to offshore production. Performance is assessed in terms of domestic and “global” clean and dirty technology shares, as well as associated impacts on domestic and “global” emissions intensity.

020-0620 Services as an Alternative Path to Sustainability

Marios Bisilkas, Zaragoza Logistics Center, Spain

Management literature suggests that product manufacturers should integrate services into their core product offerings, as the financial performance of their company is expected to be substantially improved by enjoying a triple beneficial effect: higher profit margin, coming from more transactions, with less uncertainty. Since this expectation already fulfills one of the three aspects of sustainability - financial performance - we raise the question of whether the other two aspects (social and environmental performance) can be concurrently improved. If such a condition is true, transition to a services-oriented business model could constitute an alternative path to sustainable operations. The interactions between the three components of sustainability can play a decisive role in the final viability of the new approach, as they can moderate or intensify the expected financial flows. Identifying the nature of the interactions will allow us to transform the dangers of a holistic sustainability approach to an attractive business opportunity.

020-0844 Determinants of Disclosing GHG Emissions in the Supply Chain

Chonnikarn Jira, Harvard Business School, United States
Michael Toffel, Harvard Business School, United States

Organizations that have launched initiatives to reduce greenhouse gas emissions in their own operations often begin by seeking to measure the GHG emissions of their suppliers, both to assess the suppliers' vulnerability and to identify opportunities to engage in mutual GHG and cost reduction. However, little is known about the circumstances that encourage or deter suppliers from sharing GHG emissions information with their buyers. Our paper examines the extent to which suppliers agree to requests by their buyers to reveal their GHG emission levels and their reduction strategies. We focus on three types of determinants of disclosure: the characteristics of the supplier-buyer relationship, the supplier’s institutional context, and the supplier’s organizational and competitive context. We test our hypotheses using data from the Carbon Disclosure Project’s Supply Chain Project, a collaboration of multinational corporations to request information about GHG emissions levels and reduction strategies from their key suppliers from around the world.

159 Saturday, 03:30 PM - 05:00 PM, Tuscan 5 *Track:* OEE, 6 *Chair:* Luiz Alves Daniel Arias-Aranda
Session: Operations in Small-Medium Enterprises

020-0994 The Use of Performance Indicators for SMEs: A Brazilian Experience

Eric Dorion, UCS, Brazil
Eloíde Pavoni, UCS, Brazil
Arcenildo Da Silva Nunes, UCS, Brazil
Adrieli Alves Pereira, UCS, Brazil
Eliana Severo, UCS, Brazil

Micro and Small Enterprises represent approximately 98.4% of private enterprises in Brazil. Those small businesses are placed in a highly competitive environment and they need management practices to pursue greater competitiveness, resulting in a demand for performance indicators that can better assist entrepreneurs in small business management. The aim of the research is to verify if the Micro and Small Enterprises (SMEs) associated with the MICROEMPA association of Caxias do Sul, Brazil, use performance indicators and what are these specifically. The research is exploratory with a descriptive study. The sample was completed with 42 companies from a universe of 561 companies. The results show that the majority of companies use performance indicators to monitor the management of the business, but nevertheless, a small proportion of existing indicators are being used by SMEs.

020-0691 Corporate Governance for a Brazilian Small Company: A Management View

João Santos, Methodist University, Brazil
Clovis Galdino, Methodist, Brazil
Getulio Akabane, FATEC SP, Brazil

This study aims to present the results of exploratory research on the perception of managers of Small and Medium Enterprises - SMEs in the Brazilian context. The adopted methodology was case study conducted through in-depth interview in a small company located in the city of Sao Bernardo do Campo - Brazil. The survey used as the theoretical framework a search performance model of Corporate Governance presented by Weill and Ross (2004). The results suggest that from the CEO point of view, the mechanisms of corporate management and IT are working properly because decentralization implemented there induces employees' empowerment. With these results, it is also clear that not all SMEs can build a system of proper governance, and it causes many problems for such companies, which have centralized all administrative functions in one or a few members of the organization.

020-0188 Cluster Formation to Improve Operations, Performance, &Technical Training for Small and Medium-sized Businesses in the Metalworking Sector

Luiz Alves, Universidade Federal de Juiz de Fora, Brazil
Messias Silva, UNESP- Faculdade de Engenharia de Guaratinguetá, Brazil
Gabriela Almeida, IFSUDESTEMG, Brazil
Klissian Reis, IFSUDESTEMG, Brazil
Arthur Alves, Universidade Federal Fluminense, Brazil

In an emerging economy, one of the difficulties encountered by companies in their operation and growth is the lack of trained technical personnel to absorb and apply new technologies. One solution to this problem can be found in the formation of a cluster of companies in the same segment, with one of these companies acting solely to provide technical services and support for improvement of operations, quality, management, and training. This paper describes the project of creating a technical services company that supports a cluster of small businesses in the metalworking sector in southeastern Brazil. In the development of this work, an environmental assessment was initially carried out using Michael Porter’s model, and based on the outcome of this evaluation, a SWOT analysis was employed to define the company’s operational strategy. The projected operating and financial results, and the responsiveness and partnership among the companies in the cluster, were excellent.

020-0018 Information Technology Implementation Success within SMEs in Developing Countries: An Interactive Model

Morteza Ghobakhloo, University of Granada, Spain
Daniel Arias-Aranda, University of Granada, Spain
Jose Benitez-Amado, University of Granada, Spain

Many researchers have produced a large body of research addressing factors that affect the success of information technology (IT) adoption in organizations. However, the relative importance of these factors in the context of small and medium-sized enterprises (SMEs) in developing countries has not been investigated in depth. Drawing on prior operations management (OM) and information systems research, we conceptually develop an interactive model of IT implementation success and test it empirically in Iran, an example of a developing country. Specifically, our proposed research model and hypotheses are tested using survey data from a sample of 121 Iranian manufacturing SMEs. We find that IT adoption success is affected by users' (both CEOs' and staff's) IT knowledge and involvement, CEO support and external assistance. The implications of the findings for researchers and practitioners are discussed.

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160 Saturday, 03:30 PM - 05:00 PM, Tuscan 6 *Track:* HOC, 6 *Chair:* Nezih Altay

Session: Responding to mass casualty events

020-0274 Resilience in Humanitarian Relief

Christopher Zobel, Virginia Tech, United States
Roberta Russell, Virginia Tech, United States
Mauro Falasca, East Carolina, United States

Traditional businesses make decisions about supply chain risk and recovery from a cost, profit, or market perspective. Responses to supply chain disruptions include using alternative sources of supply, rerouting shipments, managing demand, and shifting resources. Humanitarian relief supply chains, in particular, are often subject to very high stakes, severely constrained time frames and resource availabilities, and significant operational uncertainties. It is important for these supply chains to be resilient - to be strongly resistant to the initial impact of a disaster and to be able to recover quickly and respond well to changing conditions. This paper therefore examines disaster recovery and humanitarian relief with respect to the related concepts of supply chain resilience and community resilience. A theoretical model is proposed and an analytical approach is discussed for evaluating the perceived tradeoffs in resilience and recovery decisions for each stakeholder.

020-0672 Emergency Response: Models, Formulations, and Insights

Sharif Melouk, University of Alabama, United States
Burcu Keskin, University of Alabama, United States
Ibrahim Capar, University of Alabama, United States

Traffic incidents and natural or man-made disasters can impose significant safety risks and disruptions on traffic flows. Moreover, congestion resulting from such occurrences may impede the ability of EMS to respond in a timely fashion. In this research effort, we develop an optimization-based decision tool to manage the flow of emergency responders to the site of the disruption(s). Experimentation is performed on several scenarios, and managerial insights are gleaned.

020-0711 Toward a Coordination Framework in Disaster Relief Operations – A Comparative Case Study

Chaodong Han, Towson University, College of Business & Economics, United States
Tobin Porterfield, Towson University, College of Business & Economics, United States
Sharma Pillutla, Towson University, College of Business & Economics, United States

Coordination is critical to the success of disaster relief operations due to time urgency and operational complexity. However, empirical research on coordination in the context of disaster relief operations is lacking. Grounded in systems thinking and coordination theory, this study intends to build a framework for coordination in disaster relief operations. We systematically collect archival data from major news reports on five recent relief operations - 2010 Haiti Earthquake, 2010 Chile Earthquake, 2008 China Earthquake, 2005 U.S. Hurricane Katrina and 2004 South Asia Tsunami - and conduct a comparative case study. Through identifying coordination problems and assessing mechanisms used accordingly, we expect to build a typological framework for disaster relief operations. The preliminary literature review suggests that coordination mechanisms have a strong impact on the achievement of key performance indicators and that coordination mechanism effectiveness may be specific to the characteristics of disasters and country profiles.

020-0383 The Incident Commander's Problem: The Paradox of Resource Allocation in an Agent-based System

Natalie Simpson, University at Buffalo (SUNY) School of Management, United States

A large-scale emergency response relies on a single decision-maker, the Incident Commander, to allocate a changing set of resources in resolving an equally dynamic incident. The Incident Commander creates a temporary organization from these resources, employing principles reminiscent of classical bureaucratic management theory. Paradoxically, the highly centralized operation of Incident Command often exhibits traits credited to a successful agent-based system, implying significant localized decision-making among its many participants. This exploratory study examines the general form of the Incident Commander's problem, the paradoxical central management of a distributed system. Table-top simulation is introduced as a promising research tool for observing the dynamics of temporary operations and agent-based systems, issues critical to emergency response.

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161 Saturday, 03:30 PM - 05:00 PM, Tuscan 7 *Track:* PDI, 8 *Chair:* Raul Chao Enno Siemsen

Session: Meet the Editors

020-0833 Panel Discussion: Research Priorities in Product Innovation and Technology Management

Raul Chao, Darden School of Business, United States
Enno Siemsen, University of Minnesota, United States

This panel will feature Department Editors and Senior Editors from POMS and Management Science. The discussion will touch on priorities for publishing as well as a broader dialogue about research priorities and emerging questions in Product Innovation and Technology Management (PITM). The goal of this session will be to exchange ideas, views, and opinions regarding fruitful research strategies in PITM. Audience members will be invited to participate through a Q&A session.

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162 Saturday, 03:30 PM - 05:00 PM, Tuscan 8 *Track:* ERS, 8 *Chair:* Elena Katok

Session: Tutotial on Behavioral Operations
In this tutorial I will discuss the basics of designing and conducting laboratory experiments with human subjects.

020-0524 Workshop in Behavioral Operations

Elena Katok, Smeal College of Business Administration, Penn State, United States

Laboratory experiments are used increasingly in Operations Management to test behavioral assumptions of analytical models. In this tutorial I will discuss the basics of designing and conducting laboratory experiments with human subjects. Some of the methodological topics I will cover include the effect of subject the subject pool, using incentives, deception, and context. I will also summarize some of the recent work in behavioral operations management.

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163 Saturday, 03:30 PM - 05:00 PM, Tuscan 9 *Track:* ACL, 1 *Chair:* Ian Graham

Session: Teaching OM Through Simulation and Games

020-0685 Teaching Operations Management in Virtual Worlds

Ian Graham, University of Edinburgh Business School, United Kingdom

A weakness in using computer “games” to teach operations management is that the decision process is often unlike that faced by actual managers. This paper describes the use of a simulation running in Second Life that allows learners to learn about the use of planning systems, quality management, balanced scorecard, management accounting and team working in a virtual environment that mimics reality. The simulation includes three competing factories and runs continuously. Students are allocated roles, allowing them to wander round the factories, interact with the avatars of other managers, jointly develop a strategy with co-students and make decisions through a web-site interface.The paper will use activity theory (Engestrom, 1999) to analyse the evaluation of the use of the simulation with an undergraduate operations management class. It is found that the immersive engagement of virtual worlds valuably provides a more real experience of management than conventional syndicated management games.

020-0538 The Beer Game Goes Mobile

Brad Meyer, Drake University, United States

This session will describe and demonstrate a version of the Beer Game that can be played on PCs, laptops, netbooks, or smart phones. It features a rich graphical interface that visually displays inventory and animated truck deliveries and automatically creates the bullwhip graphs at the completion of the game.

020-0907 Transportation Game: A Learning Tool for Logistics Performance Management

Alvaro Gehlen de Leao, Pontifical Catholic University of Rio Grande do Sul, Brazil

This paper describes a simulation game which was designed as a learning tool for logistics performance management. The dynamics of the Transportation Game, where various individual companies compete to provide freight services, is based on successive rounds of simultaneous bids presented in a quarterly auction. The strategy for each player consists of offering a particular price to provide freight services and to set the right capacity of the fleet, in order to maximise its own profit. The main decision - how many freight services will be purchased from each company at a certain trimester - is taken based on maximisation of the customers' benefits. During the previous years, this game was successfully applied on undergraduate courses at Pontifical Catholic University of Rio Grande do Sul, Brazil. Emerging results from this experience will be depicted in this paper, evaluating educational aspects of the use of simulation games as a learning instrument.

020-0682 Formulation and Implementation of Strategies Applied for the Decision Making Process in Business Game Simulators: A Comparison

Clovis Galdino, Methodist University, Brazil

Joao Santos, Methodist University, Brazil

Getulio Akabane, Fatec SP, Brazil

The learning process increasingly relies on recreational resources to enhance knowledge of concepts or techniques. Audio, video or simulators allow the representation of a market reality with the maximum possible variables that can be known by the participant. In this study we use play to produce knowledge in the learning process, with a simulator that represents the organizational model of an organizational environment that businesses encounter in their day-to-day. Simulators are an important organizational tool for the preparation of managers in a controlled environment (Sauaia and Wadt, 2010. The formulation of strategies by the participant always takes into account the ratio of success for the formulation of price. The strategy adopted and its implementation are considered good because it is expected that the result is better placement of their market and an increase in their profitability.

020-0161 Best-Practice Teaching With Large-scale SCM/OM Simulations

Randall Chapman, LINKS-simulations.com, United States

Large-scale integrative SCM/OM simulations represent the high-end (the “ideal”?) of the active-learning spectrum. In this presentation, the LINKS simulations author provides best-practice insights on designing and teaching successful introductory and elective operations management and supply chain management courses with large-scale simulations. Topics include: (1) Similarities and Differences between Cases and Simulations; (2) Why Teach with a Large-Scale SCM/OM Simulation? (3) Course Design in Introductory and Elective Courses (including sample course syllabi); (4) Team and Individual-Student Performance Assessment with Large-scale Simulations; and, (5) Effective Teaching throughout Simulation Events (team coaching strategies/tactics, integrating the simulation into the course with JIT teaching, and 10- to 15-minute in-class simulation-focused “tutorials”). These insights are based on the author’s simulation design experience, extensive classroom and distance-learning teaching experience, and LINKS “train-the-trainer” experience with 400+ instructors and their 50,000+ students since 1999.

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164 Saturday, 03:30 PM - 05:00 PM, Tuscan 10 *Track:* REV, 2 *Chair:* Yuri Levin

Session: Pricing in Revennue Management

020-0160 Dynamic Nonlinear Pricing of Perishable Items

Mikhail Nediak, Queen's University, Canada

Yuri Levin, Queen's University, Canada

We study the problem of optimal dynamic nonlinear pricing of perishable items under uncertain demand. This problem is faced, for example, by airlines and hotels employing dynamic pricing in the presence of group bookings. We discuss the structural properties of the pricing policies and implications for the firms.

020-0528 Loss-Leader Pricing for Multi-Product Configurations

Shiva Subramanian, IBM Research, United States

Zhengliang Xue, IBM Research, United States

Markus Ettl, IBM Research, United States

We develop a discount pricing strategy for request-for-quotes (RFQs) that is applied to multi-commodity bid configurations. A bid configuration consists of a core product, such as a server computer, and a set of accessories, such as memory and hard drives. The proposed model allows unconstrained bid execution where a buyer can selectively purchase any number of products in the RFQ. We therefore observe three possible bidding outcomes: lost bids, partially won bids or completely won bids. The core product plays the role of a loss leader, because it strongly influences the buyer’s propensity to purchase additional accessories. We analyze the cross-price elasticities between the core product and accessories, and develop a pricing strategy that maximizes the total expected profit for the

bid configuration.

020-0316 Factors Influencing the Pricing of Applications in the App Store: A Developer's Perspective

Carolina Billitteri, Università di Palermo, Italy
Ciro Antonio Enea, Università di Palermo, Italy
Giovanni Perrone, Università di Palermo, Italy

Many know that Apple Inc. owes its success in Mobile Commerce to the introduction of the new “App Store” business model. This new market is characterized by the opening to third party apps, which are distributed to consumers through the App Store. This paper investigates factors influencing the pricing of applications in the Apple Mobile Application Store. By reviewing the existing literature and by analyzing the way the App Store is working, we detect three main factors that could influence prices for apps that is: developer’s market power, two-sided network externality and developer’s product specialization. In order to test our hypotheses, an empirical analysis on data of 68.220 apps downloaded from the Italian version of App Store has been carried out. Regression results support our hypotheses. This work may have important managerial implication for the thousands of developers that are competing in this emerging market.

165 Saturday, 03:30 PM - 05:00 PM, Tuscan 11 *Track:* SOM, 6 *Chair:* Hua-Hung Weng
Session: Variability, Risk and Recovery

020-0527 Managing Variability in Service Operations: The Role of Improvisation

Enrico Secchi, Clemson University, United States
Aleda Roth, Clemson University, United States

An important concern of service operations strategy and design is the impact of customer-induced variability in the service encounter on the delivery processes. One tenet of service operations is that the service delivery system should be designed to reduce such variability. In contrast, others are recognizing that the service provider must respond appropriately to customer behaviors that create deviations from the expected processes. In the words of Ashby (1958), designers have to build into the system the requisite variety to respond to such disturbances. However, in many environments, the number and diversity of disturbances can be too large to plan ahead for in detail. In such circumstances, the success of service encounters is determined by the ability of the contact personnel to "improvise" an effective response. This presentation develops these ideas and presents an empirical model of the service design antecedents of an improvisation capability and its outcomes.

020-0144 Fraud Detection

Bill Figg, Dakota State University, United States

The inability of external auditors to detect material misstatements, particularly intentional misstatements, may expose the external auditors to litigation. According to the context theory of classification judgments are assumed to be derived exclusively from stored exemplar information. This theory suggests that the judgment of an individual is influenced by his/her prior knowledge of a particular matter. Within this context, it is expected that an external auditor’s judgment regarding the existence of fraud in the audit client’s financial statements is influenced by his/her knowledge of the level of fraud risk of a particular audit situation. This paper aims to examine the moderating effect of the contextual fraud risk level on the relationship between the external auditors’ ability to assess fraud risk and their ability to detect the likelihood of fraud. The risk level has a significant effect on the relationship between the external auditors’ ability to assess fraud.

020-0305 Service Recovery: A Blessing in Disguise?

Siti Zakiah Abu Bakar, Southern Illinois University Carbondale, United States
John Goodale, Southern Illinois University Carbondale, United States

The simultaneous production and consumption characteristic of service means that errors at the service provider-customer interface will be influential factors in determining a customer’s satisfaction and continuing patronage. Realizing the inevitability of errors, service providers incorporate recovery strategies and procedures into their service operations. Given the increasing role of service recovery activity in organizations, we examine two important research questions: 1) can service recovery act as an antidote to service failure? and 2) how does compensating the customer impact satisfaction following a service failure? Specifically, this study investigates the moderating effect of compensation on the relationship between perceived justice and service recovery satisfaction. In addition, the study examines the moderating effect of compensation on the relationship between the magnitude of failures and service recovery satisfaction. We will use critical incident technique (CIT) to observe the relationships in the study. The implications of our findings will be presented and discussed.

020-0905 The Application of Contrast Effects on Service Recovery Design

Hua-Hung Weng, Yuan Ze University, Taiwan, Republic of China
Chin-Yu Kao, Yuan Ze University, Taiwan, Republic of China

This study investigates whether the application of contrast effects on service recovery can increase customer satisfaction after recovery. Contrast effects, found in behavioral science, indicate that humans evaluate one objective according to whether this objective stands alone or with other objectives. Past research in service recovery found that compensations provided by service companies have a positive impact on customer satisfaction. Contrast effects applied in service recovery design suggest that companies might increase customer satisfaction by providing recovery choices without increasing their cost. Collected in Taiwan, data shows that customers are more satisfied after recovery if they are provided with comparable recovery choices. In conclusion, suggestions are provided for service companies to properly design their service recovery practices by applying contrast effects.

166 Saturday, 03:30 PM - 05:00 PM, Roma 1,2 *Track:* NCC, 5 *Chair:* Sudheer Gupta
Session: Session 5

020-0510 Supplier Governance and the Outsourcing Lifecycle

Keith Rogers, Queen's University, Canada
Chialin Chen, Queen's University, Canada

This paper develops a model describing an outsourcing firm’s choice of relational vs. contractual governance in an environment where contract strength increases with organizational learning and markets respond dynamically to cost and profit signals. The model demonstrates how improved contract strength can impact not only an individual firm’s supplier governance strategy, but also the structure of the outsourcing market. It predicts that outsourced activities move through a lifecycle starting with a stable number of buyers and suppliers operating under relational governance. When organizational learning yields sufficiently strong contracts, the market enters the next phase, where contractual governance replaces relational governance and the market expands quickly. Finally, as the buyer side of the market becomes saturated, the model predicts a contraction in the number and profitability of suppliers. The integration of contract learning, market dynamics and governance choice provides new insights into the evolution of supply-chain relationships.

020-0751 Strategic Inventories and Supply Chain Structure

Sudheer Gupta, Simon Fraser University, Canada

We explore competing manufacturers' incentives to sell through independent retailers in a dynamic setting where retailers can carry inventories forward. We show that in equilibrium, retailers will always carry inventories as a credible source of competition for the manufacturers, even in the absence of traditional reasons for inventories. This strategic behavior by retailers drives prices down over time hurting manufacturer and supply chain profits. The presence of strategic inventories in a dynamic setting (an effect that has recently been explored in the Operations literature) counters the benefits of strategic decentralization as a 'buffer' against competition (an effect that has been extensively studied in the Marketing literature). We show how the intensity of competition between competing supply chains and the ease of carrying inventories forward (i.e., holding costs incurred per unit) affect prices, profits and equilibrium supply chain structure. Several extensions of this basic model are explored.

020-0341 Product Differentiation Decision with Strategic Customers

Wenqing Zhang, McGill University, Canada
Shanling Li, McGill University, Canada
Dan Zhang, McGill University, Canada

The purpose of many voluntary CSR practices in the food and beverage industry is to encourage healthier dietary choices and lifestyles. Customers' responses may have a broad impact on operational decisions of food and beverage companies, spanning from pricing to product decisions. We study how customers' behavior (myopic or strategic) affects a firm's product offering and pricing decisions. We also investigate how such decisions affect consumer welfare.

020-0375 Impact of Asymmetric Inventory Information on Dynamic Supply Chain Decision Making

Yuyue Song, Memorial University of Newfoundland, Canada

We consider a supplier-buyer chain where the single supplier sells a single product to a downstream buyer over a two-period selling season. In each period, the supplier offers a contract term to the buyer, then the buyer will decide the retail price and the order quantity from the supplier. We assume that the initial inventory level in the first period at the buyer's location is zero and it is a common knowledge to both parties, but the initial inventory information in the second period at the buyer's location is only available to the buyer, not the supplier. Our goal is to investigate the impact of this asymmetric inventory information on the dynamic supply chain decision making.

020-0942 Analysis of Reducing Inventory Inaccuracy with RFID Technology

Tijun Fan, School of Business, East China University of Science and Technology, China
Wen-Chyuan Chiang, Department of Finance and Operations Management, The University of Tulsa, American Samoa
Sheng Deng, School of Business, East China University of Science and Technology, China
Chi Ren, School of Business, East China University of Science and Technology, China

Inventory inaccuracy is expensive and is prevalent in many industries. Radio Frequency Identification (RFID) technology has been publicized as a promising solution. Many retailers start to push their suppliers to adopt this technology. This paper considers the situation of a retailer subject to inventory inaccuracy due to shrinkage and misplacement. We apply a Newsvendor model to analyze how to reduce inventory inaccuracy by deploying RFID technology. We study three scenarios of inaccuracy of inventory that affect retail operations: (1) shrinkage, (2) misplacement, and (3) the combination of shrinkage and misplacement. We analyze inventory inaccuracy problems by optimizing the order quantities and the expected profits in consideration with the effect of order fill rates, RFID read rate improvement, the tag price and inventory inaccuracy rate, respectively. The results show that whether the retailer should deploy the RFID technology depends on the relative values of order fill rate and inventory inaccuracy rate.

167 Saturday, 03:30 PM - 05:00 PM, Sorrento 1,2 *Track:* QPJ, 7 *Chair:* Suzana Souza Santos
Session: Session 7: Business Process Improvement

020-0416 Quality Evaluation of Brazilian National Health System (SUS) through a Healthcare Program for Pregnancy - "Mãe Paulistana"

Andréa Malanga, Universidade Paulista, Brazil
Suzana Souza Santos, Universidade Paulista, Brazil

Over the past decades, one of the main objectives of the Brazilian National Health Network System has been trying to improve management in order to provide quality services. The Public Health Model of the State of Sao Paulo involves an integrated network composed of General Practitioners, Ambulatory Care, Hospitals and Laboratories. This multiple case research aims to evaluate the quality services provided by SUS, through the patient perspective of high risk. This research proposes to contribute to identifying potential problems that could be solved to improve the quality of services provided by the service network, and captures important aspects of the quality by the perception of these patients both by its service units, as well as by the whole regional network.

020-0923 Improving Quality in the Medical Transcription Process

Abey Kuruvilla, University of Wisconsin Parkside, United States
Jordania Leon-Jordan, University of Wisconsin Parkside, United States
Pradeep Jain, ICTECT, United States
John Paul Surdo, University of Wisconsin Parkside, United States
Andrea Westland, University of Wisconsin Parkside, United States

With annual projections upward of $16 billion, the medical transcription industry is a very lucrative one. The medical transcription process is prone to errors based on the current methods being used. The acceptable quality standard for the medical transcription industry is 98 percent accuracy. The quality of reports is the most important attribute in the medical transcription industry. There is scope for improvement with respect to efficiencies and accuracy. We propose that better accuracy can be achieved without the need of higher ongoing costs, but rather by making an initial investment in technology which will give the transcription industry better control over the quality of the documents they are producing resulting in substantial return on investment. We introduce Intelligent Content Plug-In Software that could result in reduction of manpower, leading to savings. Furthermore, medical facilities will save on lawsuits, as a result of reduced medical errors.

020-0874 Application of BPM (Business Process Management) for Optimizing Business Processes

Antonio Rios, Faculdade de Tecnologia de São José dos Campos, Brazil
Carlos Nunes, Faculdade de Tecnologia de São José dos Campos, Brazil
Philippe Pinto, Faculdade de Tecnologia de São José dos Campos, Brazil
Marcos Gonzaga, Federal University of the State of Rio de Janeiro, Brazil

The competitiveness of companies has demanded a greater ability to cope with frequent adjustments to changes. Integration solutions and optimizing business processes result in products or services that are more competitive. Organizations need to have a unified global view of all processes. The increasing complexity of the demands of customers and many suppliers has raised a new standard for process modeling, Business Process Management (BPM), which streamlines the process of adaptation to changing business and makes business goals more visible through monitoring executions of processes. This study examines the

practical application of the concepts of BPM in a company that provides logistics services from the original situation, highlighting the shift points in one of its processes in order to modify the shape of the operation and maximize the use of its resources - human, technological and financial.

168 Saturday, 03:30 PM - 05:00 PM, Sorrento 3,4 *Track:* SAP, 6 *Chair:* Damien Power
Session: Strategic Sourcing and Procurement

020-0614 Procuring Complex Performance (PCP)

Nigel Caldwell, University of Bath, United Kingdom
Mickey Howard, University of Exeter Business School, United Kingdom

From the 1990s and highly influenced by perceived Japanese practices, procurement has been a strategic function in the adoption of end-to-end supply practices. Much of the work on supply chain management and procurement has, however, been in fast-moving, high-turnover and often consumer-facing markets. In B2B markets, large scale multi-decade projects such as major civil engineering or design projects have received less procurement attention. In addition, organisations are increasingly offering product/service offerings, and obtaining high revenue percentages from non-product offerings. Apparently new contractual forms are emerging that emphasise the outcome or the performance required from the contract rather than tight specification of how the outcome is to be achieved. Examples include power by the hour in aviation, contracting for availability, and performance based contracts. Procuring complex performance (PCP, Caldwell & Howard, 2010) is a new area studying how to procure these increasingly servitised offerings.

020-0607 Opportunistic Behavior in Outsourcing Arrangements: Towards a Better Understanding

Ananya Bhattacharya, The University of Melbourne, Australia
Prakash Singh, The University of Melbourne, Australia
Damien Power, The University of Melbourne, Australia

A major problem in many outsourcing arrangements is the opportunistic behavior of either the service provider or service receiver. In this paper, we investigate the factors that give rise to opportunistic behavior and its consequences for both parties. We use data from a study of 51 outsourcing arrangements that large Australian organizations have entered into. The data collected was quantitative and unit of analysis was dyadic. The results show that: the opportunistic behavior suffered by the two parties are different; degree of formality and duration of contract give rise to opportunistic behavior; and the extent of outsourcing, maturity level of the function that is outsourced, the number of service providers that are available and the nature of the function (core or non-core) do not affect opportunistic behavior. These results have implications for the design and execution of outsourcing arrangement that parties develop; these are discussed in the paper.

020-0063 Transportation Outsourcing as a Form of Operations Management: A Case Study of a Mexican Manufacturing Firm

Halia Valladares, Mount Royal University, Bissett School of Business, Canada
Karla Nava, Universidad Autonoma de Tamaulipas, Mexico

In this era of global markets and intense competition, companies should focus on their core competences and concentrate their resources in innovating their main products or services. Outsourcing allows focusing on strategic competences and leaving the other details of the supply chain to external experts. The objective of this research paper is to present the literature review of transportation outsourcing based on agency theory. The paper offers eight propositions based on the literature review. Each proposition is examined based on the case study and conclusions and implications are presented. Among the findings are: there is a positive relationship between the decision to outsource transportation services and non-core activities. Additionally, the decision to outsource is favored due to cost efficiency. There is a significant relationship between uncertainty of the transportation service and the use of monitoring and performance based systems.

169 Saturday, 03:30 PM - 05:00 PM, Naples 2 *Track:* GEN, 7 *Chair:* Sean Harrington
Session: Optimization models in OM

020-0779 Condition Based Planning for Processes, Resources and Industrial Buildings

Achim Kampker, WZL, RWTH Aachen University, Germany
Bastian Franzkoch, WZL, RWTH Aachen University, Germany
Cathrin Wesch-Potente, WZL, RWTH Aachen University, Germany
Alexander Meckelnborg, WZL, RWTH Aachen University, Germany

Today, factory planning projects that include building planning are characterized by many planning participants, a high time and cost pressure and high costs of change. Existing procedures for process and resource planning and for building planning describe the planning process as deterministic and divisible in discrete phases. Both planning processes run parallel; interfaces between architect, building services engineer, and process and resource planner are insufficiently defined. Condition based factory planning, developed at WZL of RWTH Aachen University, is a modular approach for process and resource planning that can be reconfigured according to the specific project needs. In this paper, the approach is applied to the building design process. The holistic model synchronizes both planning processes and is supported by digital planning tools. The approach has been successfully deployed in an industry case in heavy duty industry that is presented in this paper.

020-0893 A Decision Analysis Matrix for Trade Studies

Roberto Lu, The Boeing Company, United States
Shuguang Song, The Boeing Company, United States
Sean Harrington, The Boeing Company, United States
Gabriel Burnett, The Boeing Company, United States
Alma Emadi, University of Washington, United States
Qicheng Zhao, University of Washington, United States
Kitirat Srichai, Univ. of Washington, United States
Adam Graunke, Univ. of Washington, United States

Trade studies are needed to evaluate different designs and manufacturing processes for a large-scale production system, such as building airplanes. The decision factors can usually be categorized into numeric and subjective decision factors. In this paper, we provide a decision analysis matrix by considering various numeric and subjective decision factors. In particular, we propose some statistical analysis and simulation methods to study uncertainty of the decision factors. The confidence intervals of the total weighted decision analysis scores are provided for the trade scenarios. The proposed decision matrix analysis is illustrated by a case study.

170 Saturday, 03:30 PM - 05:00 PM, Naples 1 *Track:* TCH, 1 *Chair:* Dana Johnson Matteo Kalchschmidt
Session: Teaching Effectiveness

020-0042 Operations Management Teaching in the United Kingdom

Des Doran, Brunel University, United Kingdom

This paper explores the nature and scope of Operations Management (OM) teaching in the United Kingdom to provide educators with an overview of pedagogy, subject content and assessment strategies for both undergraduate and postgraduate programmes. An electronic survey tool was sent to all university teachers identified as delivering an Operations Management module on undergraduate or postgraduate programmes and listed on the Universities UK website. The findings suggest that the teaching of Operations Management in the UK is characterized by similar approaches to subject content, the use of technology in teaching, learning outcomes and assessment strategies. This research is stage one of a two stage programme. Stage two will attempt to identify the OM needs of practitioners so that a clear strategy for OM alignment between academics and practitioners can be achieved.

020-0056 Assessing the Impact of Project Management Corporate Training Programs

Emilio Bartezzaghi, Politecnico di Milano, Italy
Tommaso Buganza, Politecnico di Milano, Italy
Matteo Kalchschmidt, Università degli Studi di Bergamo, Italy

This paper focuses on the analysis of the impacts of project management corporate training programs. This work aims at providing evidence regarding the impact of project management training programs by analyzing three layers at which training can be evaluated: i) perceived quality, ii) knowledge and iii) applied competences. Data has been collected within a corporate training program on project management within an international industrial group involving more than 500 project managers. Empirical analyses are based on customer satisfaction questionnaires completed by the participants in the training activities, knowledge tests that participants had to undertake before and after the training program, and a survey conducted one year after the training activities. The analysis of the relationships between the different variables provides evidence of the conditions that influence the success of project management training programs. These results also highlight guidelines that companies should consider in order to design effective training programs.

020-0366 Integrating Sustainability Through Application and Research in a Graduate OM Course

Dana Johnson, Michigan Technological University/School of Business and Economics, United States

Growing demand for knowledge and application of sustainability concepts promotes inclusion in traditional graduate OM courses. Since there are limited case studies available integrating sustainability and OM theory/concepts, the opportunity for real-life application with private companies is ripe. The paper will describe the Go Lean and Green project at a Midwestern rural hospital. Ten semester projects were conducted that included a combination of process management, lean, and sustainability tools. A standardized framework for each of the student teams was created and can be leveraged for similar or related projects in a graduate setting. In addition to the experiential learning projects, students explored sustainability, lean, and environmental management topics through literature reviews. These topics were interwoven at the appropriate time in the course with the more traditional OM topics. The integrative approach of application and research will be outlined as well as how it can be used by others.

171 Saturday, 03:30 PM - 05:00 PM, Naples 3 *Track:* PRF, 2 *Chair:* John Angelis
Session: Session 2

020-0549 The Effect of Resources, Entrepreneurship, and Strategic Intent on Small Business Growth Processes

John Angelis, Rochester Institute of Technology, United States
Joseph Miller, Rochester Institute of Technology, United States
Richard DeMartino, Rochester Institute of Technology, United States
Rajendran SriramachandraMurthy, Rochester Institute of Technology, United States

After demonstrating an intent to grow, small businesses must operationalize their growth strategy. We interviewed 20 firms with proven intent to grow, all of which were trained in growth strategies. Of interest was the relationship between strategic growth planning, whether a firm focuses on product development, market development, or a combination as its growth method, and growth implementation. We then further investigate how the firm's resources affect the firm's chances of implementing its growth plan, and counterintuitively find that entrepreneurial experience may hurt the firm's growth processes. At a time when most growth and development research seem to focus on successful growth outcomes, we contribute to the literature by focusing on growth processes of small businesses.

020-0738 Evaluating Supply Contract Types in the Turbulent Consumer Electronics Industry

Anssi Kaki, Aalto University, Finland
Katariina Kemppainen, Nokia Corporation, Finland
Juuso Rantala, Nokia Corporation, Finland
Ahti Salo, Aalto University, Finland

The demand for global consumer electronics has recovered quickly after the recession - a situation which, together with conservatism in suppliers' capacity investment decisions, has lead to increased risks of overbooking supplier capacity. At the same time, forecasting has become more difficult due to growing uncertainties in end product demand, which has undermined the benefits of information sharing in supply chains and increased the relevance of supply contracts as tools for risk mitigation. Differences in component and supplier characteristics, however, imply that a single contracting strategy "does not fit all," and thus large product manufacturers need to implement a portfolio of customized contract types. In this paper, we elaborate a few supply contract types and present a structured evaluation framework, with the aim of helping the company to adopt those contract types that are aligned with its business objectives and establish appropriate incentives for suppliers.

172 Saturday, 03:30 PM - 05:00 PM, Naples 4 *Track:* CSC, 8 *Chair:* Manpreet Hora
Session: Network Design

020-0074 Association between Supply Network Structure and Performance: Examining Structural Properties in the Electronics Industry

Manpreet Hora, Georgia Institute of Technology, United States
Soumen Ghosh, Georgia Institute of Technology, United States
Rahul Basole, Georgia Institute of Technology, United States

Our research examines the association between supply network structure of firms and their operating performance. Specifically, we study the structural properties of supply networks in the consumer electronics/computer industry and draw the sample of about 400 firms and their respective measures from multiple secondary sources. Our empirical analysis sheds light on three properties - network centrality, density, and embeddedness - and their association with a firm's

operating performance. We discuss both theoretical and practical implications of our findings.

020-0108 Empirical Investigation of Supply Networks Using Social Network Analysis

Thomas Choi, Arizona State University, United States

We will review a supply network constructed using empirical data. It is shown in a typical tree-like structure. We will then subject this network to a social network analysis and generate a sociogram. Finally, we will compare the two different ways of representing the same supply network and consider its theoretical and managerial implications.

020-0137 A Stochastic Multicommodity Flow Approach to Combinatorial Truckload Auctions

Amitabh Sinha, University of Michigan, United States
Shervin AhmadBeygi, Metron Aviation, United States
Damian Beil, University of Michigan, United States
Richard Chen, Sandia National Laboratories, United States
Amy Cohn, University of Michigan, United States

We consider a fully-enumerated stochastic combinatorial truckload procurement auction characterized by uncertainties in carriers' repositioning capacities and costs. Typically, carriers participating in combinatorial truckload auctions estimate repositioning capacities and costs and use these estimates as a basis for computing bid prices. However, awarding shipments awarded in this way often leads to sub-optimal solutions in expectation. To rectify this problem, we extend our earlier development of an implicit bidding approach for truckload procurement auctions to derive a tractable winner determination problem that is fully expressive and more accurately approximates carriers' uncertain repositioning capacities and costs. We then present an accelerated decomposition algorithm for solving the resulting winner determination problem and extensive computational studies to demonstrate its efficacy. Finally, we generalize the models and algorithms presented to a class of stochastic network flow problems, and demonstrate the applicability to a broader class of stochastic network flow problems.

020-0626 Organizational Structure and NPD Performance: A Network-based Study

Bilal Gokpinar, University College London, United Kingdom

A significant challenge in Operations Management research is modelling and quantifying the complex web of interactions within organizations. These interactions include both coordination and collaboration efforts of individuals/teams (i.e., network of people) and a set of interdependencies between the systems and tasks that these individuals/teams work on. Complex networks models and analyses bring a fresh perspective and set of tools to quantify, study and understand these interactions. In fact, researchers in fields ranging from physics to psychology have applied network models and analysis tools to gain insights into a wide array of physical, biological and social phenomena including the US power grid, protein networks, the Internet, and interlocking directorates. In this work, using vehicle development data from a large auto manufacturer, we illustrate the use of network analysis to characterise the engineering design organization and gain insights into product development work.

020-1057 When is Small Profitable?

Garrett van Ryzin, Columbia University, United States

The historical trend in most infrastructure technologies is one of ever greater scale. There are clear advantages to scale in terms of basic geometrical efficiencies (e.g. the ratio of area to volume, which affects thermal losses) and reduced labor costs. Yet small-scale technologies have distinct advantages; they are flexible, diversify risk and can be mass produced, lowering capital costs. Indeed, in his influential book Small is Profitable, Amory Lovins argues that there are “207 hidden benefits” to small-scale electric energy technologies. With the prospect of a massive restructuring of the world’s energy infrastructure to cope with global climate change, the question of the appropriate scale for infrastructure is being revisited. In this talk, we describe our progress on a framework and theory for answering the “large vs. small” question.

173 Saturday, 03:30 PM - 05:00 PM, Naples 6 *Track:* OMF, 8 *Chair:* Ralf Seifert

Session: Session 8: Supply Chain Contracts

020-0038 Trade Credit Line and Retailer's Financing Decision

Weili Yin, Peking University, China
Lihua Chen, Peking University, China

In this paper, by setting up a single period supply chain model with one supplier and one retailer, we study the capital constrained retailer procurement and financing problem, and explore the optimal trade credit contract offered by the supplier with different risk preferences. When the supplier is risk neutral, at equilibrium, we find the supplier induces the retailer to choose trade credit as the unique financing scheme. When the supplier is risk averse, we find when she is risk averse very much, she induces the retailer to choose bank loan as the unique financing solution. But when the supplier's risk preference is higher than some specific value, she prefers to bear the whole credit risk and induces the retailer to choose trade credit as the unique financing solution. Otherwise, in the numerical experiment, we observe the portfolio of bank loan and trade credit is the retailer's best response.

020-0202 Financial Supply Chain Management: Working Capital Requirements with Short-term Debt

Ariel Zeballos, EPFL, Switzerland
Ralf Seifert, EPFL, Switzerland
Margarita Protopappa-Sieke, EBS Universität für Wirtschaft und Recht (in Gründung), Germany

We formulate a mathematical model that includes key financial aspects such as working capital restrictions, payment delays and multiple sources of financing in a standard operational setting. We solve for the optimal working capital allowance using an embedded Nelder-Mead optimization. We perform sensitivity analysis on cash flows and short-term debt usage. While Modigliani and Miller established that the financial choices of a firm do not play a role in its valuation, we examine the robustness of this result in a richer setting where we depart from their underlying assumptions. Our numerical experiments show that when access to short-term debt is granted, the expected cash flows are indeed fairly insensitive to varying short-term debt premiums. However, when short-term debt access as such becomes prohibitive or when downstream payment delays increase, the required working capital allowance inflates rapidly.

020-1029 Optimization of Warranty Reserves in a Multi-product Setting

Cigdem Gurgur, Purdue University, United States

In this research we address optimal management of cash reserves set aside to cover warranty claims for a company that produces multiple types of products with different characteristics related to their sales volume, failure rates, and repair expenses. Since the failure of each product type is probabilistic, the reserve may overestimate or underestimate the true cost. Maintaining excess reserves would result in opportunity cost in the form of lost interest. Depleting the warranty reserve might necessitate canceling other projects or finding emergency funds. We model the warranty reserve problem as a multi-product inventory problem of infinite horizon that consists of periodic reviews. We find the optimal warranty reserve policy by determining the amount of cash additions or subtractions at the beginning of each period, and the amount to contribute the reserve after each sale.

Sunday, 08:00 AM - 09:30 AM

177 Sunday, 08:00 AM - 09:30 AM, Tuscan 1 *Track:* HOM, 9 *Chair:* Craig Froehle
Session: Capacity Management in Outpatient Clinics

020-0121 Appointment Scheduling with Potential Call-in Patients

Rachel Chen, University of California at Davis, United States
Lawrence Robinson, Cornell University, United States

We consider a hybrid appointment scheduling system which accommodates both traditional patients who book well in advance and same-day patients with acute needs who call that morning for an appointment. Our model determines which appointment times should be reserved for these potential same-day patients, and which times should be allocated to traditional patients. Our model considers random service times, no-shows, overtime, and auxiliary physician tasks.

020-0123 Optimizing the Outpatient Clinic Schedule for Both Patients and Providers

Craig Froehle, University of Cincinnati, United States
Michael Platt, Cincinnati Children's Hospital Medical Center, United States
Michael Magazine, University of Cincinnati, United States

Clinics with patients who need to see multiple care providers during a single visit often find it difficult to manage that complexity. Since only a subset of staff are formally scheduled, many “float” from patient to patient, which can create inefficiency and exacerbate coordination problems. Better schedules would provide timely care for patients while also minimizing wasted time for staff and improving the clinic’s operational effectiveness. We create an optimization model that sequences the activities within each patient visit in order to balance multiple performance criteria (e.g., patient waiting, staff utilization, overall clinic duration, deviation from scheduled appointments, etc.). We then test the efficacy of that model by comparing its solutions to actual schedules from a specialty clinic. Finally, we discuss how this model could be implemented in practice.

020-0122 The Impact of Batching on Throughput and Flow Time in an Emergency Department

Gregory Dobson, University of Rochester, United States
Hsiao-hui Lee, University of Connecticut, United States
Arvind Sainathan, Nanyang Technological University, Singapore
Vera Tilson, University of Rochester, United States

In an ER at a medical teaching facility we use a queueing model to analyze the initial exam of the patient by a resident physician, the subsequent conference with the attending physician, and the attending physician visit with the patient, and observe throughput and flow time of patients. When preemptions are allowed, we prove the throughput optimal policy. When preemption is not allowed, we demonstrate numerically that a throughput optimal policy involves batching multiple patients at the conference and the residents waiting for the attending to start a conference. Constraining batch sizes or reducing the number of beds reduces throughput slightly but has a large impact on flow time. Depending on how the hospital trades off the cost of patient waiting, the cost of ER physicians, and the cost of bed space, the results suggest where a hospital should place its assets.

020-0385 Increasing Patient Throughput at an Outpatient Clinic with Two Classes of Patients and Two Types of Providers

Yann Ferrand, University of Cincinnati, United States
Michael Magazine, University of Cincinnati, United States
Craig Froehle, University of Cincinnati, United States
Uday Rao, University of Cincinnati, United States

In an outpatient clinic, we propose a novel way to schedule new and returning patients, and to assign them to a physician and a nurse who work collaboratively. We can increase patient throughput by assigning a specific share of the workload to each provider and identifying specific tasks that can be done concurrently.

178 Sunday, 08:00 AM - 09:30 AM, Tuscan 2 *Track:* GOS, 4 *Chair:* Inga-Lena Darkow Mark Stevenson
Session: Security in Global Supply Chains

020-0938 The Impact of Security on Integrated Cross-border Supply Chains

Yan Cimon, Université Laval, Canada
Fatima-Zhara Barrane, Faculty of Business Administration, Universite Laval, Canada

North America is one of the world’s most integrated economic spaces. Prior to 9-11, Canada and the United States used to share the longest “unprotected” border in the world. That tragedy, however, changed the level of border security between these two countries. Yet North American value chains remain highly integrated in many sectors. This begs the following research question: How does increased security affect cross-border integrated supply chains? This paper first looks at the North American context. Second, it reviews the literature on cross-border supply chain integration. Third, in-depth case studies of industries such as automobile manufacturing as well as aerospace and defence are used to test research hypotheses. It is found that geography and security matter to the extent it may induce geographic shifts in the supply chain. Implications for academics and practitioners are suggested.

020-0856 Supply Chain Security 2030 – A Delphi Consensus

Inga-Lena Darkow, EBS Business School, Germany
Christoph Markmann, EBS Business School, Germany
Tobias Gnatzy, EBS Business School, Germany
Heiko von der Gracht, EBS Business School, Germany

Debates are ongoing if critical infrastructures will increasingly become targets for hostile attacks, compromising the stability of global supply chains. Our research addresses the future of supply chain security 2030 and is centred on future causes for supply chain disruptions, possible supply chain targets, consequences and measures to cope with supply chain security challenges. In order to analyse future scenarios, we conducted a real-time Delphi survey with international security experts from business, politics and academia. Our research assesses targets for supply chain attacks and reveals how far security measures will impact logistics costs in the future. Moreover, our expert panel addresses the critical roles of governments and technologies to minimize security risks. In our scenarios, we will also consider security audits and security implications for transport times. We will conclude with possible future measures to cope with supply chain attacks as well as the establishment of such measures.

020-0445 Product Counterfeiting and Supply Chain Resilience: A Secondary Data Analysis

Mark Stevenson, Lancaster University, United Kingdom
Jerry Busby, Lancaster University, United Kingdom

Product counterfeiting is an increasingly widespread phenomenon which can undermine a trademark - an important reputational signalling device underpinning supply chains. It also threatens consumer welfare as in industries like automotive and pharmaceuticals, as substandard products can be fatal. Although many OM studies acknowledge the risks to intellectual property that result, for example, from off-shore outsourcing and supplier involvement in new product development, the specific topic of counterfeiting has been neglected. This paper uses secondary case data to identify the various strategies employed by counterfeiters to obtain materials, produce goods, distribute them, and infiltrate legitimate supply chains. This forms a basis for understanding how supply chains can become more resilient to counterfeit activity. The structural connections between legitimate and counterfeiting supply chains are analysed, but it also becomes evident that many counterfeiting threats come from actors with no obvious relationship to the 'victim' or genuine supply chain.

179 Sunday, 08:00 AM - 09:30 AM, Tuscan 3 *Track:* OMM, 4 *Chair:* Adrian Choo
Session: Implementation in Practice

020-1043 Problem Solving Efficiency and the Impact of Problem Representations in Six Sigma Projects

Adrian Choo, Georgia State University, United States

This research studies how a quality program affects innovation by examining the effects of problem representations on problem solving efficiency in Six Sigma projects. First, we investigated if more time spent in problem definition led to more efficient problem solving in a Six Sigma project. Using data collected from 192 quality improvement projects in a Six Sigma company, our results indicate spending more time on early phases (i.e., Define and Measure phases) of a Six Sigma project facilitated faster project completion. Second, we studied if a greater variety of the use of problem solving tools in a Six Sigma project resulted in better problem representations, leading to shorter project duration. Using detailed data of the use of Six Sigma tools in 35 R&D projects collected from an industrial R&D center of another company, our findings show the use of design-oriented tools was associated with shorter R&D project duration.

020-0506 Exploring the Encounter Triad in the Design of Service Delivery: Evidence from Healthcare

Paulo Gomes, Universidade Nova Lisboa, Portugal

The search for efficient governance mechanisms in services is impeded by several factors. I explore the encounter triad to better understand how service firms organize for exchange with the objective of maximizing both customer satisfaction and service efficiency. The context for the study is the design of a nationwide program to deal with waiting lists for elective surgery - SIGIC. The results show the impact of SIGIC on different dimensions of performance (functional quality, technical quality and cost) and also on service delivery choices made by key service providers.

020-0258 Workload Control and the OM-Marketing Link in MTO Companies: Successful Implementation in Practice

Linda Hendry, Lancaster University Management School, United Kingdom
Mark Stevenson, Lancaster University Management School, United Kingdom
Yuan Huang, Lancaster University Management School, United Kingdom

Recent research has stressed the importance of taking a contingency-based view of Production Planning & Control whereby approaches are developed which are contingent on key company characteristics, including production strategy and process type. Workload Control (WLC) is one such solution, primarily designed for the Make-To-Order (MTO) sector; however, more research is needed regarding its use in practice, including addressing the OM-Marketing link as customer enquiries are managed. Through longitudinal action research, this paper addresses this research gap by providing empirical evidence that WLC leads to significant, sustained performance improvements in a MTO context. The paper also adds to the literature on how WLC can be successfully implemented and presents theoretical refinements to make WLC more applicable to practical settings. For example, theoretical modifications include: adding 'impact analysis' to assess the implications of allowing new 'rush orders' to jump the queue, as required by marketing to satisfy a key customer.

180 Sunday, 08:00 AM - 09:30 AM, Tuscan 4 *Track:* ESO, 9 *Chair:* Clandia Gomes
Session: Strategic and Organizational Issues in Sustainability

020-0762 Management Practices Aimed at Sustainability and Its Relationship with Business Performance

Clandia Gomes, Santa Maria Federal University, Brazil
Isak Kruglianskas, São Paulo University, Brazil
Flavia Scherer, Santa Maria Federal University, Brazil
Roberto Neto, Santa Maria Federal University, Brazil
Uiara de Menezes, Santa Maria Federal University, Brazil

The study aims to contribute to inferences about the relationship between management for sustainable development and corporate performance. The main objectives are to identify whether the adoption of management practices committed to sustainable development affects business performance and to verify the behavior of these firms for sustainable management practices varying according to its international insertion. The research involved a quantitative implementation of a survey based on a conceptual framework that related to variable management for sustainable development with variable business performance. Results showed that business performance is influenced by variables related to management practices that are committed to sustainability. In the same way, it was verified that sustainable business behavior varies according to international insertion, confirming that sustainable management influences business competitiveness in international markets.

020-0775 Operations Strategic Management and Sustainability

Edson Pinheiro de Lima, Pontifical Catholic University of Parana, Brazil
Sergio Gouvea da Costa, Pontifical Catholic University of Parana, Brazil
Pamela Mocelin Manfrin, Pontifical Catholic University of Parana, Brazil

Companies' operations network systems are being redesigned to cope with new performance requirements, which are based on social responsibility, conscious environmental management system design, and economic sustainability. These aspects define dimensions for operations performance and should be integrated in a unified design framework. The set formed by these three dimensions is named the triple bottom line and could individually be defined by performance drivers. If a structural framework is used for defining operations strategy, multiple relationships could be mapped between performance drivers and decision areas in each of the studied dimensions. The objective of this paper is to propose operations strategic management design framework based on sustainability design requirements. Literature review is the methodology used for defining the conceptual base that informs the proposed framework. The synthesis produced from literature review defines theoretical determinants that are the building blocks of operations strategic management design framework founded in sustainable operations based approach.

020-0497 Environmental Performance Assessment of Logistic Operations in a Supply-Chain

Miguel Sellitto, Unisinos, Brazil
Miriam Borchardt, Unisinos, Brazil
Giancarlo Pereira, Unisinos, Brazil
Luciana Gomes, Unisinos, Brazil

This paper presents a method for measuring environmental performance in industrial operations in supply-chains. The research method was the triple case study. The objects were three industrial operations in the supply chain of an air-conditioning systems manufacturer. The first operation includes receiving and preparing materials. The second includes picking up and transporting to the manufacturer facilities. The third includes receiving and storing sub-systems, finished parts and finished goods. Environmental performance was treated as an intangible top term, formed by five latent constructs: atmospheric emissions, liquid effluents, solid waste, usage of natural and energetic resources and management and certifications. Experts used AHP for prioritization. Constructs were appraised by thirty-five indicators and assessed in each operation by questionnaires answered by managers. Global results were 73.65%, 74.73% and 77.61% out of the maximum possible, respectively in preparation, transportation and warehousing. Results can help in prioritizing actions in the environmental management of the supply chain.

020-0518 EIP Analysis in Developing Countries

Cyntia Rosa, University of Sao Paulo, Brazil
João Neto, University of Sao Paulo, Brazil

The development of Eco-Industrial Parks (EIPs) is an emerging concept that is being spread worldwide. The EIP methodology has been spread in developing countries as an alternative to overcome environmental damage and, at the same time, to improve industrial and community economy as well as social welfare in order to support their development. The objective of this study is to present an analysis of opportunities and barriers for deployment of EIP in two developing countries. It was analyzed the EIP project in Santa Cruz, Brazil, and in Tianjin, China. The former is in its early stages and the barriers are greater than the opportunities. The latter is in the ongoing development of initiatives where government incentive has provided support to overcome barriers. This work brings to light that despite Brazil and China being developing countries, government support is essential to the development of the EIP.

181 Sunday, 08:00 AM - 09:30 AM, Tuscan 5 *Track:* ESO, 17 *Chair:* Suresh Tadisina
Session: Sustainability in Diverse Industries

020-0931 Scheduling Volunteers with Continuous Planning Horizon

Shenghan Xu, University of Idaho, United States
Scott Metlen, University of Idaho, United States

With increased awareness of social responsibility, more people are willing to participate in volunteer work. Even though most organizations welcome the great participation in the volunteer program, they are also facing some difficulty in matching the particular needs of the volunteers and the program's needs. In this paper, we study some unique situations in scheduling volunteers. A case study of assigning volunteers for an experiential learning program to an elementary school over multiple years was presented.

020-0292 Sustainability in the Food Supply Chain: Evidences from the Beef Industry

Matteo Kalchschmidt, Università degli Studi di Bergamo, Italy
Ruggero Golini, Università degli Studi di Bergamo, Italy

Sustainability in supply chains is a relevant but complex topic to study, especially when considering at the same time the three pillars of sustainability, namely social, environmental and economical. In particular there is much evidence that it is not only a matter of the decisions taken by companies individually but it is more related to how the whole supply chain, including the market and the regulator, behaves (Seuring and Muller, 2008). Given the strong differences from industry to industry, we focused on the Italian beef supply chain that is relevant for its impact on the economy, the environment and the health of people. Through a set of case studies of companies at different stages of the chain we identified the sustainability practices put in place and which are the triggers - in particular if they come from inside or outside the company - and the related implications.

020-0072 Towards Sustainable Supply Chain Management in the Agriculture Sector

Normansyah Syahruddin, University of Bergamo, Italy
Matteo Kalchschmidt, University of Bergamo, Italy

Research has shown that agriculture products become main goods in daily activities, sources of employment for millions of people across the globe and counted as a key element in elevating poverty. To address the problem of food safety and rising concerns of social and environmental issues, nowadays agricultural firms are aware that the implementation of sustainability is inevitable. Though SSCM has been a rather discussed topic in the last few years, only few contributions are available for sustainable supply chain management in the agricultural sector. Research coverage starts from the downstream industries to the consumer table. The paper is aimed at providing an extensive literature review on the practice of supply chain management and sustainability in agriculture sectors, in order to identify the extent of the discipline in this field and to highlight areas that need further research. Implications will be extended towards similar industries such as food industries.

020-0481 The Role of Competitive Priorities and Stakeholder Pressure in the Adoption of Environmental Practices

Teresa Betts, Murray State University, United States
Suresh Tadisina, Southern Illinois University, United States

The purpose of this paper is to examine the underlying effect of a manufacturing plant's competitive priority focus and its adoption of environmental practices. An NRBV theoretical approach will be utilized to develop and test a set of hypotheses surrounding how manufacturing plants with different competitive priorities have a greater likelihood of implementing sets of environmental practices than organizations with alternative competitive priorities. Pursuant to empirically establishing differences in adoption of environmental practices based on a plant's competitive priority focus, further analysis will comparatively evaluate how the influence of stakeholder pressure varies across empirically established groups of manufacturing plants with different competitive priorities. The theoretical contribution of this paper focuses on further refining the relationship between NRBV and stakeholder theory. The practical implications of this paper help further our understanding of how levers of stakeholder pressure influence manufacturing plants differently based on their competitive priority focus.

182 Sunday, 08:00 AM - 09:30 AM, Tuscan 6 *Track:* HOC, 7 *Chair:* Sushil Gupta Martin Starr
Session: Crisis Management

020-0156 Researching Humanitarian Aid and Disaster Relief: A Review and Research Agenda

Amydee Fawcett, Univeristy of Arkansas, United States

Stanley Fawcett, Georgia Southern University, United States

Evidence suggests that disasters throughout the world are on the rise, and the costs associated with them are rising. A review of relief-and-recovery glitches related to earthquakes in Haiti and Chile, Hurricane Katrina and the tsunami in Indonesia revealed four main issues that hinder the effectiveness of past relief efforts: ineffective collaboration, failed logistics, poor governance, and the lack of proper infrastructure. A common theme across these issues is a need for a more holistic systems design to provide better coordination within Humanitarian Aid and Disaster Relief (HADR). This paper uses systems design theory to frame the extant literature and delineate the challenges and opportunities in HADR with respect to environment, processes, and goals. Continuing with the focus on systems design, we use fundamental principles of systems thinking to identify core issues and questions that demand the attention of future research.

020-0348 A Bayesian Group-Information-Updated Sequential Approach for Humanitarian Logistics Planning in Natural Disasters

Yong Ye, Zhejiang University, China
Nan Liu, Zhejiang University, China

There is an urgent need in disaster rescue to allocate relief resources to affected areas efficiently and effectively. By using historical sample information and a Bayesian approach, we propose a concept of two losses to explain the disaster's influence on supply and emergency logistics: (1) losses caused by the mismatch between supply of and demand for relief resources in the affected areas, (2) losses of transportation time due to logistics processes under emergency conditions. Then, we adopt the above concept to establish a multi-period Humanitarian logistics planning model with GIU by employing the stochastic programming approach. This model describes a setting in which relief is transported from dispatching centers to affected areas with multi-transportation modes in each emergency response period. In addition, we propose a matrix-coding-based genetic algorithm to solve the model. Finally, we apply the methodology to the WenChuan earthquake to verify the effect of the proposed methodology.

020-0090 A Hybrid Humanitarian Response to Disasters

Amiya Chakravarty, Northeastern Univesity, United States

Natural and man-made disasters imply great uncertainty in terms of potential damage, causing huge spikes in the demand for relief supplies. Ruptures in the infrastructure add to delays in providing aid. A multilateral tradeoff involving disaster-severity, infrastructure disruptions, cost of acquisitions and protection, delivery delays, and the social cost of lost lives, create complexities in response decisions. We explore a hybrid of proactive and reactive approaches for supply chain fortification, pre-positioning of inventory, and deliveries in real-time, and establish infrastructure contracts for reducing social cost. We show that demand volatility may impact the proactive and reactive decisions differently, especially if disasters become increasingly severe, as in recent years.

020-1035 POM Expertise (Know-How) is Essential for Crisis Management (CM)

Martin Starr, Crummer Graduate School of Business, Rollins College, United States
Sushil Gupta, Florida International University, United States

POM expertise is crucial for proper treatment of crisis management situations. No other managerial function can deal with anticipating, stopping, controlling, and mitigating the effects of imminent disasters. Threats of impending destructive events that arise from natural causes, malevolent persons, epidemic illnesses, and systems failures have been experienced by POM. That know-how permits creation of new scenarios reflecting accomplishments in predictive maintenance, non-zero sum military gaming, and the scientific knowledge about floods, earthquakes, hurricanes, fires and disease control. POM knowledge is both tacit and explicit. Each variant leads to different strategies and tactics for early warning and humanitarian operations.

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183 Sunday, 08:00 AM - 09:30 AM, Tuscan 7 *Track:* PDI, 9 *Chair:* Glen Schmidt
Session: Markets and Bargains: The Structure of Innovation

020-0965 Trembling into Myopia: Honesty in the Dynamic Hold-up Problem

He Chen, University of Maryland, United States
Krishnan Anand, University of Utah, United States
Manu Goyal, University of Utah, United States

In the classical hold up problem, investment in relation specific assets by a firm leaves it vulnerable to ex-post opportunistic behavior by its contracting partner. We study the hold-up problem through an evolving (multi-period) relationship between a manufacturer and his supplier. The manufacturer outsources innovation to the supplier and has the opportunity to 'hold up' the supplier once innovation is complete. Manufacturers can be rational (i.e., expected utility maximizers) or honest (i.e., committed to honoring their contractual obligations). We prove that the mere possibility of honest manufacturers can elicit honest behavior from rational manufacturers, thereby mitigating the hold up problem. Moreover, the honest manufacturer can obtain greater profit than the rational manufacturer, even though the rational manufacturer's strategy space includes mimicking the honest manufacturer (but not vice versa). Thus, honesty emerges endogenously as the optimal policy, and the hold up problem is mitigated without resorting to the complex (and extreme) remedies suggested in literature.

020-0964 Market Mechanisms for Pollution Control: A Comparative Study of Cap-and-Trade, Cap and Emission Taxes

Krishnan Anand, University of Utah, United States
Francois Giraud-Carrier, University of Utah, United States

In addition to traditional "command and control" regulation, cap-and-trade, cap and emission taxes are alternative market-based pollution control mechanisms. We analyze and compare these mechanisms using a mathematical model. Under cap-and-trade, the regulator specifies a pollution limit ("cap"), with which firms can comply through some combination of three actions: (a) investing in pollution abatement, (b) trading in emission allowances, or (c) restricting their output. Under a pure cap regime, firms cannot trade on emissions, and must comply using some combination of pollution abatement and output reduction. Finally, emission taxes induce pollution reduction by directly imposing a monetary cost on firms' pollution levels. We model the strategic interactions between a pollution-sensitive regulator and firms. We compare firms' profits, consumer surplus and welfare under the three market-based pollution control mechanisms. We also study the effect of competition among firms with asymmetric abatement costs.

020-0933 Place the Push-pull Point Prior To or Past the Fan-out Point?

Bo Van der Rhee, Nyenrode University, Netherlands
Glen Schmidt, University of Utah, United States
Weiyu Tsai, University of Utah, United States

Conventional wisdom has suggested that in a multi-stage supply chain facing variable demand the stage to hold safety inventory (the push-pull point) and the stage to start customizing a product (the fan-out point) should be located together to achieve the lowest supply chain costs. To examine the conventional wisdom, we developed a model where two differentiated products with common components are produced and customized in a supply chain to satisfy the end demand from consumers. The two streams of product demand are normally distributed with known means, standard deviations, and a correlation coefficient. We find that the conventional wisdom may not always hold true. Depending on several factors, the push-pull point can be either before or after the fan-out point to achieve the lowest supply chain costs.

020-0859 The Bargaining Nature of Product Specification: Implications from Cross-Functionality

Jeremy Kovach, Georgia Institute of Technology, United States
Stylianos Kavadias, Georgia Institute of Technology, United States

In this paper we investigate how the functional stakeholder interactions during NPD projects shape the project outcome. We focus on a key interaction point during the development process, where the product functional specifications are delivered from the marketing department to the engineering department. Historically, optimizing this information exchange has been investigated through the lens of a central authority figure, capable of coordinating all project related decisions and managing their execution. Alternately, we posit that often those cross-functional processes rely on the interactions of the many stakeholders and their individual metrics, which determine their decisions. We develop a normative model based on the Nash bargaining framework to understand the effects of such decisions.

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184 Sunday, 08:00 AM - 09:30 AM, Tuscan 8 *Track:* ERS, 9 *Chair:* Anupam Agrawal Santiago Kraiselburd
Session: Topics in Empirical Research I

020-0133 The Impact of IT Intensity, IT Outsourcing and Software Customization on Operational Performance: Empirical Evidence from Manufacturing SMEs

Andrea Masini, HEC Paris, France
Marco Botarelli, University of Perugia, Italy

SMEs still look upon Information Technology with some skepticism. Furthermore, although the pervasive diffusion of standard packages dedicated to the middle-market and the availability of low-cost external providers make IT more affordable, the value of software standardization and IT outsourcing remains unclear for these organizations. Using primary data from 205 SMEs, this paper aims to shed some light on the relationship between IT adoption, IT strategy and operational performance. Drawing upon the information-processing view of organizations, transaction cost economics and the resource-based theory, we put forth a model to examine the impact of IT outsourcing and software customization on performance. The analysis suggests that SMEs align their IT intensity with their information processing needs and that the IT strategies adopted are not equifinal: the value of IT outsourcing and software customization is highly context-dependent and varies with the information processing needs and the level of IT intensity of the firm.

020-0502 Order Variability, its Manifestations and their Relationships

Mario Monsreal, Zaragoza Logistics Center, Spain
Santiago Kraiselburd, Zaragoza Logistics Center, Spain
Rogelio Oliva, Zaragoza Logistics Center, Spain

Order variability in supply chain operations is one of the major concerns for the industry and researchers. This type of variability can have three different manifestations: variations in order quantities (volume variability), in the intervals between consecutive orders (time variability) and in the nonnegative orders received daily (daily orders variability). It is clear that daily ordering behavior is related to order size and frequency; however, the dimension and direction of these relations are not so clear. Nevertheless, these ordering variations and their relationships affect different operational decisions at upstream levels. In addition, aggregation may affect order variability. And in turn, the number of echelons downstream and inventory policies may affect aggregated relationships.This research pursues to understand more clearly, through an empirical study, the relations between these three types of order variability, their aggregate behavior, and the effect of the number of echelons and the inventory policies on such relations.

020-0260 The Roles of Strategic Intent and Product Type in Sourcing Decisions: The Private Label Context

Ram Narasimhan, Michigan State University, United States
Myung Kyo (M.K.) Kim, Michigan State University, United States

Extant operations and sourcing literature has highlighted the sourcing decision as a critical antecedent of better resource allocations and financial performance of a buying firm. However, previous lessons anchored by manufacturing contexts cannot be applied to sourcing environments of the most dynamic and rapidly growing private label (PL) segment of retailing industry. This research fills this gap by using the tenets of strategic intent perspective. Specifically, by hypothesizing interrelationships among a buying firm's strategic intents in introducing PL products, its supplier selection criteria, and financial performance, the present research attacks the following questions: 1) how to select suppliers where co-opetition, information asymmetry, TCE-RBV discrepancy, and different roles of strategic intent and supplier selection exist, 2) how they differently impact firm performance, and 3) how product types differently affect these interrelationships. We conclude with theoretical contributions and managerial implications.

020-0639 Field Vehicle Fleet Management in Humanitarian Operations: An Empirical Study

Alfonso Pedraza Martinez, INSEAD, France
orla Stapleton, INSEAD, France
Luk Van Wassenhove, INSEAD, France

This study is the second stage of a two-stage research design on fleet management in humanitarian field operations. The first stage, which has been completed, consisted of exploratory case-based research to formulate a conceptual model of the factors affecting fleet management in humanitarian field operations. The ensuing model includes propositions on humanitarian operating conditions, funding for vehicle procurement and incentive alignment. The second stage of the research design consists of empirically testing these hypotheses. This is a challenging process, because in the humanitarian sector, data is often scarce. Furthermore, it consists mainly of printed records that are difficult to use for analysis. We discuss the results from the first stage, as well as our plan for data collection necessary for hypothesis testing. This study contributes to developing a theory on transport and fleet management in humanitarian operations.

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185 Sunday, 08:00 AM - 09:30 AM, Tuscan 9 *Track:* ACL, 2 *Chair:* Krishna Mital
Session: Teaching OM Through Case Studies

020-0089 New Frontiers in Training

Avraham Shtub, Technion, Israel

The need for experienced well trained professionals in Operations Management is growing fast. The traditional approach for training is to teach the appropriate body of knowledge and to train on the job. Since on-the-job training is expensive, time consuming and in some areas also risky, efforts are made to save the time and cost of on-the-job training. We present some recent findings regarding the design and use of training simulators for business and engineering students. Two recent books that are based on such simulators will serve as examples:1. ERP: The Dynamics Of Supply Chain And Process Management, by Avraham Shtub and Reuven Karni; and 2. Project Management Simulation, Avraham Shtub with PTB Project Team Builder by Avraham Shtub.

020-0674 Marketing Communication in Educational Institutions: A Case Study of Brazilian Adventist University

Clovis Galdino, Methodist University, Brazil

Joao Santos, Methodist University, Brazil
Getulio Akabane, Fatec SP, Brazil
Mariana Sa, Adventist University of Sao Paulo, Brazil
Eduardo Santos, Methodist University of Sao Paulo, Brazil

Currently the use of marketing strategies is critical to the success of the institution, with the emergence of new competitors and changes in the profile of students, who are increasingly demanding and quality-conscious in teaching. To analyze the marketing communication and its importance to educational institutions, we take as a case study a UNASP - Adventist University Center of Sao Paulo. Given the changes within the educational environment, it is necessary to keep the audience informed of the actions undertaken by the institution of interest. In fact, for a long time educational institutions refused to use marketing tools to disclose programs, structures, brand name and other demanded information. Educational institutions have realized the importance of such new challenges in order to meet requirements and desires of their customers, and therefore provide improved quality of services by the institution.

020-0458 A Case on Estimating Parking Space Needs of Visiting Field Parties at Base Office of an Oil Exploration Company

Krishna Mital, IILM Institute for Higher Education, India

The case pertains to the analysis of parking space needs of field parties which are engaged for carrying out seismic surveys for oil exploration by a petroleum exploration company. These parties include geophysicists, geologists, support staff, and fleet of vehicles such as labour carrying trucks, trucks and jeeps for carrying explosives, water tankers, jeep trailers, instrumentation vans, etc. that accompany visiting field party staff. All the geophysical and geological field parties after being away to designated locations for 2-3 months return to the base office where they stay for a 1-2 month period until they proceed to their next onward location. Parking space needs at the base office thus vary according to the size of the vehicle, length of stay at the base office, and movement schedules. This case involves estimation of parking space needs of field parties at a regional base office complex based on analysis of past data and future schedules.

186 Sunday, 08:00 AM - 09:30 AM, Tuscan 10 *Track:* ICM, 7 *Chair:* Rasoul Haji
Session: Discussion on Inventory Policy

020-0324 Inventory and Service System in a Two-echelon Supply Chain Using Base Stock Policy

Rasoul Haji, Sharif University of Technology, Iran (Islamic Republic of)
Mohammad Saffari, Sharif University of Technology, Iran (Islamic Republic of)

In this paper we consider a two-echelon supply chain system consisting of a supplier and a retailer. The supplier has an inventory system and a service unit to process the orders received from the retailer. Demands arrive to the retailer according to a Poisson process. Both supplier and retailer apply one-for-one ordering policy. The supplier's lead time and the service time of his service unit are exponentially distributed random variables. When the supplier has on-hand inventory, the retailer's order joins the queue at the service unit. Otherwise the supplier does not accept retailer's order. In this paper we first derive the steady state joint distributions of the "queue length" and "on-hand inventory of the supplier" and show that it has a product form. Furthermore, we derive the total expected system cost per unit time. Finally by a numerical example we obtain the optimal solution of the total system cost.

020-0898 Economic Production Quantity and Pricing under Variable Production Cost

Alireza Kabirian, University of Alakska Anchorage, United States

An extension to original economic production quantity problem for a single-item single-machine system with fixed production rate and price elastic demand is studied. In addition to sales revenue, inventory and setup costs, we assume there is a variable cost of production which is a linear function of the lot size. Two solution paradigms are presented for the model, one that logically considers the constraints of the model and another one that directly incorporates the constraints via Kuhn-Tucker approach. We use Newton Method to find local optima and prove the asymptotic convergence of the solution algorithm to global optimum. A numerical study followed by a discussion provides additional insights into the problem.

020-0320 Comparing Costs of One-for-One-Period Policy and One-for-One Policy with Poisson Demand

Rasoul Haji, Sharif University of Technology, Iran (Islamic Republic of)
Hamed Tayebi, Sharif University of Technology, Iran (Islamic Republic of)

Consider an inventory system with lost sales, Poisson demand, constant lead time, and negligible ordering cost. For controlling the inventory of this system a well -known policy called base stock, one-for-one or (S-1,S) policy has been introduced in the literature. Haji and Haji (2007) introduced and found the optimal solution for a new policy called (1, T) or one-for-one-period policy, where the quantity of each order is always one and the time interval T between any two consecutive orders is fixed. This new policy has the important property that it eliminates the demand uncertainty for the suppliers. The (S-1, S) policy has been compared with other policies in the literature. In this paper, we show that for longer lead times, performance of (1, T) policy is better than (S-1, S) policy, and this superiority depends on the ratio of the lost sale cost to holding cost.

020-0162 Workload Control Due Date Setting Rules: The Key to Short and Reliable Lead Times

Matthias Thürer, University of Coimbra - CEMUC, Portugal
Mark Stevenson, Lancaster University - Department of Management Science, United Kingdom
Cristovao Silva, University of Coimbra - CEMUC, Portugal
Martin Land, University of Groningen - Department of Operations, Netherlands
Lawrence Fredendall, Clemson University - Department of Management, United States

Workload Control (WLC) is a unique production planning & control concept which protects throughput from variance in a Make-To-Order (MTO) context where job specifications and lead times can vary greatly. One way that WLC accommodates the needs of MTO companies is by providing appropriate Due Date (DD) setting rules which match required and available capacity over time. This study compares the performance of different WLC DD setting rules and assesses the impact of the strike rate (or likelihood of winning an order) on rule performance. Simulations showed that effective WLC DD setting rules achieve a mean lateness close to zero and significantly reduce the variance of lateness compared to simple infinite rules under all analysed strike rates. Results support the argument that WLC is a comprehensive concept which allows inventory, capacity & lead time buffers to be used effectively and, as a result, performance to be improved significantly.

187 Sunday, 08:00 AM - 09:30 AM, Tuscan 11 *Track:* SOM, 7 *Chair:* Vincent Hargaden
Session: People and Service Processes

020-0891 Critical Success Factors of a Virtual Shared Service Center

Gernot Kaiser, EBS Business School, Germany
Eckhard Erling, IBM Deutschland GmbH, Germany

Virtual teams, variously defined as geographically dispersed, electronically dependent, and comprising diverse members working remotely, are growing in number and importance. At the same time Shared Services has seen quite popular implementations across companies and with the internet technologies have been confronted with a new set of opportunities towards efficiencies and cost reductions. Besides some empirical studies, there is still an ongoing debate whether virtuality in team setups have more benefits or more drawbacks.To shed light on this debate we collected more than 1,200 datasets of procurement cost engineering requests in a large enterprise currently being set up as a Virtual Shared Service Centre. The Procurement Cost Engineers are geographically spread in Asia, Europe and the US and so are the internal clients (Global Commodity Manager). Our results indicate that benefits or drawbacks heavily depend on the underlying spend volume, type of request, and the related commodity.

020-1047 Dynamic Management of Skill Portfolio for Global IT Service Delivery

Munish Goyal, Research Collaboratory for Service Science/ IBM Research India, India
M. Rammohan Rao, Indian School of Business, India

In today's globally challenging economic environment where demand for services is highly varying with rapid technological changes, managing a portfolio of globally dispersed skilled resources optimally is a big challenge for most multinational IT services organizations. We model IT skill portfolio as a composition of several resources with different attributes including the pair of skills they possess, their respective level of expertise and geographic location. The portfolio is highly dynamic as a resource may acquire new skills, gain expertise, and/or attrite. Demand is modeled as a set of multi-period projects where each project type specifies a vector consisting of the number of resources, starting time and the duration of engagement for the desired skill types. Linear programming is applied to solve the problem yielding project engagement, skill hiring and training strategies while maximizing the overall profit. We numerically compare the firm's performance under various training options and labor market constraints.

020-0362 Workforce Capacity Management in Service Operations

Vincent Hargaden, Rensselaer Polytechnic Institute, United States
Jennifer Ryan, Rensselaer Polytechnic Institute, United States

This research develops a model for the optimization of the workforce capacity management process in professional service organizations. Using data gathered during semi-structured interviews with senior executives in these firms, the model captures the complexities of the workforce planning process in this service sector. The capacity planning process must capture all of the attributes of the resources of the firm (i.e., employees) and optimally assign these resources to satisfy customer demand, represented by projects. A number of test firms are created and experiments are conducted on these firms to analyze the impact of various workforce policies on key business metrics. The policies evaluated include employee skill profile, the structure of a firm's project portfolio, the number of concurrent projects an employee can be assigned to, the role of employee cross-training, the management of separation and hiring, and the organizational design.

188 Sunday, 08:00 AM - 09:30 AM, Roma 1,2 *Track:* LOM, 4 *Chair:* David Woodruff
Session: Strategies & Technologies

020-0910 Progressive Hedging for Enterprise-Scale Systems Optimization on Commodity Computing Clusters

David Woodruff, UC Davis, United States
Jean-Paul Watson, Sandia National Labs, United States

Enterprise-scale logistics operations for system support are now frequently modeled as large-scale stochastic simulation models, as opposed to more traditional analytic models. While typically possessing fewer restrictive and unrealistic modeling assumptions, optimization wrappers for these simulation models are significantly more difficult to solve than simpler analytic models. Consequently, deployment of solutions to real-world customers is a significant issue. We describe our experience in developing a practical stochastic programming solution for efficiently optimizing an enterprise-scale logistics network. Our approach, based on Rockafellar and Wets' Progressive Hedging (PH) algorithm, is naturally and efficiently parallelized on the small-to-moderate-scale computing clusters. We also discuss deployment of our parallel PH algorithm on the Amazon EC2 compute cluster. Finally, we detail various real-world requirements driving the deployment.

020-0563 The Influence of Production Systems in Postponement Make-to-Stock with Seasonal Demand

Paulo Rodrigues, Univ. Estadual Paulista, Brazil
Fernando Marins, Univ. Estadual Paulista, Brazil
Fernando Souza, Univ. Estadual Paulista, Brazil

The supply chain management, postponement and demand management functions are of strategic importance to the economic success of organizations because they influence the production process, but when viewed in isolation it may hinder understanding of their behavior. The aim of this paper is to analyze the influence of the postponement in an enterprise production system with make-to-stock and with seasonal demand. The research method used was a case study; the instruments of data collection were semi-structured interviews, documentary analysis and site visits. As a way to support the research on the analysis of case study and the final considerations, the following issues will be discussed: supply chain management, postponement, demand management system and make-to-stock.

020-0818 Addressing the Best RFID Technology for the Apparel Industry in Colombia

Angelica Perez, Center for Latin-American Logistics Innovation (CLI), Colombia
Alfonso Sarmiento, Center for Latin-American Logistics Innovation (CLI), Colombia

The apparel industry is one of the sectors selected by the Colombian government to be developed in accordance with best manufacturing, technological, logistics, and quality practices due to opportunities for growth in national and international markets. Currently, the Colombian companies in this industry experience several problems in the supply chain that include inventory inaccuracy, delays in receiving and shipping operations due to long verification processes, and product losses;this negatively affects profit, delivery times, and competitiveness. This paper presents a methodology to measure the impact of implementing RFID technology in the apparel supply chain using the Electronic Product Code (EPC) standard. We provide a process evaluation of the Colombian textile sector (represented by five important companies) and highlight which steps of these processes can be improved by using RFID technology. Moreover, we show the results for the first part of the methodology which consists of finding the adequate RFID tags to achieve the best performance at the item identification level. The conclusions shows that factors such as read distance, antenna orientation and height, and item distribution inside the boxes are relevant for improving tag reading performance.

020-0827 On The Use of Installed Base Information for Spare Parts Logistics: A Review of Ideas and Industry Practice

Rommert Dekker, Erasmus University Rotterdam, Netherlands
Cerag Pince, Erasmus University Rotterdam, Netherlands
Rob Zuidwijk, RSM-Erasmus University Rotterdam, Netherlands

Demand for spare parts is often difficult to forecast using historical data only. In this paper, we give an overview of installed based information and provide

several ways in which installed base forecasting can be used. We discuss cases of installed based forecasting at four companies and list the issues involved. Moreover, we provide models to assess the value of installed base information and conclude that forecasts of spare parts demand and return can be made considerably more timely and accurate by using installed base information.

020-0327 Logistics Network Design: Considerations for Hub Operations and Shipment Delays

Rafay Ishfaq, Loyola University Chicago, United States
Charles Sox, The University of Alabama, United States

In this research, logistics operations at a hub are modeled as a queuing network and the shipments as multiple job classes with deterministic routings. By integrating this hub-operation queuing model with a hub location-allocation model, this research investigates the effects of limited hub resources on the design of intermodal networks under service time requirements. The findings of a research study based on a 25-city intermodal logistics network are discussed.

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Sunday, 08:00 AM - 09:30 AM, Sorrento 1,2 *Track:* QPJ, 8 *Chair:* Sarah Wu
Session: Session 8: Quality Measurement

020-1005 Conceptualizing a Social Dimension of Quality

Shane Schvaneveldt, Weber State University, United States

Many definitions of quality exist. However, a review of the extant literature reveals that most definitions of quality take the perspective of conformance or customer satisfaction and do not consider the increasingly important role of stakeholders and society at large. This paper introduces a new, broader framework of quality definitions that incorporates a societal dimension in addition to conventional perspectives. To illustrate the application of the proposed framework, several examples from both manufacturing and service industries are discussed.

020-0479 The Impact of Quality Culture on Quality Management Practices and Performance

Sarah Wu, Fordham University, United States

One of the commonly cited problems in the implementation of quality practices is related to cultural resistance to change. While the importance of organizational culture to quality management practices has been recognized in the literature, there is little we know about how organizational quality culture influences quality performance. The goal of this study is to fill this gap by exploring the mechanism. Following the literature, we classified quality management practices into two types: human-oriented practices and specific/unique practices; and we argued that the former provides a supporting mechanism for the latter to take effect. This study empirically assesses the path from quality culture to human-oriented practices, specific practices, and finally to quality performance using structural equation models. The results of this study contribute to understanding the cultural implications for successful quality management implementation.

020-0706 An Empirical Analysis on Communicational Aspects of Quality Management

Jing Zeng, Yokohama National University, Japan
Phan Anh, Yokohama National University and Vietnam National University, Japan
Yoshiki Matsui, Yokohama National University, Japan

Although existing literature of quality management (QM) and various quality awards have regarded communication as an important factor for quality system, there are only limited attempts to construct an integrated model of communication supporting QM practices. This study proposes an analytical framework for quality communication, which examines the relationship among three types of communication for QM (visionary & cross-functional communication, external communication and shop-floor communication) and their effects on two dimensions of quality performance (conformance quality and customer satisfaction). Data collected from manufacturing plants in eight industrialized countries are used to test hypothesized relationships by structural equation modeling. The results show that(1) visionary & cross-functional communication has positive impact on external and shop-floor communication with more influence on external communication, and (2) there are two ways of direct influence of communication which respectively lead to customer satisfaction and conformance quality.

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Sunday, 08:00 AM - 09:30 AM, Sorrento 3,4 *Track:* SAP, 7 *Chair:* DaeSoo Kim
Session: Sourcing and Procurement: Flexibility, Inertia, and End-of-Life Considerations

020-1002 The Profitability of Leasing in Closed Loop Supply Chains

Aybek Korugan, Bogazici University, Turkey
Caner Demirayak, Bogazici University, Turkey

Recently many countries have passed laws to control the negative effects of constantly increasing consumption of goods, while studies have explored the benefits of closed loop supply chains (CLSC) in the existing demand-supply relations based on sales of goods. In this study we compare the profitability of systems based on sales of products with the ones based on sales of services in CLSCs. For this purpose, three different supply chain structures are considered. The first structure is a traditional supply chain, while the second structure includes a CLSC where used products are acquired for remanufacturing. The third structure also considers a CLSC where products are leased and leased products are remanufactured for leasing. The analysis is carried out on queuing network models comprising of the main products life cycle phases of each respective structure. Then average profits are calculated using the performance measures obtained from queueing networks.

020-0927 Final Purchase and End-of-Life Acquisition Decisions in Response to a Component Phase-out Announcement

Dwayne Cole, Syracuse University, United States
Scott Webster, Syracuse University, United States
Burak Kazaz, Syracuse University, United States

We investigate a problem faced by a durable-goods manufacturer of a product that is no longer manufactured but still under warranty. A supplier announces that a component of the product will be phased out and specifies a deadline for the final order. The manufacturer projects the component needs for product under warranty and considers a two-stage decision problem: (1) the size of the final order and, in the event that the final order is less than actual requirements, (2) the design of a trade-in program for component harvesting that considers both marketing and operational issues. Different types of trade-in policies are proposed and analyzed, and the impact on profitability vis-à-vis the current alternative (i.e., no component harvesting) is evaluated.

020-0581 The Effect of Switching Cost and Supply Flexibility on Purchasing Performance under Environment Uncertainty

JungJin Kim, Korea University Business School, Korea, Republic of (South Korea)
DaeSoo Kim, Korea University Business School, Korea, Republic of (South Korea)
Chan-Hwang Park, SeoKyeong University, Korea, Republic of (South Korea)

As environment uncertainty increases, firms have increasingly recognized the importance of purchasing and supply management. It is particularly important for a

firm to adapt and quickly respond to changes in environment by crafting flexible supply management strategies. To do so, the firm can increase switching cost, i.e., time and efforts to search and select optimal suppliers. The firm can also increase supply flexibility to adapt to changes in operational requirements. Thus, this study empirically investigates the antecedents of supply flexibility and the effect of switching cost and supply flexibility on the firm's operational purchasing performance under environment uncertainty.

020-0592 The Effects of the Supplier's Collaboration and Specific Investment on the Buyer's Switching Inertia in IT Service Outsourcing

BooYun Cho, Korea University Business School, Korea, Republic of (South Korea)
Kwangtae Park, Korea University Business School, Korea, Republic of (South Korea)
DaeSoo Kim, Korea University Business School, Korea, Republic of (South Korea)

The buying firm's switching inertia of trying to maintain existing relationships with incumbent suppliers has received little attention despite its importance in supply chain management. Suppliers have relatively higher competitive advantages when the buyer's switching inertia exists in the incumbent-challenger rivalry. This paper primarily investigates the effects of the supplier's collaboration and specific investment on the buyer's switching inertia mediated by the buyer's switching barrier and commitment to the existing supplier. We propose and test a research model using the data gathered from the buyers who experienced IT service outsourcing. The results show that both buyer's switching barrier and commitment positively influence the buyer's switching inertia. The supplier's specific investment positively affects both buyer's switching barrier and commitment, whereas the supplier's collaboration shows no impact on the buyer's switching barrier.

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Sunday, 08:00 AM - 09:30 AM, Naples 2 *Track:* GEN, 11 *Chair:* Willard Price
Session: Operations Strategy

020-0936 A Common Theory of Prevention v. Response

Willard Price, University of the Pacific, United States

This research hypothesizes prevention efforts are justified and the total cost of prevention and response optimizes at a level of prevention or avoidance that occurs with minimum cost of response/recovery or failure. Many situations do not appear to be consistent with this theory or are even based on the prior analysis of this tradeoff, so the opposite hypothesis ought to be examined. Application of the “prevention - response” tradeoff theory abounds throughout the economy through these decisions: quality strategies, queuing design, inventory choices, maintenance efforts, security options and human and/or natural disasters. The purpose of the presentation is to model this quite generic decision, explain the variables considered, demonstrate the mathematics of the analysis and suggest the reasons why prevention is avoided and consequences accepted in many situations.

020-0821 Operations Management in Brazil - First Findings

Sergio Gouvea da Costa, Pontifical Catholic University of Parana, Brazil
Edson Pinheiro de Lima, Pontifical Catholic University of Parana, Brazil

There is a lot of work being done on Operations Management in Brazil, based on Business Schools and Industrial (Production) Engineering Departments. Even though we have schools as old as fifty years old, since now there is not a survey about the Brazilian contribution to the field. This paper reports the first finds of a wider research that investigates the Brazilian contribution to OM. Initially, the researchers and research groups were identified from the Lattes Platform (a Brazilian Government database filled by individual researchers) and the universities web sites. As a second stage, based on the most used scientific databases, the main authors, subjects, research methodologies and outcomes (local and international) were identified. This paper presents and discusses results, indicating the next research stages.

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Sunday, 08:00 AM - 09:30 AM, Naples 1 *Track:* TCH, 2 *Chair:* Michael Way Gurram Gopal
Session: Program Assessment, Learning & Design

020-0447 Improving the Design and Operation of an Undergraduate Program in Supply Chain Management

Gurram Gopal, Elmhurst College, United States

The Center for Business and Economics at Elmhurst College offers undergraduate degrees in a number of disciplines (majors) including marketing, accounting, operations management, and ‘logistics and supply chain management (LSCM).’ It also offers an M.S. program in Supply Chain Management and an MBA program. While the M.S. in SCM program is highly successful, enrollment in the undergraduate OM and LSCM majors is very low. This paper describes the process used to identify the weaknesses of the current program, and the operational challenges in redesigning and enhancing the program in a liberal arts college. One finding is that without exposure to a core course in SCM, students graduate without a good understanding of SCM. Nearly 80% of graduating senior students surveyed reported no prior knowledge or little knowledge about SCM. The lessons learnt will be useful to academicians and industry professionals involved in the teaching of LSCM and OM programs.

020-0944 Improving Student Learning in Asynchronous Online Instruction

Michael Way, California State University Bakersfield, United States

Providing formative feedback is an important part of instruction, particularly in an asynchronous online setting. The difficulty is compounded when teaching an Excel-based course, where feedback extends to software execution errors. This project examines an attempt to mitigate these difficulties through the use of streaming video. Half of the students received video feedback while the other half received written feedback. Student performance was measured in the areas of problem identification, execution, and interpretation. Results illustrate the positive benefits of video feedback, particularly in the area of problem execution.

020-0982 Designing a Process for Teaching the Main QDF Matrix In The Classroom

Danilo Sirias, Saginaw Valley State University, United States
Joyce Hoffman, Saginaw Valley State University, United States

This research focuses on a learning process for teaching the quality function deployment (QFD) in a college classroom. QFD is a tool for translating customer needs into designed specifications. Starting with a set of customer requirements and their importance, QFD helps to set the parameters satisfying needs and developing products. This research develops a process for teaching the QFD matrix by having students apply the matrix to the designing of a business course based on what students consider to be important. The process was developed and applied to several different classes with several teams in each class. Data was compiled from all teams tested and analyzed for patterns. Discussed in the research is the comparison and contrast of the parameters set by the different teams, along with the results of the process designed for teaching the QFD to students.

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Sunday, 08:00 AM - 09:30 AM, Naples 3 *Track:* TEC, 7 *Chair:* Andre Dias Ferreira
Session: Topics in Technology Management

020-0845 The Technological Underrepresentation of Small to Medium Enterprises

Zenon Michaelides, The University of Liverpool, United Kingdom
Roula Michaelides, The University of Liverpool, United Kingdom
Richard Forster, The University of Liverpool Management School, United Kingdom
Philip Hauser, The University of Liverpool Management School, United Kingdom

This paper proposes a design, development and implementation methodology for an ASP (Active Server Page) based system for e-enabling an electronic Regional Collaboration Cluster (eRCC), the purpose of which is to integrate SMEs in order to increase their strategic and competitive advantage. The system design utilises Software as a Service (SaaS) as an architecture model to unite SMEs into a strategic business alliance, interacting as an integrated entity, thus offering SMEs an opportunity to counteract the market dominance of larger companies. Research shows that the speed of technological adoption and degree of effectiveness in SMEs significantly lags behind that of larger organisations (Pavic et al., 2007, Khong et, al, 2010). This paper researches the reasons for this inequality and proposes a way to infuse competitive advantage in SMEs through the adaptation of collaborative models for clustered communities of business, supported by suitable ICT developments.

020-0606 What Drives Mobile Telephony Diffusion in Rural India? An Empirical Analysis

Karuna Jain, SJMSOM, Indian Institute of technology, India
Ruchita Gupta, SJMSOM,Indian Institute of technology, India

The current decade has witnessed an exponential growth in mobile telecommunication in India. The share of rural subscribers in total subscription is increasing at a rate of 16%. Literature suggests that diffusion of mobile technology depends on various macro factors. Factors which directly influence the real motivations of the end user have not been considered in research studies. The identification of these micro factors driving the adoption of mobile telephony will have significant value and will provide insights to service providers.Thus the objective of this paper is to examine and identify micro factors affecting the adoption and hence the diffusion of mobile telephony in rural India. Data is collected through a questionnaire survey in the rural part of India. Factor analysis is performed to identify and examine the underlying factors. Social influence and mobility are found as the most influencing factors affecting the decision to adopt mobile telephony.

020-0504 IT Outsourcing Decisions: How Some Factors Can Change the Level of Importance of the Strategic Aspect

Andre Dias Ferreira, University of Sao Paulo, Brazil
Antonio Santos, University of Sao Paulo, Brazil
Fernando Laurindo, University of Sao Paulo, Brazil

Information technology (IT) outsourcing has received attention from academy and practitioners in past years. There are three areas where this theme is being investigated: IT outsourcing decision, bringing back outsourced IT and management of outsourced contracts. This work is focused on understanding how the strategic aspect of IT outsourcing decision receives influences from other factors. By using multiple cases to evaluate such influence, this study indicates positive relationship between IT importance and the importance strategic aspect receives on outsourcing decision. Also, the evaluation of the relationship between the hierarchical level of the decision-making person and the importance the strategic aspect receives seems to be inappropriate. Finally, it was found that the level of importance the strategic aspect receives in IT outsourcing decisions is influenced by the level of access the company has over the outsourced technology and also the perceived benefits the company has over the exploration of such outsourced technology.

020-0784 RFID Technology Analysis to Improve the Metal/Water Readness Issue

Juan Ochoa, Center for Latin-American Logistics Innovation (CLI), Colombia

Water and metal made products are typically "hard to tag/read" items due to some physical "inevitable" interferences that give low read rates, something undesirable when RFID is used as an automatic data capture technology. Furthermore, this leads to wrong conclusions about overall RFID performance, pointing it out as an inefficient technology. Although RFID is not a new technology, it has been evolving technically to overcome these well-known physical issues (refraction and absorption) produced by some materials that need to be scanned/read, such as high water/metal content items/package materials. This paper aims to show how some specialty RFID UHF C1G2 metal/water tags enhance the read rate of those "hard to tag/read" items and allow companies to consider RFID as the best way of identifying the products of their logistics process. Several tests conducted at LOGYCA's accredited Test Center in Bogota will show how many different brands of readers, antennas and tags lead to high read rates on metal/water made items. These tests vary from fixed dock door portal dynamic tests, to conveyor dynamic tests, and even RFID handheld mobile devices, according to technical and process methodology defined by Electronic Product Code (EPC) global. Multiple tag/reader brands/types were used for testing with many different products from multiple companies and industries.

194 Sunday, 08:00 AM - 09:30 AM, Naples 4 *Track:* CSC, 9 *Chair:* Kyle Cattani H. Sebastian Heese
Session: Retail Operations I

020-0744 Well Adjusted: Using Expediting and Cancelation to Manage Store Replenishment Inventory for a Seasonal Good

Kyle Cattani, Indiana University, United States
Gregory DeYong, University of Michigan-Flint, United States

We find closed-form solutions for the initial order and the adjusted orders in a two-period newsvendor problem where the initial forecast is a combination of a binary random variable and two general distributions. Specifically, there is a probability pL that demand will be from the “low” distribution and a probability 1-pL (=pH) that demand will be from the “high” distribution. At the beginning of the second period, the binary random variable has been realized and the final distribution is known. At this point, the initial order is adjusted upward or downward, but these changes incur expediting or cancellation costs, respectively.

020-0666 Exploring Supply Chain Absorptive Capacity in Product and Service-Focused Firms

David Dobrzykowski, Eastern Michigan University / College of Business, United States
Paul Hong, University of Toledo / College of Business and Innovation, United States
William Doll, University of Toledo / College of Business and Innovation, United States
James Roh, Rowan University / Rohrer College of Business, United States

Innovation or market responsiveness is a key factor to firm success. Absorptive Capacity - in other words, a firm's ability to acquire, assimilate, transform, and apply information from supply chain partners - has been posited to be an important capability for firms striving to achieve innovation. Given this, extant studies have explored Absorptive Capacity using many different methodologies and measures. While these studies provide useful insights, very few have explored differences among product and service focused firms. This is particularly important given the growing emphasis on the firm's offering as consisting of a product and service bundle. This study informs a key curiosity in the extant literature by investigating differences in the Absorptive Capacity approaches of product and service focused firms. Data from the International Manufacturing Strategy Survey of 711 manufacturing firms in 23 countries reveals meaningful insights into different Absorptive Capacity approaches.

020-0477 Initial Shipment Decisions for New Products at Zara

Adam Mersereau, UNC Kenan-Flagler Business School, United States

Jeremie Gallien, London Business School, United Kingdom
Andres Garro, MIT Sloan School of Management, United States

Given uncertain popularity of new products by location, fast-fashion retailer Zara faces a tradeoff. Pushing large initial shipments to stores reduces lost sales in the critical first few days of the product life-cycle, but maintaining stock at the warehouse allows restocking flexibility once initial sales are observed. Our solution, piloted at Zara, features a data-driven model of forecast updating and a dynamic program that allocates limited stock by location over time.

020-0764 Bargaining for an Assortment

Goker Aydin, Indiana University, United States
H. Sebastian Heese, Indiana University, United States

We consider a retailer who must compose an assortment from products that are offered by several different manufacturers. We propose a model in which the retailer engages in simultaneous bilateral negotiations with the individual manufacturers. We characterize the equilibrium assortment and profit allocation, and we explore how the equilibrium depends on manufacturer and product characteristics.

020-0491 Online Retailing and Repercussions for Sustainability

Ruoxuan Wang, University of Florida, United States
Janice Carrillo, University of Florida, United States
Asoo Vakharia, University of Florida, United States

Recent press has highlighted the environmental benefits associated with online shopping, such as emissions savings from individual drivers, economies of scale in package delivery, and decreased inventories. In addition, if customers perceive the online channel as being more “environmentally friendly,” they may be willing to pay a higher price for goods delivered through such a channel. We formulate a dual channel model of a retailer which has access to both online and traditional market outlets to investigate the impact of customer environmental sensitivity on its supply. In particular, we analyze stocking decisions for each channel incorporating price linear demand, customer preference/utility for environmental goods, and channel related costs. Note that this model is particularly relevant to an individual retail firm deciding whether or not to complement its traditional sales with an online sales channel.

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195 Sunday, 08:00 AM - 09:30 AM, Naples 6 *Track:* SCH, 5 *Chair:* Tapan Bagchi
Session: Scheduling

020-0587 EVT-based Lower Makespan Bounds for a 2-Machine 3-Operation Flowshop

J N D Gupta, University of Alabama in Huntsville, United States
Aditya H K, Indian Institute of Technology Kharagpur, India
Tapan Bagchi, Indian Institute of Technology Kharagpur, India

This study develops probabilistic lower bounds for makespan for a special two-machine flowshop common in steel plate rolling mills. Here each job requires three operations to be performed on it. The first operation occurs on the first machine; the second could be performed on either machine, while the third operation must be performed on the second machine. The problem is NP-hard and it often remains unclear as to how close to the optimum proposed solutions would be. This study uses EVT to uncover bounds and compares them to solutions found by heuristic and meta-heuristic methods or enumeration where possible.

020-0585 Exploring Extreme Value Theory Applications in Operations Scheduling

Tapan Bagchi, Indian Institute of Technology Kharagpur, India
Siddharth Singh, IEM IIT Kharagpur, India
Aditya H K, IEM IIT Kharagpur, India
Rajmani Prasad, IIT Kharagpur, India
J N D Gupta, University of Alabama in Huntsville, United States
Fan Tseng, University of Alabama in Huntsville, United States

This study explores a possible assessment of the quality of production schedules. The task is too complex computationally and frequently requires heuristic or meta-heuristic methods to solve it. This work borrows from EVT-based techniques that help size cash reserves held by banks by observing extreme events of financial significance. The specific target of this study is to check the efficacy of the VaR/ESq risk quantification framework in evaluating the goodness of schedules. To the best of our knowledge, many available methods claim to find efficient shop schedules, but few indicate how "good" a proposed schedule is.

020-0883 Dynamic Lot Sizing with Learning and Forgetting in Setups

Suresh Chand, Krannert School of Management, United States

The objective of this presentation is to analyze the dynamic lot-sizing model in which there is “learning and forgetting in setups.” As a result, the setup cost depends on the number of prior setups and the number of periods between two consecutive setups. We present an optimal forward dynamic-programming algorithm and decision/forecast horizon results for the problem. We also present computational results that support the desirability of smaller, more-frequent lot sizes.

020-0739 A Markov Decision Model for Consumer Term Loan Collections

Suzhou Huang, Ford Motor Credit Company, United States
Ping He, Ford Motor Credit Company, United States
Zhixin Liu, University of Michigan - Dearborn, United States
Jingren Shi, Ford Motor Credit Company, United States

We study how to efficiently schedule collection actions over consumer term loan accounts using a Markov decision model. A consumer loan account at each period can be classified into different account states, and naturally experiences state transition across time periods. The lender needs to employ collection actions to maintain loan accounts to be in states that generate high value. We model the state transition of loan accounts using a Markov transition matrix, and provide a solution approach to determine the collection action at each state and period for each consumer type that maximizes the lender's expected value. Our optimization approach incorporates the default risk and operational cost, and also addresses the time value of money, the tradeoff between interest revenue and borrowing cost, the time consistency in optimization, competing risks between different account states, and penalty of late payment.

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196 Sunday, 08:00 AM - 09:30 AM, Capri 3 *Track:* CSC, 24 *Chair:* Steven Melnyk

Session: Panel on Role of Supply Chains in Responsive Innovation

020-0770 Understanding the Role of Supply Chains in Responsive Innovation - A Panel Discussion

Steven Melnyk, Michigan State University, United States
Hugo DeCampos, Michigan State University, United States
Stanley Fawcett, Brigham Young University, United States
Elliot Bendoly, Emory University, United States

Innovation and responsiveness are becoming increasingly important competitive forces in today's economy. In light of the experiences of Proctor and Gamble, Sealy Mattresses, and GE Transport, we now recognize the greater role played by supply chains in helping the firm achieve these objectives. However, research in these areas has been limited. For example, in innovation, the attention has been on collaboration. Yet, there is empirical evidence that supply chains can affect the outcomes in a multitude of ways. In this panel discussion, we focus on the role played by the supply chain. Among the topics discussed will be the new outcomes demanded of supply chains, the diversity of innovation approaches, the role played by metrics, and factors affecting outcomes such as innovation. This workshop will conclude with a discussion of potential research issues. Panel participants: Steven A. Melnyk, Hugo DeCampos, Stan Fawcett, and Elliot Bendoly.

199 Sunday, 10:00 AM - 11:30 AM, Tuscan 1 *Track:* HOM, 10 *Chair:* Ken Klassen
Session: Scheduling in Outpatient Clinics

020-0182 Reserving Capacity for Urgent Patients in Primary Care

Gregory Dobson, University of Rochester, United States
Sameer Hasija, INSEAD, Singapore
Edieal Pinker, University of Rochester, United States

We analyze the common practice of reserving slots for urgent patients in a primary healthcare practice on two service quality measures: the average number of urgent patients not handled during normal hours (handled as overtime or referred to other physicians or the ER) and the average queue of non-urgent patients. We formulate a stochastic model of appointment scheduling. We conduct numerical experiments to optimize the performance accounting for revenue and these two service quality measures as a function of the number of reserved slots for urgent patients. We compare traditional methods to the advanced-access system, in which urgent slots are not reserved, and evaluate the conditions under which alternative appointment scheduling mechanisms are optimal. Finally, we demonstrate the importance of patient arrival dynamics to their relative performance finding that encouraging routine patients to call for same day appointments is a key ingredient for the success of advanced-access.

020-0199 Scheduling Capacity in Outpatient Clinics with Satellite Facilities

Denise White, Cincinnati Children's Hospital Medical Center, United States

Large healthcare organizations faced with increased demand and limited facilities often take advantage of satellite facilities to expand operations. Management of the capacity from these satellites can become quite complex as demand for many different specialties and procedures can originate from across the region. We explore the allocation of flexible clinical space for six satellite facilities and a main location with fixed capacity among twenty divisions in a large hospital. Developing objectives that consider both geographic distance for patients and the propensity for patients in an area to be served at the main location, we utilize optimization techniques to evaluate the objectives and distribute the satellite capacity among the divisions.

020-0972 Now or Later? How Clinic Capacity Management and Patient Treatment Adherence Affect HIV Incidence

Jessica McCoy, Stanford University, United States
M Johnson, Tuck School of Business at Dartmouth, United States

The health delivery supply chain in a resource-limited region potentially creates or removes barriers for patients seeking regular treatment. For example, the funding and capacity development strategy of a clinic has an impact on the progression of an epidemic in the catchment area. We develop an optimization model to help a clinic maximize the number of infections averted in its catchment area by controlling the creation of treatment slots in each period. Since adherence to HIV treatment is a predictor of viral suppression and impacts transmission rates, we model the impact of adherence behaviour on capacity decisions. We find that a constant adherence function leads to unrealistic funding allocation strategies, and that if the clinic instead uses a linear adherence function, it will develop a more balanced funding strategy.

020-0191 General Rules for Appointment Scheduling

Ken Klassen, Brock University, Canada
Reena Yoogalingam, Brock University, Canada

The presence of many environmental factors present significant challenges when designing an appointment system. The impact of patient and physician unpunctuality and service interruptions on the choice of the best schedule is studied. Empirical data is used to lend realism to the parameter distributions, and a simulation-optimization framework is used to address the stochastic nature of the problem and complexities of the factors studied. Best schedules are identified for various clinic characteristics and environmental conditions. General scheduling rules for minimizing the negative impacts of these factors are formulated based on these results to provide guidelines for practical implementation.

200 Sunday, 10:00 AM - 11:30 AM, Tuscan 2 *Track:* GOS, 5 *Chair:* Kannan Govindan Tracy Johnson-Hall
Session: Perishable and Food Supply Chains

020-0724 Reviewing Supply Chain Strategy - A Longitudinal Case Study

Roy Stratton, Nottingham Trent University, United Kingdom

Markets are increasingly characterised by demand uncertainty and short product life cycles that are often exacerbated by supply shifting to low cost global sources. The effect of these two changes is the growing importance of a cost versus response trade-off, acutely felt in the apparel industry (Fisher, 97; Lowson, 2002; Lee, 2002; Stratton,2003, Sun et al., 2009). However, when management is confronted by such transitions the implications of poor response are often only belatedly acknowledged and addressed. This paper reports on a longitudinal case study where the trade-off implications of such a transition initially resulted in significant supply instability. The study explores how and why stability was re-established through product and process design changes with particular reference to the systematic causes of the management inertia. This case is then used to explore how existing supply chain strategy models (Fisher, 97; Lee, 2002) support such decision making.

020-0661 An Integrated Production-Distribution Model for a Two-Echelon Food Supply Chain

Devika Kannan, Indian Institution of Industrial Engineering, India
Kannan Govindan, University of Southern Denmark, Denmark
Troels Martin Range, University of Southern Denmark, Denmark

Due to an increasingly competitive business environment, companies are undergoing enormous pressure in almost every industry. In such an environment, companies need to continuously search for ways to design new products, and then to manufacture and distribute these products in an efficient manner. In other words, how to reduce distribution costs becomes a critical factor in almost every company. In this paper, we proposed an integrated mixed integer linear programming production and distribution model for a two echelon food supply chain. The proposed model is solved using modified Genetic algorithm (GA) and compared with solutions obtained using GAMS. The performance of the proposed modified GA is analyzed for various sizes of test problems.

020-0861 Towards a Typology of Transparency in Food Supply Chains: What Information Will Firms Willingly Share with Customers?

Aleda Roth, Clemson University, United States
Tracy Johnson-Hall, Clemson University, United States
Enrico Secchi, Clemson University, United States

Recently the number and scale of food product recalls and safety issues have attracted consumer, government, industry and academic attention. Notwithstanding this interest and the impact of these issues, little supply chain research has been done taking customers' perspectives into account. Using a random sample of North American food producers, we explore how these firms respond to consumer inquiries regarding ingredient sourcing, supplier knowledge,

monitoring, and recall practices. We develop a typology of responses using product categories and dimensions of empathy, transparency and traceability. While some firms give limited information about their ingredient sourcing and monitoring practices, other firms appear to be positioned to use their supplier knowledge for competitive advantage. Differentiation, in particular, is a key issue for the typically low-margin food industry. Our study indicates a primary area for future research is how firms will react as customers become savvier and information asymmetries decrease.

202 Sunday, 10:00 AM - 11:30 AM, Tuscan 4 *Track:* ESO, 10 *Chair:* Ravi Subramanian

Session: Analyzing consumer markets for multiple lifecycle products

020-0083 Economic and Environmental Assessment of Refurbishing Strategies for Product Service Bundles

Anton Ovchinnikov, Darden School of Business, University of Virginia, United States
Gal Raz, Darden School of Business, University of Virginia, United States

It is commonly assumed that remanufacturing is environmentally beneficial. That, however, is true only when refurbished units replace the need to manufacture new ones, i.e., when remanufactured product cannibalizes new products' demand. At the same time, as our earlier work showed, by optimally pricing remanufactured products the firm can effectively eliminate cannibalization, thus creating a potential tension between economic and environmental performance of remanufacturing activities. In this paper we look at remanufacturing from the perspective of a product-service firm and through a combination of an analytical model and a behavioral study, and analyze the economic and environmental impacts of introducing a remanufactured version of a high-end product into a product line that otherwise consists of new high- and low-end products. We combine the methodologies from operations management and industrial ecology and seek insights that will help align economic and environmental goals of the firm and the society.

020-0926 Key Factors in the Market for Remanufactured Products: Empirical Evidence from eBay

Ravi Subramanian, Georgia Tech, United States
Ramanath Subramanyam, University of Illinois at Urbana-Champaign, United States

We analyze a sample of 250 transactions of remanufactured products sold on eBay to examine factors that explain differences between the purchase prices of corresponding new and remanufactured products. We also report on purchase price differences across different product categories. Further, we explore post-purchase buyer satisfaction between remanufactured and new products.

020-0668 Consumer Perceptions of Remanufactured Products

James Abbey, Penn State, United States
Daniel Guide, Penn State, United States
Meg Meloy, Penn State, United States

This study focuses on consumer markets for multiple lifecycle products, or the so-called back-end of the closed-loop supply chain. Through surveys and field experiments, the authors found that consumer perceptions of remanufactured products tend to be highly heterogeneous and even contradictory. To help clarify the drivers of the remanufactured product perceptions, this research focuses on the impacts of discounting, brand equity, and disgust for multiple lifecycle consumer products. The results show many interesting patterns not in line with previous theory as well as distinct separations of preferences based on product category.

020-0516 Sustainable R&D Portfolio Assessment

Catherine Decouttere, Flanders InShape, Belgium
Nico Vandaele, Katholieke Universiteit Leuven, Belgium

Research and development portfolio management is traditionally technologically and financially dominated, with little or no attention for value-based performance or for sustainable focus. The latter is mainly due to the lack of quantified and reliable data on the human aspects of product/service development: sustainability, usability, ecology, ethics, product experience, perceived quality, etc. Our results from an industry review that these issues really matter, not least when it comes to radical innovations (compared to incremental innovations). Using real-life examples, we show that this seemingly impossible assessment is practically possible to include sustainable, social and human-centered issues.

203 Sunday, 10:00 AM - 11:30 AM, Tuscan 5 *Track:* OEE, 7 *Chair:* Luiz Brito Annibal Scavarda

Session: Food Supply Chain Management

020-0802 Pistachio Supply Chain Management in Iran

Annibal Scavarda, School of Business and Management, American University of Sharjah, United Arab Emirates
Mohsen Nakhaeinejad, School of Business and Management, American University of Sharjah, United Arab Emirates
Ricardo Santa, College of Business, Alfaisal University, Saudi Arabia

Pistachio nuts are a healthy snack which are loved by people in various countries. Iran is the biggest pistachio producer in the world. Nowadays, the supply chain of this nut is encountering some supply problems. The first problem is that some major consumer countries have banned the import of pistachios because of the high level of “Aflatoxin” toxicity. Aflatoxin is a toxin which can be produced by fungi in pistachios under some special circumstances. The second issue is the increasingly high costs of producing pistachios. This paper analyzes the pistachio’s supply chain and processing methods utilized in Iran. As one of the possible solutions for decreasing processing costs is mechanization, the level of mechanization in processing pistachios in Iran will be studied. Moreover, the supply chain stages that affect the level of Aflatoxin will be identified.

020-0735 Operational Capabilities and Financial Performance in Sugar Cane Processing

Luiz Artur Brito, Fundacao Getulio Vargas - EAESP, Brazil
Maurício De Mauro, Fundação Getúlio Vargas, Brazil

Sugar cane processing is one of the important industrial activities in Brazil as a source of ethanol for domestic and export markets. Being a commodity type of market with limited product differentiation, competitive advantage and superior performance should rely on a higher level of sophistication of operational capabilities, following the resource-based logic. Results indicated that more sophisticated manufacturing and financial management capabilities are significantly related to better profitability. When growth was considered as a dependent variable, plant innovativeness was also statistically significant and with a positive influence. Other capabilities including agricultural management, human resources and planning did not show significant effects. The state has 169 processing units and 47 participated in the survey representing 37% of the processed volume. Multivariate regression and cluster analysis were used to support the conclusions. Results suggest possible paths of improvement and priorities for manufacturers.

020-0582 Redefining Retailers' Satisfaction Index : A Case Of Nestle India Ltd.

Sadia Samar Ali, JK Business School, India

Globalisation and maximum profit-fetching attitude drive many companies to nourish their retailers /distributors. Retailers'/Distributors' satisfaction is the buzzword of late 1990s; keeping in mind the importance of service as a major marketing tool, the decisions regarding retailers/distributors are enjoying a healthy share in any company's strategic decisions. Such decisions retrieve further importance because of non-predictability and uncertainty in working environment.In this paper we try to propose a model based on American Customer Satisfaction Index, ACSI, to evaluate the satisfaction level of Retailers/Distributors. Data has been collected from 3 Distributors and 18 Retailers working with Nestle India Limited, which will definitely highlight certain areas for managers to work upon.

020-0829 Internationalization Strategies and the Challenge of Sustainability for the Brazilian Beef Industry

Luis Pereira, FGV, Brazil
Adriane Farias Santos L. de Queiroz, UFMS, Brazil
Diogo Silva, UFMS, Brazil

Although the importance of sustainability is highly recognized, there is still some skepticism about the competitiveness gains through the adoption of sustainable practices.The Brazilian beef industry is highly competitive. However, the aggregate value of its product is still low when compared to its main competitors. One important discussion that has been raised is the impact of sustainability practices in the value of Brazilian beef in the international market. The aim of this study is to understand which are the strategies of the Brazilian Beef Industry companies to respond to this challenge. The main concern is to understand how these companies can provide a more valuable offer to the market.A multi-case study has been carried out with the most important Brazilian beef companies. Preliminary findings show that these companies are already including sustainability in their agenda and starting to adopt sustainable practices.

204 Sunday, 10:00 AM - 11:30 AM, Tuscan 6 *Track:* HOC, 8 *Chair:* Soumia Ichoua
Session: Supply Chain Issues in Humanitarian Logistics

020-0736 Prepositioning Emergency Supplies: A Stochastic Phase-Dependent Approach

Soumia Ichoua, Johnson C. Smith University, United States
Walid Klibi, CIRRELT, Canada
Alain Martel, Universite Laval/CIRRELT, Canada

We propose a scenario-based approach to tackle the strategic problem of prepositioning emergency supplies. The proposed approach can be divided into two major parts. In the first part, the disaster process is modeled using a risk modeling approach. The intent is to derive a Monte Carlo procedure to generate a set of plausible disaster scenarios. In the second part, the problem is first formulated as a two-stage stochastic programming model. The corresponding SAA model is then derived using the set of generated scenarios.

020-0771 A Decision Theoretic Model for Managing Retail Hurricane Shipments

Douglas Morrice, The University of Texas at Austin, United States
John Butler, The University of Texas at Austin, United States
Fehmi Tanrisever, Eindhoven University of Technology, Netherlands
Ozgur Araz, The University of Texas at Austin, United States

We consider the problem of a retailer that ships inventories from its warehouse to retail locations in preparation for a hurricane event. Shipment allocation decisions are made over multiple time periods in the face of uncertain demand. We construct a decision tree model to assess courses of action for the retailer and to compare different policies the retailer can use.

020-0301 Lean Humanitarian Supply Chains - Rhetoric or Reality

Pauline Found, Cardiff University, United Kingdom
Anthony Beresford, Cardiff University, United Kingdom

Emergency humanitarian aid is heavily dependent on the existence of finished goods, such as corrugated steel, blankets and medical products, etc., to be available within the supply chain that can be instantly commissioned by governments and aid agencies to provide essential shelter and meet immediate survival requirements. Central to Lean is the elimination of the waste of overproduction with an overall reduction of inventory coupled with demand-driven production of goods and services that are synchronized to actual customer orders, leading to an overall reduction of stock within the supply chain. This paper examines this paradox and suggests how it may be resolved.

205 Sunday, 10:00 AM - 11:30 AM, Tuscan 7 *Track:* PDI, 10 *Chair:* Sanjiv Erat
Session: Collaboration and the Genesis of Ideas

020-1020 Idea Generation and Concept Selection

Stylianos Kavadias, Georgia Institute of Technology, United States
Svenja Sommer, HEC, France

Idea or concept generation and selection is an essential, but relatively poorly understood part of the new product design process. In this work, we consider how group interactions affect the information dissemination during the idea generation process, and how the idea generation process and organizational choices affect the concepts ultimately selected for further development.

020-0836 How Complexity Impacts Innovation

Raul Chao, Darden School of Business, United States
Elena Loutskina, Darden School of Business, United States

Technological innovation is often thought of as a search process. To operationalize technological innovation and search, managers must allocate resources and select innovation projects to include in the R&D portfolio. In large organizations, these decisions often involve a large number of factors that interact in non-trivial ways, resulting in a complex decision problem. In this study we evaluate how two sources of complexity inherent in resource allocation and R&D portfolio decisions - organizational complexity and financial complexity - impact technological search for a large sample of publicly traded firms. We find broad empirical evidence that both organizational and financial complexity drive companies to pursue more exploratory search.

020-0712 Sharing Rules and Individual Incentives: Implications for Collaboration

Sanjiv Erat, Rady School of Management, UCSD, United States

Economic agents collaborate and jointly produce value in a variety of contexts. Oftentimes, the application of an implicit or explicit "sharing rule" determines how this created value is allocated between the collaborators. The current article examines how the broader collaboration patterns in a population arise as a result of

the individual incentives provided by these sharing rules. Our analytical model reveals that sharing rules result in (i) (relative) homophily in the groups wherein group members are less likely to collaborate with people outside the group, (ii) decreased collaboration in the population as a whole, and (iii) decreased collaboration among the group that is (systematically) disadvantaged by the sharing rule. Finally, we use US patenting data to offer an empirical test, and we offer evidence that sharing rules influences collaboration patterns in patenting as predicted by our model.

020-0574 Joint Product Improvement between OEM and Customer Support Center: The Role of Contracts

Shantanu Bhattacharya, INSEAD, Singapore
Sameer Hasija, INSEAD, Singapore

In this paper, we consider the role of a customer support center that cooperates with an OEM on the product improvement effort undertaken by the OEM. The customer support center exerts costly effort that facilitates the product improvement process of the OEM. The effort of the support center is an abstraction of the multiple tasks that the support center carries out, such as transcription of customer feedback on product design, statistical analysis of customer preferences and complaints, analysis of market trends, etc. However, this cooperative role of the support center has to be incentivized adequately by the OEM. In a double moral hazard framework, we characterize the structure of optimal contracts offered by the OEM and identify cases where renegotiation improves the profits of both firms. We also characterize options based contracts that are renegotiation-proof, and achieve the first best outcome.

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Sunday, 10:00 AM - 11:30 AM, Tuscan 8 *Track:* ERS, 10 *Chair:* Steve Brown Gloria Fragoso-Diaz
Session: Topics in Empirical Research II

020-0335 The Influence of Product/Process Strategy on Logistics Performance in the Presence of Supply Chain Integration

Mark Jacobs, University of Dayton, United States
Shawnee Vickery, Michigan State University, United States
Cornelia Droge, Michigan State University, United States

This study investigates the role of external integration, both upstream and downstream, in mediating the effects of product modularity versus process modularity strategy on service and delivery performance. The results demonstrate that customer integration mediates the relationships between product & process modularity and delivery performance, as well as mediating the relationship between process modularity and service performance. In contrast, supplier integration mediates the relationship between process modularity and delivery performance only. Product modularity and process modularity are both shown to be related to supplier integration and customer integration, suggesting that they engender integration across a supply chain.

020-0677 The Impact of Strategic Resonance upon Plant Performance - Exploring the Ongoing Role of Operations Strategy

Steve Brown, University of Exeter, United Kingdom

There has been growing interest in the importance of manufacturing/operations strategy since Skinner's seminal contribution in his 1969 HBR article. This paper provides details of longitudinal case studies using a profiling/clustering/performance approach and shows important distinctions between what Brown (2000; 2009) and Brown and Blackmon (2005) have termed strategic resonance and strategic dissonance. The reasons behind strategic resonance and dissonance within plants are explored and we shall see how operations strategy still has a vital and pivotal role to play related to plant performance in a range of operations parameters. This may help fill a gap in the literature because: "when alignment [between operations and business strategy] has been studied, its impact on the manufacturing unit's performance has rarely been examined" (Joshi et al, 2003, p355). This link is explored and developed in this paper.

020-0281 Operations Management Practices and Business Performance in a Successful Industry

Lawrence Corbett, Victoria University of Wellington, New Zealand

A key question in the field of operations strategy and operations management is how a firm’s practices, resources and capabilities contribute to its achieving and maintaining competitive advantage relative to its competitors. This study uses data from the 2005 Business Operations Survey carried out by the official statistics agency, Statistics New Zealand. This study examines the operations practices and business results in 211 firms in the food and beverage manufacturing sector. It was chosen because it has experienced a step-change in performance since 2001. The results show a wide range of practices contributing to these business performance measures as would be expected but there are some anomalies (monitoring competitors, quality management certification). The employee practices results are consistent with the literature. The results for quality management are mixed: positive contributions from having quality procedures but negative for working with suppliers and customers to improve, and encouraging employees to identify problems.

020-0372 SCM Competences and Competitive Priorities: The Moderating Effect of Competitive Environment on Firm Performance

Oscar Bustinza, University of Granada, Spain
Mª Nieves Perez-Arostegui, University of Granada, Spain
Daniel Arias-Aranda, University of Granada, Spain
Luis Molina, University of Granada, Spain

As long as Supply Chain Management is becoming a core competency, there is an increasing interest in the relationship between the competences derived from SCM and firm performance. The strategy literature has shown that a fit between strategy and structure has a positive impact on firm performance. SCM competences underlie on the structure of the firm, so that the alignment of SCM and operations strategy competitive strategy and its impact on firm performance is a question to be analyzed. In this paper we propose an alignment between SCM competences and competitive priorities and study the impact of this alignment on firm performance. For our proposes, we use data from manufacturing business units from firms operating in the European Union. After analysing the moderating effect of the competitive environment, our findings supported a positive relationship between this operational alignment and performance.

020-0573 Attitudes of US Managers toward the Ease Of Doing Business in Various Countries when Outsourcing

Gloria Fragoso-Diaz, DePaul University, United States
Helen LaVan, DePaul University, United States

U.S. manufacturing managers were surveyed to discern their attitudes towards outsourcing/offshoring. Hypothesized relationships include demographics, variability in what activity is outsourced and perceived ease of doing business in China, Singapore and Mexico. Variables related to cost to open a business, time to open a business, employment, protecting investors, paying taxes and trading across borders were included. It is hypothesized that managers with international experience are more likely to value offshoring and those with concerns about cost reductions, job loss and adhering to labor standards are less likely to value offshoring. Another hypothesis relates to how challenging it is to outsource/offshore various components of operations: manufacturing, assembly, business processes (including accounting and human resources) or IT.

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Sunday, 10:00 AM - 11:30 AM, Tuscan 9 *Track:* ACL, 3 *Chair:* Shane Schvaneveldt
Session: Active Learning for Enhancing the OM Classroom Experience

020-0920 Understanding the Role of Rational Subgroups in Statistical Process Control: An Active Learning Exercise

Shane Schvaneveldt, Weber State University, United States

Rational subgrouping is a foundational concept of statistical process control (SPC) and is a necessary condition for control charts to correctly distinguish between potential signals and probable noise. However, most textbooks and corporate training materials provide little explanation or illustration of the concept. This paper proposes a hands-on learning exercise using U.S. coinage that illustrates the effect of proper and improper subgrouping of sample data. A control chart based on random samples of coins does not detect a process change, but when properly organized into rational subgroups, the control chart easily reveals the time of the change.

020-0270 The Role of Corporate Partnerships in Active Learning of Service Supply Chains

Jack Crumbly, Tuskegee University, United States

Service supply chains and components have emerged as essential tools for undergraduates entering the job market. One way for undergraduates to learn these tools is to provide solutions to current challenges in the market. This research will discuss a case study involving a transportation company providing challenges for supply chain students. The study will discuss the background, results and future research opportunities.

020-0334 Forecasting Demand for New Products Using Agent Based Models

Surya Pathak, University of Washington, Bothell, United States
P.V. Balakrishnan, University of Washington, Bothell, United States

Traditionally, forecasting methods taught as part of an operations management course involve weighted moving averages, trend-adjusted exponential smoothing, and seasonality methods. While these topics are relevant, forecasting demand for a new product based on individual level adoption behavior is not emphasized enough. Keeping this in mind we present an interactive, agent-based teaching module using Netlogo, that allows students and managers to help forecast product category demand using the Bass diffusion model. Our module allows users to model populations of consumers across a wide range of market settings. This allows students to understand the impact of varying different parameters of a diffusion model. Importantly, it helps them to understand how changing the underlying agent level consumer behavior impacts aggregate demand patterns. The demand patterns can then be used for capacity planning and supply chain decisions.

020-1050 Frogtek: Mobile Technology for Micro-Retailing

Margaret Pierson, Harvard Business School, United States
Garrett van Ryzin, Columbia Business School, United States

Incorporated in 2008, Frogtek was a social enterprise focused on developing smart-phone technology to improve operations of micro-retail supply chains in Latin America. In June 2009, it received its first major investment of start-up capital. What operational strategy should Frogtek's founders take to position the venture for sustainable economic growth and social impact?

020-0395 Distribution Channel as Competitive Advantage in a Wholesale Strategy

Getulio Akabane, FATEC - SÃO PAULO, Brazil
Adriano da Silva, FATEC - BS, Brazil
Washington Luiz Soares, UNISANTA, Brazil

Wholesale companies have as their principal function to intermediate transactions between manufacturers and retailers. Two tendencies have been threatening the position of wholesalers in a distribution channel: vertical integration and development of the retail networks. In this context this research aimed to analyze a channel of distribution where retailers concentrate most purchases straight from manufacturers in order to check the economical viability of intermediation of the wholesale companies. The results were analyzed by using multivariate regression indicating which portion of the products presented economical viability for the wholesalers, confirming the importance of such institutions in a channel of distribution.

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208 Sunday, 10:00 AM - 11:30 AM, Tuscan 10 *Track:* ICM, 8 *Chair:* Rommert Dekker
Session: Managing Special Demands

020-0349 Evaluating the Potential Effects from Probabilistic Selling of Seasonal Items

Yongbo Xiao, School of Economics and Management, Tsinghua University, China
Jian Chen, School of Economics and Management, Tsinghua University, China

Probabilistic selling has been regarded as an efficient way of increasing sales and reducing risk from demand uncertainty. This paper considers an online retailer selling two similar and seasonal products (A and B) during a finite horizon. Besides selling the products at regular prices, the retailer may, from time to time, offer an additional option that sells a probabilistic good (PG), "A or B", at a discounted price. Whenever a customer buys a PG, the retailer still needs to assign one type of the products for the fulfillment. Based on a continuous-time, discrete state, finite horizon dynamic programming model, we study the optimal admission decisions (which include the offering of PS and assigning of products) for the retailer and provide an exact solution using a constructive method. By studying three variants of scenarios we evaluate the potential demand induction, demand dilution, and inventory pooling effect from adopting the PS strategy.

020-0376 End-of-Life Inventory Problem for Capital-Intensive Spare Parts

Morteza Pourakbar, Erasmus University Rotterdam, Netherlands
Rommert Dekker, Erasmus University Rotterdam, Netherlands

In this paper we consider the inventory problem of capital-intensive spare parts in their final phase of service life cycle. This phase starts as soon as the production stops and lasts till the last service contract expires. Using a finite horizon stochastic dynamic programming approach we find the optimal final order quantity and characterize the optimal service policy. Numerical analysis sheds light over the importance of different cost parameters and signifies the improvement gained by implementing the optimal policy.

020-0155 Inventory Planning with Forecasted Advance Demand Information: An Industrial Study

Dong Tang, Intel Corporation / Customer Fulfillment, Planning and Logistics Group, United States

Though imperfect, forecasted advance demand information is adopted for inventory planning and control in a wide range of industrial practices where the supply lead time or manufacturing throughput time is long. Based on an extended base-stock policy, this paper first shows that the usefulness of forecasted advance demand information is determined by the relationship between the variances of forecast errors and real customer demands, and then proposes a method to choose the best forecast lead time. This paper also studies an industrially popular but less investigated inventory policy - 'keep n days of inventory', which depends upon forecasted advance demand information to calculate the inventory position requirement. Numerical studies show that this policy is very forecast-error sensitive and isn't an appealing way to utilize forecasted advance demand information when the forecast error is large or grows fast as the forecast lead time increases.

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209 Sunday, 10:00 AM - 11:30 AM, Tuscan 11 *Track:* SOM, 8 *Chair:* Aistair Brandon-Jones
Session: Risk and Complexity Analysis

020-0370 Managing the Effects of Product Complexity on Aircraft MRO Operations

Wolfgang Kersten, Hamburg University of Technology, Germany
Markus Klotzbach, Hamburg University of Technology, Germany

Manufacturing companies in the aviation sector are supporting the efforts of IATA 2050 goals to reduce aviation net carbon emissions by 50% on a 2005 basis. Hence, airframers and aircraft-related component manufacturers focus on enhancing operational efficiency of aircraft by using lightweight material, improving engine efficiency and integrating several functionalities on a single aircraft component. In consequence of this trend, product complexity is increasing significantly. Thus not only manufacturers but also aircraft MRO providers have to cope with the process-related impacts of product complexity. We develop an approach that enables companies in the aircraft MRO sector to identify the implications of product complexity on service operations. The approach contains the development of adequate indices for both product and process complexity and outlines specific effects on operational cost, time and performance. The contribution includes initial results of a case study currently conducted with a major MRO company.

020-0203 Evaluation of the Administrative Decentralization Process of the University of São Paulo (USP), Brazil

Cristina Rousseau, University of São Paulo, Brazil
João Amato-Neto, University of São Paulo, Brazil

The aim is to analyze the results of the administrative decentralization process at the University of São Paulo (USP) after the first year of its implementation. The results were evaluated by an interview conducted via e-mail with the coordinators of the 6 USP campuses. In this interview, each oordinator responded to a semi-structured questionnaire with 12 questions regarding: the importance of decentralization, relations between the coordinator and the Management Council of the respective campus and administrative bodies that have been decentralized, the role each one played in the process, the difficulties encountered in its implementation, and the changes and the results obtained so far. Most of them considered that decentralization had its importance with regard to reducing bureaucracy and streamlining the processing of cases. Another favorable point expressed by them was the proximity and interaction with the decentralized bodies, while respecting the main directives.

020-0222 How to Teach the Service Process Analysis Tool?

Youn Sung Kim, Inha University, Korea, Republic of (South Korea)

According to previous study, service blueprinting facilitates problem solving and creative thinking by identifying potential points of failure and waiting and focusing opportunities to innovate service productivity and quality. In the classroom, students can understand the service blueprinting by the action learning project under the guidance of the professor. In this paper, the process and results of this project will be explained.

020-0365 Exploring Service Sustainability

Helen Walker, University of Warwick, United Kingdom
Emma Brandon-Jones, University of Bath, United Kingdom
Aistair Brandon-Jones, University of Bath, United Kingdom

To date, the growing interest in sustainability has focused on manufacturing rather than services. This study seeks to develop a conceptual framework to improve understanding of service sustainability. We start by considering different conceptualizations of service - exclusion, IHIP, rental-access, and UST. We also consider different perspectives on sustainability - triple bottom line, sustainable products versus processes, and sustainability and competitive advantage. Having considered views of services and sustainability, we hope to develop a more nuanced view of sustainable service by considering different service types. For example, services could be differentiated in terms of the combination of elements delivered in the value package, the mix of performance objectives, or the volume-variety characteristics. It is likely that the focus of sustainability efforts will vary for different kinds of service and so will the extent to which sustainability can be implemented and have an impact.

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210 Sunday, 10:00 AM - 11:30 AM, Roma 1,2 *Track:* NCC, 6 *Chair:* Mili Mehrotra
Session: Session 6

020-0884 A Single-Supplier, Multiple-Retailer Model with Single-Season, Multiple-Ordering Opportunities and Fixed Ordering Cost

Apurva Jain, University of Washington, United States
Yong-Pin Zhou, University of Washington, United States
Kamran Moinzadeh, University of Washington, United States

We discuss the replenishment decision of a seasonal product in a two-echelon distribution system consisting of a supplier and multiple retailers. At the beginning of the season, the supplier orders its entire stock for the season. The retailers can replenish their inventory from the supplier anytime in the season. Demand at each retailer follows a Poisson process. Each retailer order incurs a fixed cost, and the usual under- and overstocking costs occur. We characterize the structure of the retailer's optimal policy and propose a number of heuristics. For the supplier, we characterize the distribution of total demand and provide an approximate solution for its order-size decision. We find that the optimal retailer policy can sometimes cause large demand variation for the supplier, resulting in lower supplier profit. In centralized settings, this may even result in lower system profit than some naïve retailer heuristics, creating inefficiency in the supply chain.

020-0105 Driving Process Innovation Competition through Environmental Considerations in an Industrial Symbiotic Sustainable System

Yunxia Zhu, The University of Texas at Dallas, United States
Srinagesh Gavirneni, Cornell University, United States
Vaidy Jayaraman, University of Miami, United States

In this paper, we propose a methodology, illustrated with adetailed example, of how we can use the principles of Industrial Ecology to provide an alternate corporate planning model where a company sets up not one but a complex of diverse industries in which one industry uses the waste from another as an input.

020-0426 An Analysis of Coordination Mechanisms for the U.S. Cash Supply Chain

Milind Dawande, The University of Texas at Dallas, United States
Mili Mehrotra, The University of Minnesota, United States
Vijay Mookerjee, The University of Texas at Dallas, United States
Chelliah Sriskandarajah, The University of Texas at Dallas, United States

Through its new cash re-circulation policy, the Federal Reserve of the United States intends to induce Depository Institutions to effectively re-circulate cash so that the societal cost of providing cash to the public is minimized. We first analyze the efficacy of the Fed's current policy as a coordinating mechanism and then

propose and analyze a fundamentally different mechanism.

020-0990 Supply Chain Coordination and Product Design with Multiple Attributes

Bing Liu, University of Alabama, United States
Charles Sox, University of Alabama, United States

It is common for a customer to choose competing products based not only on price but also other product attributes; for example, battery life and CPU speed for a personal computer. In this case, the demand is not only price sensitive but is also influenced by a set of product attributes. Such a manufacturer can improve its profit by carefully selecting the attributes and prices of its products. The supply chain coordination literature focuses only on price to differentiate products and to influence purchasing decisions. First, we extend the Bertrand model to include another product attribute. Second, we investigate the impact of another attribute on the price-only strategy and on the effect of double marginalization in a setting with a single manufacturer and a single retailer. Third, we study the coordination strategies when a second manufacturer is introduced and the two competing manufacturers sell products through a single retailer.

211 Sunday, 10:00 AM - 11:30 AM, Sorrento 1,2 *Track:* QPJ, 9 *Chair:* Arthur Hill
Session: Session 9: Sustaining Lean

020-0947 Sustainability Framework of Lean's Successes

Lumbidi Kupanhy, Wakayama University, Japan

Lean companies are known not only for their focus on a thorough elimination of wastes relating to production processes, but also for the sustained competitiveness of their products in the market as well as their steady increasing market share. Strikingly, of the many companies that adopted or switched to lean production methods, only a handful of them have experienced and/or enjoyed the sustained successes of lean production methods. Why? Furthermore, the recently spectacular stumble of Toyota due to quality problems of some of its products seems to have sent a shaking shockwave message that Lean-sustained successes are not necessarily sustainable forever, that the sustainability of Lean's successes might be just a myth. Our aim is to define a tentative sustainability framework of Lean's successes.

020-1045 The Impact of Manufacturing Inventory Levels on New Product Innovativeness

George Ball, Carlson School of Management, University of Minnesota, United States
Rachna Shah, Carlson School of Management, University of Minnesota, United States
Arthur Hill, Carlson School of Management, University of Minnesota, United States

It has been demonstrated empirically that manufacturing cross-functional involvement in the new product development process enhances new product performance. However, it is not clear if there are certain characteristics of a manufacturing environment that enable a more knowledgeable involvement of manufacturing personnel in the new product development process. We hypothesize that a manufacturing environment which operates with lower levels of inventory will be more knowledgeable about their products and processes, and that this knowledge will enable a more effective cross-functional involvement by manufacturing personnel. Using data from a cross-section of international plants covering 3 industries, we examine the impact that lower inventory levels in manufacturing has on the relationship between cross-functional involvement and new product innovativeness. We find evidence that cross-functional involvement has important contextual factors, and that knowledge gained in manufacturing through inventory reduction can enhance performance in other functional areas in the firm.

020-0422 Lean - How Much is Enough?

Rhys Watson, The University of Melbourne, Australia
Damien Power, The University of Melbourne, Australia
Danny Samson, The University of Melbourne, Australia

This research had the primary aim of conducting an international analysis of lean manufacturing practices based in theory to determine the extent they have been adopted and how they may influence performance. The theoretical lens of Resource-Based View was adopted to view the influence of lean practices and the implications for building competitive advantage. This paper examines the influence of lean practices at the plant level on the performance dimensions of quality, cost, flexibility and delivery. The Global Manufacturing Research Group dataset was used for this paper. Empirical data was gathered directly from 1295 manufacturing plants in 22 countries. The study considers whether Lean plants have characteristically better performance than No-Lean plants and the implications of different levels of commitment to lean on performance. Primary findings were that it is not sufficient to be partly committed to lean. A high level of commitment is required to achieve results.

212 Sunday, 10:00 AM - 11:30 AM, Sorrento 3,4 *Track:* SAP, 8 *Chair:* Gary Stading
Session: Sourcing and Procurement: Supplier Relationships

020-0268 A Fuzzy Approach for Evaluating Suppliers Based Upon On-time Delivery & Product Quality

Margaret Shipley, University of Houston Downtown, United States
Gary Stading, University of Houston Downtown, United States

A fuzzy set-based model is utilized to select suppliers based upon their proven ability to deliver on-time (OD) and provide the quality of product (QP) necessary for efficient supply chain functioning. Fuzzy belief in a supplier's performance behavior can be determined as falling into a designated interval that is acceptable to management or coming as close as possible to this acceptable range, in this paper, based on early or late delivery (ED or LD, respectively) and damaged or missing products (DP or MP, respectively). A set of data was accumulated to represent a group of suppliers. Belief functions were assigned to each supplier's performance according to the DM's opinion of the strength of representation for each on-time delivery and quality product orientation. After specifying management's goal levels for the OD and QP acceptable for the company, the fit of suppliers' performance to the target goal allowable was analyzed.

020-0749 Factors for Procurement Success and the Role of Repeat Incumbent Awarding

Christopher Held, Georgia Institute of Technology, United States

For the past several decades, there has been a fundamental dispute about the appropriate mechanism for procurement. The supporters of Porter advocate a competitive setting where short-term contracts are used to increase buyer power and lower supplier prices. Meanwhile, the supporters of Deming advocate the idea of long-term contracts to align buyer and supplier incentives. This trade-off between long-term and short-term contracts has fundamentally affected the means of procurement, with some suppliers attempting hybrid strategies such as repeat incumbent procurement: a strategy characterizedby short-term contracts with frequent rebidding but awarding to the same incumbent supplier repeatedly to create a long-term relationship. This paper examines this hybrid strategy to determine its effectiveness.First, we create an empirical model that identifies and measures the trade-off between the Porter and Deming strategies. Second, we incorporate the practice of repeat incumbent awarding into our model to identify the impact and mechanism by which this strategy impacts the overall success of procurement.

020-0756 Assistance Versus Pressure: A Theoreotical Model and Empirical Analysis of Alternate Supply Management Approaches

Scott Ellis, University of Kentucky, United States
John Henke, Oakland University, United States

Transaction cost and relational governance theories suggest that the provision of assistance and the application of pressure serve as two countervailing supply management tactics that buyers may adopt to influence the behaviors of their suppliers. Whereas assistance embraces contemporary SCM orientation, pressure is largely consistent with an arms-length approach to supplier management. While extant theory suggests that these approaches may be incompatible, our interviews with supply managers suggest otherwise. To gain further insight, we develop a four-stage causal model in which we consider the antecedents and relational consequences to buyers' simultaneous use of assistance and pressure tactics. Using survey response data from direct material suppliers, we find that both supplier and buyer dependence affect buyers' adoption of pressure and assistance tactics. Further, results suggest that buyers' provisions of assistance significantly affect suppliers' views of customer relationship importance and, subsequently, the benefits that suppliers convey to buying firms.

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213 Sunday, 10:00 AM - 11:30 AM, Naples 2 *Track:* GEN, 8 *Chair:* Bilal Gokpinar
Session: Supply chain network and relationship

020-0627 SME-Suppliers Cooperation: Impact Analysis of Innovation on Firm Performance

Marta Fossas-Olalla, Universidad Complutense of Madrid, Spain
Francesco Sandulli, Universidad Complutense de Madrid, Spain
Beatriz Minguela-Rata, Universidad Complutense de Madrid, Spain
Antonio Rodriguez-Duarte, Universidad Complutense de Madrid, Spain

When it comes to meeting the preferences of their customers, companies are increasingly dependent on their network of suppliers. This buyer-supplier relationship can take on many different forms, ranging from competitive models to those of cooperation. This paper analyses the type of relationship found between small and medium-sized Spanish enterprises (SMEs) and their suppliers and the degree to which this relationship affects firm performance. Cooperation with suppliers involves the exchange of information, supplier development, for example through technological collaboration, and the existence of mutual dependence between the parties involved. We conclude that SMEs with a higher degree of cooperation with suppliers perform better financially and are more efficient.

020-0870 The Performance Indicators That Contribute to the Relationship between a Network of Stores and their Suppliers

Oberdan da Silva, Universidade de Caxias do Sul, Brazil
Eric Dorion, Universidade de Caxias do Sul, Brazil
Maria Emilia Camargo, Universidade de Caxias do Sul, Brazil
Grieco Bossardi, Universidade de Passo Fundo, Brazil
Ana Elizabeth Moiseichyk, Universidade Federal de Santa Maria, Brazil

The work identifies the performance indicators that build a strategic relationship between a store network situated in the northwest region of Rio Grande do Sul and their suppliers. It was realized as a qualitative study, involving cases, where the exploratory research was guided through in-depth interviews with the director of the store network. It was identified that the mix of products that satisfies the customer, the agility in the businesses, the complements of interests, united projects, trust and technical support, are factors that contribute to the construction of a strategic relationship among the network of stores and their suppliers. The study also indicated that the performance over the mean for products and results, the shared, the promotional team and the organizational capacity of the partner, are factors that justify the strategic relationship within the network in study.

020-0914 A Study on Relationships among Business Environment Characteristics and Competitive Priority on Manufacturing Firms' Business Performance

Nambirajan Thangasamy, Pondicherry University, India
Prabhu Bordau Mannadhan, Pondicherry University, India

Competitive priorities are formulated to determine the way in which organizations can move from their present competitive position to a new stronger one. This can be achieved only by improving an organization's competitiveness. In the present work, authors aim to analyze the relationships among four constructs - business environment characteristics, advanced manufacturing technologies (AMT), competitive priorities and firm performance. This study provides a systemic understanding of relationships among the individual business environment characteristics, the individual competitive priorities and advanced manufacturing technologies and the impact of alignment between these elements on firms' business performance. Authors propose a valid and reliable measurement model to measure the business environment characteristics, advanced manufacturing technology, competitive priorities and firm performance. Implementation of advanced manufacturing technology has been viewed as a powerful competitive weapon. A more competitive environment will result in increased use of advanced manufacturing technology, which will increase the firm's performance.

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214 Sunday, 10:00 AM - 11:30 AM, Naples 1 *Track:* OMF, 5 *Chair:* William Schmidt
Session: Session 5: Operations and Financial Market Performance II

020-0521 The Predictive Power of Abnormal Inventory Growth

Saravanan Kesavan, UNC Chapel Hill, United States
Vidya Mani, UNC Chapel Hill, United States

In this paper we test the predictive power of abnormal inventory growth to forecast retailers' earnings. We demonstrate an inverted-U relationship between abnormal inventory growth and one-year ahead earnings per share for retailers. We find this relationship to be robust to different measures of abnormal inventory growth obtained from operations management literature. Our results also show that equity analysts do not fully incorporate the information contained in abnormal inventory growth in their earnings forecasts, resulting in systematic biases in their earnings' forecasts. We show that incorporating abnormal inventory growth in analysts' forecasts would improve their forecast accuracy. This improvement can be as much as 15.08% for overinventoried retailers that are identified based on previous year's abnormal inventory growth.

020-0842 Sales Forecasting with Financial Indicators and Experts' Input

Nikolay Osadchiy, Emory University, United States
Vishal Gaur, Cornell University, United States
Sridhar Seshadri, University of Texas at Austin, United States

We investigate how uncertainty in sales in retail, wholesale and manufacturing sectors can be explained by the return on a financial market index.This information can be employed in forecasting, hedging, and risk management. Our forecasting model expresses the total sales of a firm as a function of sales forecasts generated by equity analysts, the term of the forecast, and the return on an aggregate financialmarket index over the term of the forecast. Using a

panel of annual firm-levelsales forecasts, we show that a large and significant part of the sales forecast errors is explained by marketreturns. Surprisingly, this information is not accounted for in the analysts' forecasts. Therefore, we develop a method of augmenting sales forecasts with market returns thereby improving their accuracy. The accuracy improvement can exceed 20% inout-of-sample tests under various performance metrics.

020-0374 The Effect of Supply Chain Disruptions on Company Value

William Schmidt, Harvard Business School, United States
Ananth Raman, Harvard Business School, United States

The possibility of disruption is inherent in most supply chains, but it is not clear why some supply chain disruptions have a much larger relative effect on company value compared to other disruptions. This is an important managerial question as understanding it could help companies structure their supply chains and target risk mitigation efforts toward those disruptions that destroy the most value. We use a unique data set and rigorous empirical model to alleviate endogeneity and sample selection issues. Using the level of audited earnings information included in supply chain disruption announcements, we show that increased investor confidence in company disclosures may influence the impact on abnormal returns. In addition, we identify that the magnitude of abnormal returns may be affected by the perceived level of managerial control over the supply chain disruption.

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Sunday, 10:00 AM - 11:30 AM, Naples 3 *Track:* HOM, 20 *Chair:* Vicki Smith-Daniels

Session: Healthcare Supply Chain Challenges and Solutions

020-0781 Managing Cold Chain and Temperature-sensitive Products in the Pharmaceutical Industries

Vicki Smith-Daniels, Indiana University - Kelley School of Business - Indianapolis, United States
Mohan Tatikonda, Indiana University Kelley School of Business, United States

The safety and security of the supply chain includes maintaining the efficacy of the drug. Cold Chain refers to an uninterrupted flow of a temperature-controlled shipment from manufacturing through delivery to end user. This requires knowledge and control of the shipping environment, package design, duration of the shipment(s) and critical points throughout the process. All companies in the pharmaceutical industry are expected to comply with applicable state and federal regulations with respect to temperature-sensitive products. Drawing on earlier studies of supply chain design and quality management systems, we present a conceptual model of cold chain management in the pharmaceutical industries and identify a research agenda for this critically important industry problem.

020-0877 Towards Quality Improvement in Underresourced Settings: Evidence from Electronic Health Record Utilization in Primary Care Clinics

David Zepeda, University of Minnesota, United States
Kingshuk Sinha, University of Minnesota, United States

There is a well-documented association between resource availability and quality of care in health care settings. Yet, evidence is lacking regarding health IT interventions and quality of care outcomes in underresourced settings. Underresourced settings, in particular, provide care for people who have insurance with low reimbursement rates or are uninsured, constraining their ability to make capital and human resource investments. Using clinic level data of 400+ clinics, this study looks at various characteristics of primary care clinics and their relationship with electronic health record (EHR) utilization and diabetes care outcomes.

020-0734 Supply Chain Coordination, Information Systems Capabilities, and Perioperative Surgical Service Performance

Vicki Smith-Daniels, Indiana University - Kelley School of Business - Indianapolis, United States

Surgical services departments are implementing new ways of coordinating the hundreds of supply chain activities that are required to plan and perform a surgical procedure. Drawing on earlier research on coordinating mechanisms in health care, this study examines the effects of supply chain coordination on surgical suite operational performance. This study also investigates the complementary performance effects of integrated information systems capability on inter-functional and inter-organizational supply chain coordination. Due to the existence of important tradeoffs in operational capabilities, operational performance has been conceptualized as a composite construct made up of several performance indicators. The theoretical model will be tested using primary data that is being collected from surgical services departments in U.S. acute care hospitals, including objective performance measures and multiple respondent perceptual measures of supply chain coordination and information technology capability.

020-0045 Treading Carefully on Thin Ice: Outsourcing a Clinical Trial to a CRO

Arvinder Loomba, San Jose State University, United States
Rita Susanto, Abbott Vascular, United States

Driven by high cost and increasing drug development complexity due to stricter FDA regulations, use of a CRO by bio-pharmaceutical companies to provide services is becoming more prevalent. This new business model is seen as an attractive alternative to many organizations, in particular start-ups and smaller companies, as it is perceived to reduce overhead costs and shorten time to market by accessing CRO staff and expertise at the right time. In response, CRO market has grown substantially since late 1990s, and is expected to grow 9% annually to reach $35 billion by 2015 worldwide. In this paper, we outline a case study of a major medical device manufacturing firm and its interaction with a leading full-service CRO to outsource execution of its FDA-mandated post-approval trial. We address the specific operational hurdles that hampered smooth dealings between the two organizations and offer managerial reflections and lessons learned for industry practitioners.

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Sunday, 10:00 AM - 11:30 AM, Naples 4 *Track:* CSC, 10 *Chair:* Dorothee Honhon

Session: Dynamic Assortment Planning

020-0263 Dynamic Assortment Strategies for Variety-Seeking Consumers

Dorothee Honhon, University of Texas at Austin, United States
Gurhan Kok, Duke University, United States

In this project, we first characterize the static optimal assortment for a retailer with variety-seeking consumers. We then characterize the optimal assortment sets in the dynamic strategy that offers possibly different assortments each period. We show that it is possible to generate a high level of satisfaction at the customer level by having a mixed assortment strategy.

020-0871 Optimal Bundling and Pricing for Vertically Differentiated Information Goods

Xiajun Pan, University of Missouri at Kansas City, United States
Dorothee Honhon, University of Texas at Austin, United States

Inspired by iTunes' successful online business, we study how to choose the optimal bundling and pricing strategy for a retailer offering vertically differentiated information goods. We compare the profits of the suppliers and retailers as well as the consumer surplus under different pricing schemes. We characterize the conditions under which pure bundling and mixed bundling strategies are optimal respectively. We provide efficient methods to identify which individual components to offer, whether or not to offer a bundle and how to price the offered individual components and the bundle in order to maximize the decision

maker's profit.

020-0323 Learning Consumer Tastes through Dynamic Assortment

Canan Ulu, University of Texas at Austin, United States
Dorothee Honhon, University of Texas at Austin, United States
Aydin Alptekinoglu, Southern Methodist University, United States

How should a firm modify its product assortment over time when learning about consumer tastes? We study dynamic assortment decisions in a horizontally differentiated product category for which consumers' tastes can be represented on a Hotelling line. Each period, the firm chooses an assortment to maximize total expected profits given its subjective beliefs over consumer tastes. The consumers then choose a product from the assortment that maximizes their own utility. The firm observes sales, which provide censored information on consumer tastes, and updates beliefs in a Bayesian fashion. There is a recurring tradeoff between the immediate profits from sales in the current period and the informational gains to be exploited in future periods. We show that one can (partially) order assortments based on their information content and that in any given period the optimal assortment cannot be less informative than the myopically optimal assortment.

020-0684 Textbook Retail Business at The Cornell Store

Amr Farahat, Cornell University - The Johnson School, United States
Vishal Gaur, Cornell University - The Johnson School, United States
Suresh Muthulingam, Cornell University - The Johnson School, United States

We develop a demand forecasting model for new and used textbooks using data from the Cornell Store. We investigate goodness of fit of demand distributions and evaluate the performance of various estimation methods to forecast demand. The study reveals the effects of substitution, pricing and various product characteristics on consumer purchase behavior.

217 Sunday, 10:00 AM - 11:30 AM, Naples 6 *Track:* SCH, 6 *Chair:* Anurag Agarwal
Session: Project Scheduling

020-0505 Project Scheduling with Alternative Technologies: Incorporating Varying Activity Duration Variability

Stefan Creemers, IESEG School of Management, France
Bert De Reyck, University College London, United Kingdom
Roel Leus, K.U.Leuven, Belgium

We look into project scheduling with expected-NPV objective and stochastic activity durations. Individual activities carry a risk of failure, and an activity's failure can cause the overall project to fail. More than one alternative may exist for reaching intermediate project deliverables, and these alternatives can be implemented either in parallel or sequentially. We determine the optimal solution to the scheduling problem by means of stochastic dynamic programming. We examine the impact of the variability of activity durations on the project's value. We also illustrate that higher operational variability does not always lead to lower project values, meaning that (sometimes costly) variance-reduction strategies are not always advisable.

020-0500 A New Approach for Master Production Schedule under Theory of Constraints

Davood Golmohammadi, University of Massachusetts Boston, United States
Afshin Mansouri, Brunel University, United Kingdom

Product mix optimization is one of the main challenges in a production system. Several algorithms have been developed based on Theory of constraints (TOC) approach to determine an optimized master production schedule (MPS). Most of these algorithms are evaluated based on simple examples and they may not be very efficient in dealing with real-world operations. We investigate inefficiency of recent algorithms, and demonstrate some of the fundamental factors that have not been considered in any of the current algorithms. Finally, we propose a new algorithm under TOC approach to create an efficient MPS.

020-0200 Towards Economically Optimal Objectives for Resource-constrained Project Scheduling

Anurag Agarwal, University of South Florida, United States

In resource-constrained project scheduling, various objectives such as minimizing makespan or cost minimization are used. It is generally left to the discretion of the project manager to choose an objective. For example, if the manager is facing time deadlines, a makespan-minimization objective might be most suitable. Not all objectives are equivalent; some objectives may even contradict others. This paper develops a unifying framework for the objective function and provides some economic insights for the popular objectives. We posit that there is an economically-optimum general-purpose objective function, and that other objectives are basically special cases of this objective under certain boundary conditions. We call the generalized objective function the economically optimal objective, and develop boundary conditions under which this objective function reduces to the objectives commonly used. As a corollary, we develop conditions under which the popular objectives are not economically optimal.

020-0333 Minimizing Penalties with Partial Deliveries in Integrated Supply Chains in Lean Manufacturing

Anurag Agarwal, University of South Florida, United States
Vaidyanathan Jayaraman, University of Miami, United States
Anthony Ross, University of Milwaukee, United States

One of the goals in lean manufacturing in integrated supply chains is zero inventory, both at the supplier and customer ends of the supply chain. Sharing customer’s production plans with the supplier enables suppliers to schedule their production to ensure on-time deliveries. However, due to variances in production plans, and given capacities on production, there is a chance that deliveries may be delayed, which result in held-up production at the customer’s end, resulting in penalties imposed on the supplier. Some of the penalties may be mitigated through partial deliveries to prevent held-up production. In this paper we present a mathematical model for the supplier's problem of scheduling in order to minimize penalties. We also present heuristics to solve the problem. The supplier’s production environment is assumed to be a flow-shop environment. The model is tested empirically on several test problems.

020-0457 Scheduling Arrivals to a Stochastic Service Delivery System Using Copositive Cones

Qingxia Kong, National University of Singapore, Singapore
Chung-Yee Lee, Hong Kong University of Science and Technology, China
Chung-Piaw Teo, National University of Singapore, Singapore
Zhichao Zheng, National University of Singapore, Singapore

We develop a convex programming approach to the appointment system design problem in a single server facility, using a (stochastic) network flow model to capture the waiting time of each patient in the system. We solve a robust min-max problem, using a representative worst case distribution matching the prescribed moments estimates of the service durations, to determine the optimal schedule. The scheduling decisions obtained by planning against the worst case distribution perform exceedingly well for several distributions with the same mean and covariance parameters. Furthermore, in a multi-class system, if patients with higher variability are to be seen before those with lower variability, the optimal schedule generally exhibits a "Bailey's Rule + break" structure. Our analysis also reveals an interesting characteristic of the optimal appointment system - except slots with zero length, the chances of waiting for consultation service are identical for patients choosing all other slots in the system!

221 Sunday, 01:30 PM - 03:00 PM, Tuscan 1 *Track:* HOM, 11 *Chair:* Thomas Rohleder
Session: Patient Flow and Process Modeling

020-0722 Simulation Modeling to Improve a Gastroenterology Procedures Practice

Thomas Rohleder, Mayo Clinic, United States
Todd Huschka, Mayo Clinic, United States
Bjorn Berg, North Carolina State University, United States
Mark Larson, Mayo Clinc, United States
Brian Denton, North Carolina State University, United States

We present a case study of a simulation modeling project with the objective of evaluating improvement options for the Advanced Gastroenterology Practice of Mayo Clinic. The practice is relatively complex because five different procedures are performed, each with unique volume, procedure time, staff, and equipment characteristics. The model provides a test bed to explore different staff assignment and procedure room management strategies.

020-0778 Planning Recovery Bed Capacities for Surgical Patients

Yariv Marmor, Mayo Clinic, United States
Thomas Rohleder, Mayo Clinic, United States
Todd Huschka, Mayo Clinic, United States
David Cook, Mayo Clinic, United States
Jeffrey Thompson, Mayo Clinic, United States

We report on a project to determine the number of recovery beds required for cardiovascular surgery patients at Mayo Clinic. A simulation model was developed to assist in the planning process. The model accounted for variability due to surgery scheduling (with seasonal and weekday effect), patient mix, and patient length of stay. The model provides decision makers with a means to understand the relationship between patient service level and bed capacity. It also provides a tool to evaluate the effects of proposed clinical and process improvements.

020-0280 Improving ICU Resource Utilization

Muer Yang, University of Cincinnati, United States
Michael Fry, University of Cincinnati, United States

Mt. Sinai Hospital is struggling to respond to the high demand for Intensive Care Units (ICUs). Post-surgery, patients are generally transferred to an ICU bed, but such beds are limited in number due to the expense of staffing and equipping an ICU. If no bed is available in ICU, a scheduled surgery has to be postponed---deferring the substantial profits generated by the surgery and costing both the hospital and the patient's health. Our goal is to provide efficient tools to the hospital to wisely allocate the ICU beds, taking into account both the known and potential surgeries to be performed each day. Our solution method combines simulation and optimization techniques.

020-0328 Cost Model for Estimating Central Sterile Surgical Instrument Processing

Philip Kazemersky, University of Tennessee at Chattanooga, United States

A research study in the central sterile department of an urban hospital was executed to baseline process parameters for external supplied instrument trays used in orthopedic knee replacement procedures and internal instrument tray processing costs. Statistical process times associated with each stage of the decontamination and sterilization process were determined. The cost equations are developed for the total process cost encompassing the six discrete work elements that occur in instrumentation trays processing through sterilization. The cost equations are broken into low, medium, and high approximations. The approximations are compressed to a single approximation. The result by using typical cost parameters is used to provide projected process costs. A simulation, based on collected data, was created as an approximation of the processes that occurred in the hospital's central sterile department. Distribution and number of trays processed can be forecast determined.

222 Sunday, 01:30 PM - 03:00 PM, Tuscan 2 *Track:* GEN, 12 *Chair:* Sam Wood
Session: Award Winning OM Game

020-1058 Play an award-winning online game used to teach Operations Management

Sam Wood, Responsive Learning Technologies, United States

In 2004 POMS awarded the Wickham Skinner Award for Teaching Innovation for the development of a competitive online simulation-based assignment named Littlefield Technologies. Last year the game was used in introductory operations courses at the undergraduate, graduate, and executive level in hundreds institutions around the world. In this highly interactive session, participants will play an actual game compressed to 45 minutes. The session will also include discussion of how online games can be used effectively. Although not required, attendees are encouraged to bring a laptop to the session.

223 Sunday, 01:30 PM - 03:00 PM, Tuscan 3 *Track:* OMM, 5 *Chair:* Kathryn Stecke
Session: Consumer behavior

020-0386 Impact of Resource Consumptions and Quality Differentiation on Firms' Market Share and Financial Performances

Muge Yayla-Kullu, RPI Lally School of Mgmt. & Tech., United States
Praowpan Tansitpong, RPI Lally School of Mgmt. & Tech., United States

We empirically investigate how the customer perceived quality and the resource consumption differences of products may impact product line decisions, and how they are related to firms' market shares and financial performances. Prior literature has shown that product lines are largely determined by the quality differentiation of the products. Recently, there have been new developments in the analytical literature where researchers also show that the success of product line decisions depends critically on the resource utilization decisions of the firms. However, there has been no empirical investigation regarding these new assertions. In this paper, we combine all the constructs in a large framework and link the product line decisions to the performances of the firms. Using an international airline data set, we find that the firms that implement correct capacity utilization strategies during product line design make significantly more money than the firms that do not.

020-0798 The Effects of Gift Card Sales on the Optimal Order and Discount of Seasonal Products

Moutaz Khouja, University of North Carolina at Charlotte, United States
Jing Zhou, University of North Carolina at Charlotte, United States

Jingming Pan, University of Electronic Science and Technology of China, China

Gift cards have gained popularity during the holiday season. We study the retailer's inventory-pricing decisions of seasonal products in two periods. In the first period, the retailer determines the order quantity in dollars and consumers decide to buy either products or gift cards. In the second period, the retailer decides the post-holiday price to sell the remaining inventory. The gift card holders choose between the discounted holiday products and regular-priced non-holiday products. We investigate how gift cards change the retailer's ordering and pricing decisions and affect the retailer's profitability. We find that increased gift cards sales decreases the retailer's optimal stocking level. The effect of gift card sales on the expected profits depends on certain factors such as treatment of unredeemed gift card balances by the state, demand variability, and the pricing level of non-holiday products.

020-0184 Managing Pricing in a Supply Chain Perspective

Marco Formentini, University of Udine/DIEGM, Italy
Pietro Romano, University of Udine/DIEGM, Italy
Thomas Bortolotti, University of Udine, Italy

Literature on Supply Chain Management emphasizes the adoption of a collaborative attitude towards process management. According to literature, production planning, logistics, quality management, new product development are all business processes that can benefit from a collaborative supply chain perspective. On the other hand, scholars have not devoted as much research to the pricing process. This paper aims at contributing to knowledge by developing a conceptual research framework to defining collaborative pricing, its key decisions and mechanisms in supply chains. This framework is based on the authors' original interpretation of cases found in literature and has been further applied to the case of a high-quality food supply chain.

224 Sunday, 01:30 PM - 03:00 PM, Tuscan 4 *Track:* ESO, 11 *Chair:* David Hollingworth
Session: Continuous Improvement, Lean and Green

020-0157 The Relationship Between Corporate Social Responsibility and Continuous Improvement Orientation and Their Effects upon Employee Attitudes

David Hollingworth, University of North Dakota, United States
Sean Valentine, University of North Dakota, United States

Prior research has established that both Total Quality Management (TQM) and Corporate Social Responsibility (CSR) have positive effects upon employee attitudes. Some reason that TQM and CSR are compatible while others disagree. This study examines the relationship between specific aspects of TQM, namely a continuous improvement orientation (CIO) and CSR by identifying shared moral values (value congruence) as an enabling linkage. We analyze survey data from employees of a (USA-based) financial services firm, to test hypotheses regarding the relationship between CIO and CSR and the effects of CSR and CIO upon employee commitment and turnover intentions. Results provide evidence supporting 1) a strong relationship between CSR and CIO, 2) positive relationships from both CSR and CIO with Organizational Commitment, and 3) a strong relationship between organization commitment and turnover intentions. Managerial and theoretical implications are discussed, as well as limitations and future research directions.

020-0310 A Lean and Green Kaizen Model

Andrea Pampanelli, Universidade Federal do Rio Grande do Sul, Brazil
Pauline Found, Cardiff University, United Kingdom
Andréa Bernardes, Universidade Federal do Rio Grande do Sul, Brazil

The improvement of environmental performance is key for deploying sustainable business. Therefore, following Lean concepts, the management of environmental aspects should be focused in improving material and energy flows that can cause significant environmental impacts. This paper proposes a model based on Lean concepts for managing environmental aspects capable of promoting a better integration of the environmental processes to business needs. Integrating Lean and Green concepts by taking a Kaizen approach in a cell level, the model developed has the ultimate goal of reducing environmental impacts generated by the production process. The paper reports initial findings of recent global application of the developed model in a major engineering international corporation. Some of the conclusions of this testing consider that the model developed is capable of reducing an average of 30% of production cells material usage and waste generation.

020-0332 What Factors Influence Firms to Implement ISO 14001: Internal or External?

Donghyun Choi, University of Nebraska Lincoln, United States
Jinsung Rha, University of Nebraska Lincoln, United States
Yonghwi Noh, University of Nebraska, United States

A number of firms have adopted ISO 14001. However, factors that affect ISO 14001adoption are not well understood. Some firms adopt ISO 14001 due to external pressure, although they do not have capability to obtain superior performance. Others implement ISO 14001 based on their capability and these firms can acquire superior performance. Studies have tried to investigate the relationship between ISO 14001 implementation and financial performance. Yet, since we do not understand which firm implements ISO 14001, the results are mixed. In this study, we will suggest what brings firms to implement ISO 14001 and how this affects performance of the firm.

020-0363 Lean & Green Operations in Local Restaurants

Jennifer Edmonds, Wilkes University, United States

Oftentimes, there is the assumption that small businesses may lack the resources and capability to participate in the same sustainable programs that larger organizations can. This study explores the adoption and success of lean and green practices in the local restaurants of Northeastern Pennsylvania and compares them to the benchmark that larger restaurants have set. Specifically, this study examines basic awareness, recycling efforts, energy utilization, transportation, maintenance, waste and general operations information.

225 Sunday, 01:30 PM - 03:00 PM, Tuscan 5 *Track:* OEE, 8 *Chair:* Haifa Binsahl Annibal Scavarda
Session: Industry Case Studies

020-0872 Internationalization of a Network: A Case Study of a Brazilian Enterprise of the Automotive Sector

Linduarte da Silva, Instituto Mauá de Tecnologia, Brazil
Suzana Souza Santos, Mackenzie University in Sao Paulo, Brazil

This work aims to study the formation process of a network of business units through the experience of internationalization of an enterprise of the automotive industry. The interest in studying the model of the global expansion of a Latin American enterprise is related not only to being still uncommon in the academic literature, but also the possibility of understanding how external factors affect business and contribute to the adoption of a internationalization strategy. Furthermore, this case study presents the main challenges and barriers to entry faced by this enterprise, highlighting the different processes used for the

internationalization strategy implementation in Argentina, Germany, China, and Japan.

020-0774 Functional Supply Chain Relationship Strategies in China: A Cross Industry Analysis

Peter O'Neill, Faculty of Business and Economics , Monash University, Australia
Annibal Scavarda, School of Business and Management, American University of Sharjah, United Arab Emirates
Booi Kam, RMIT University, Australia
Si Gao, RMIT University, Australia

Researchers have mostly conducted supply chain studies in Western developed countries and less frequently in emerging economies like China. Academic papers involving Chinese supply chains have been spurred on in recent times as China has grown to be the world's second largest economy, third largest trader, and a major consumer of goods-and-financial services. This research analyses Chinese functional supply chains through a relational capital lens. It is a qualitative study with interviews from selected focus groups across three tiers of the functional supply chains in each of four manufacturing industries: clothing, automobile, electronic, and food. Based on comparisons with Western experience and models of functional supply chains, the findings suggest that in China, relational capital is not only manifest in buyer dominated, adversarial, close partnerships, but can also be supplier dominated, adversarial and arm's length, depending on the focal industry and nature of upstream or downstream relational dependency.

020-0570 The Effects of a Focal Firm's Absorptive Capacity on Supplier Innovation, the Role of Joint Action: An Empirical Study from the Arabian Gulf

Zainab Al-Balushi, The University of Melbourne, Australia
Haifa Binsahl, The University of Melbourne, Australia

Given current business trends of market globalization and outsourcing, manufacturing organizations have recognized the value of integrating supplier manufactured modules into their products. Accordingly, organizations extended the focus of innovation across their boundary to cover suppliers' innovation. This paper aims to examine the relationships among a focal firm's absorptive capacity, boundary spanning activities, suppliers' innovation and joint action from a buying firm perspective. Dynamic capability view was used to guide the study. A survey was conducted in six Arab countries. Data analysis covered reliability and factor analysis, followed by structural equation modelling. The study provides empirical evidence that high joint action mediates the relationship between boundary spanning and supplier innovation. However the relationship between absorptive capacity and supplier innovation was not significant. The limitation of the study is that it does not include longitudinal data, which would be more useful in examining changes in variables that affect supplier innovation.

226 Sunday, 01:30 PM - 03:00 PM, Tuscan 6 *Track:* TEC, 3 *Chair:* Jose Benitez-Amado
Session: Information Technology Management

020-0889 The Contribution of Information Technology and Communications to Improve Competitiveness

Nelson Raudales Garcia, National Autonomous University of Honduras, Honduras
Cesar Ortega Jimenez, National Autonomous University of Honduras, Honduras

The last decades have reflected the contribution of information technology and communications technology (ICTs); they have shown significant contribution in improving the development of activities of daily living of humans (improvement in terms of telecommunications processes, improvements in contributions in the area of medical sciences, physics, statistics, etc.) as well as reducing production costs. At the production level improvements may be reflected in the production activities carried out - for example in the area of operations management of the organization, just to mention one of the many departments or divisions of the company. However for these results to be viable they must be coupled with improving the level of knowledge or human resources, a vital element in the process of business production cycle. This element is important throughout the production process, and influences both production of goods and services as well as the monitoring and logistics necessary for shipment or delivery of the final product.

020-0698 Research on Use of Information Technology in Companies Located in a Sao Paulo State Industrial Region

Clovis Galdino, Mathodist University, Brazil
Getulio Akabane, Fatec SP, Brazil
Otavio Sanches, Mathodist University, Brazil
Emerson Baneton, Fatec, Brazil
Luciano Gaspar, Sao Paulo University, Brazil
Adriano Silva, Fatec BS, Brazil

Nowadays the complexity of the organizational environment demands efficient information systems (IS) in order to support management decision making processes. The present semi-structured field inquiry takes as its purpose the mapping of the current situation of industrial enterprises located in the state of Sao Paulo - Brazil. Questions were asked about enterprises' behaviors regarding IT use, especially concerning decision process, current situation in business automation planning, whether business partners are appropriately treating opportunities produced by electronic commerce, and mapping relations in information security and other open questions. The results are tabulated using Microsoft Excel and complemented with the resources of the SPSS, 12.0-2007.

020-0304 Complementarity between IT and Organization: Evidence for Micro, Small and Medium Enterprises

Francesco Sandulli, University Complutense of Madrid, Spain
Beatriz Minguela Rata, Universidad Complutense de Madrid, Spain
José López-Sánchez, Universidad Complutense de Madrid, Spain
Marta Fossas-Olalla, Universidad Complutense de Madrid, Spain

This article presents the results of a research exploring the relationship of organizational investments to IT adoption as a means of improving productivity in micro, small and medium enterprises. Specifically, we examined the role of work reorganization, IT training and recruiting practices on firm productivity. We employ DEA analysis to calculate the technical efficiency of firms, selected as a measure of performance in a sample of 2801 companies with fewer than 250 workers both in services and manufacturing. In contrast to findings related to large corporations, the study results suggest that the complementarity hypothesis can not generally be applied to the specific features of MSMEs.

020-0124 Information Technology as Competitive Advantage: The Role of Quality Management Capability

Jose Benitez-Amado, University of Granada, Spain

A key question for operations management (OM) and information systems (IS) researchers and practitioners is whether and how information technology (IT) generates competitive advantage for the firm. To address this question, this paper focuses on the emerging IT-enabled organizational capabilities perspective to investigate the relationship between IT leveraging capability, quality management (QM) capability and competitive advantage. Competitive advantage is assessed in terms of commercial and financial excellence. A proposed research model and hypotheses are tested by using cross-sectional data collected from 85 firms operating in Spain. Data analysis using the partial least squares technique shows that: (1) QM capability leads to competitive advantage, and IT leveraging capability shows a strong predictive power against QM capability; (2) IT leveraging capability impacts positively on the generation of competitive

advantage through QM capability. The implications of the findings for researchers and practitioners are discussed and further research directions suggested.

020-0013 Reasons for Information Technology Adoption and Sophistication within Manufacturing SMEs

Morteza Ghobakhloo, University of Granada, Spain
Jose Benitez-Amado, University of Granada, Spain
Daniel Arias-Aranda, University of Granada, Spain

This paper analyzes which reasons persuade small and medium enterprises (SMEs) to adopt information technology (IT), as well as which factors affect the level of IT sophistication in this entrepreneurial segment. Drawing on the technology-organization-environment view of the firm, the study hypothesizes that technological, organizational and environmental factors can be viewed as the reasons for IT sophistication within SMEs. Our proposed research model and hypotheses are tested using survey data from a sample of 121 Iranian manufacturing SMEs. We find that external pressure, information processing needs, IT-enabled innovativeness and performance and competitive pressure are the key drivers of IT sophistication within SMEs. The findings offer valuable insights to executives and consultants as to why SMEs move toward IT adoption. Likewise, the results of this study could serve as a benchmarking measure of reasons persuading SMEs to adopt sophisticated IT.

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Sunday, 01:30 PM - 03:00 PM, Tuscan 7 *Track:* PDI, 11 *Chair:* Yael Grushka-Cockayne
Session: Project Management

020-0916 Planning for the Planning Fallacy: Causes and Solutions for Unrealistic Expectations about Project Delivery

Yael Grushka-Cockayne, Darden School of Business / University of Virginia, United States

It is likely that few were surprised when it was announced that the estimated cost of the aquatic center being built for the London 2012 Olympic games had tripled (from £75 to £242 million), the expected date of completion was set back by two years, and its estimated size was reduced by almost two thirds. The media are full of stories in which projects underperform; cost too much, take too long, and deliver too little. Studies on representative samples of projects, both public and private, and in many different fields, show that the average project does underperform; this general tendency is called the planning fallacy. Using data from a wide range of past projects, we explore the reasons for the planning fallacy, in effort to support project managers and planners in overcoming the fallacy and better estimating project outcomes.

020-0888 Adding Value to Earned Value Analysis

Mario Vanhoucke, Ghent University and Vlerick Leuven Gent Management School, Belgium
Avraham Shtub, Technion - Israel Institute of Technology, Israel

The non-repetitive nature of projects leads to uncertainty that is present to some degree in every project. Our limited ability to accurately forecast future values of parameters that are used as input to plan projects affects every project. Due to uncertainty and the resulting risk, project planning is in fact a starting point in the project management process that consists of planning, monitoring and control. Risk management techniques are also used in project management for the very same reason. Understanding the dynamic, stochastic nature of projects and the tools and techniques that can help us cope with this environment is the focus of this paper. In this paper we discuss some ideas, tools and techniques that may help project managers cope with uncertainty. We focus our discussion on two new ways to teach students and practitioners the Earned Value concept: the Project Team Builder and ProTrack's Assistant.

020-0839 Incentives for Complex R&D Projects

Raul Chao, Darden School of Business, United States
Kenneth Lichtendahl, Darden School of Business, United States
Yael Grushka-Cockayne, Darden School of Business, United States

The organization hierarchy makes it difficult to manage R&D projects because knowledge and effort are decentralized from managerial authority. Making matters worse, complexity in R&D projects often arises from interactions between the attributes that determine a project's potential value. In light of these challenges, how should the firm structure incentives to ensure that managers reveal the true potential of a project and invest adequate resources to create value? In this paper, we develop a model that shows how an idea that emerges from search on a complex landscape is intimately tied to an agency problem of adverse selection and moral hazard. Our results show that incentives depend on both the mode of search employed in an organization as well as the complexity of the project.

020-0469 Meeting Project Deadlines under Uncertainty: An Alternative Method to Critical Chain

Christoph Loch, INSEAD, France
Fabian Sting, Erasmus University, Rotterdam School of Management, Netherlands
Arnd Huchzermeier, WHU, Germany
Dirk Stempfhuber, Roto Frank Bauelemente GmbH, Germany

A fundamental problem in project planning and control is meeting deadlines under uncertainty and with private information of project workers. The project management community possesses only heuristics, such as Critical Chain planning. Improving such complex processes cannot be accomplished with analysis alone, but a variety of approaches are needed. We study a company that has developed an interesting alternative to Critical Chain. The system can be described by four principles, which clearly differentiate it from other existing systems: (1) Disciplined aggregate milestone planning, but flexible weekly plans produced by project teams themselves, (2) visual management, showing the weekly status and promptly highlighting problems, (3) a fast problem resolution process that increases cross-task collaboration and eliminates the tendency towards inflating and exhausting individual time buffers, and (4) using lower-priority projects as a capacity buffer, rather than a project time buffer. The company has improved its project management performance with this system.

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Sunday, 01:30 PM - 03:00 PM, Tuscan 8 *Track:* ERS, 11 *Chair:* Inga-Lena Darkow Xin Zhai
Session: Topics in Empirical Research III

020-0420 Supply Chain Practices and Information Quality: A Supply Chain Strategy Study

Honggeng Zhou, University of New Hampshire, United States
Xin Zhai, Peking University, China

This paper investigates two supply chain practices (i.e., sourcing practice and delivery practice) and information quality. Scales measuring sourcing practice, delivery practice, and information quality were developed. Four strategic clusters of companies, using alternative supply chain strategies, are identified. In three of the strategic clusters, the supply chain practice investment level is consistent with the level of information quality. The fourth strategic cluster has a high level of information quality but a low level of effective supply chain practices. In this study, the fourth strategic cluster performed consistently worse than the other three strategic clusters. The performance measures consist of sales revenue, market share, and profitability. This study shows that firms need to align supply chain practice with the level of their information quality in order to achieve good overall business performance. Implications of our findings and future research opportunities are addressed.

020-0854 Challenges for Supply Chain Management in a Volatile Environment

Inga-Lena Darkow, EBS Business School, Germany
Christoph Markmann, EBS Business School, Germany
Heiko von der Gracht, EBS Business School, Germany

Not only the 2008/09 crisis but also recent natural disasters and terroristic attacks have brought the high vulnerability of the global economy to our minds more than ever. In order to mitigate the extent of exogenous shocks, current research particularly concentrates on supply chain resilience and flexibility. Our paper contributes to existing results in this field by adding insights from research with small and medium-sized enterprises (SME). Overall, 25 semi-structured in-depth interviews with top decision makers have been conducted to identify challenges and trends in supply chain resilience and to provide a multi-faceted view on supply chain vulnerability of SME. Different supply chains dimensions have been assessed and compared regarding their impact in a volatile environment. Among others, we will discuss measures to adapt the supply chain to the challenges of highly dynamic and complex markets. We will conclude with recommendations for making supply chains more flexible and future-robust.

020-0971 Tactical Supply Chain Management: Impacts on Supply Chain Performance and Firm Performance

Sufian Qrunfleh, The University of Scranton, United States
Susita Asree, Winston Salem State University, United States
Sawsan Altammar, The University of Toledo, United States
Caleigh Conahan, The University of Scranton, United States

This paper examines the alignment between supply chain management strategy (SCMS) and supply chain management practices (SCMP), and its impact on supply chain and firm performances. In this paper, we developed a model proposing that deploying the appropriate strategy - lean SCMS and agile SCMS - to support and execute the corresponding practices - strategic supplier partnership and postponements - respectively, will enhance supply chain and firm performances. Using the mediating alignment, our results show that it is critical for focal firms to consider the capabilities and practices of their suppliers before structuring their strategic supply chain decisions to yield the desired benefits of such strategies and to improve supply chain and firm performances. Research method includes: item development, Q-sort, a large scale survey of 205 respondents who were mainly purchasing managers/directors of large manufacturing organizations, and data analysis using Structural Equation Modeling (SEM).

229 Sunday, 01:30 PM - 03:00 PM, Tuscan 9 *Track:* BOM, 8 *Chair:* Andrew Davis Doug Thomas
Session: Forecasting and Inventory Risk Management

020-0723 Forecasting Correlated Time Series

Mirko Kremer, Penn State, United States
Enno Siemsen, University of Minnesota, United States
Doug Thomas, Penn State, United States

In practice, a demand planner often has the responsibility of generating forecasts for multiple products in the same product family or category. In addition, a planner may need to generate forecasts for these similar items across multiple locations. One might expect these related time series to be correlated. For certain correlation structures, we identify how much weight a planner should place on forecast errors from other related series. We experimentally investigate how characteristics of these related time series, including their correlation structures, affect how human subjects improve, or fail to improve forecast accuracy by simultaneously forecasting for multiple correlated time series.

020-0285 Bounded Rationality, Focal Points, and Newsvendors

Nelson Lau, INSEAD (Singapore), Singapore
Neil Bearden, INSEAD (Singapore), Singapore
Sameer Hasija, INSEAD (Singapore), Singapore

In the standard newsvendor problem, the optimal order quantity (q*) is unique. However, experimental participants invariably order a range of quantities rather than a single point. Expected utility models attribute this dispersion to error, while several bounded rationality models propose that individuals have a probability distribution over quantities. We call attention to the role of focal points in explaining ordering variability, but note that this is one of several motivations underlying decision-making. Indeed, a case may be made for heterogeneity in order quantity choices. Assessments of log-likelihood, BIC, and error demonstrate that including focal points in ordering behavior models dramatically improves fit, especially relative to extant models. To establish the explanatory power of focal points, in multiple experiments we show that inducing salient focal points (holding constant q*) alters subjects' ordering behavior. We urge the consideration of focal points in descriptive models of decision-making, and highlight their potential prescriptive applications.

020-0201 Asymmetries in the Pull-to-center Effect of the Newsvendor Experiment

Tianhu Deng, University of California, Berkeley, United States
Zuo-jun (Max) Shen, University of California, United States

As one of the fundamental building blocks of modern supply chain management, newsvendor model delivers "normative" answers to questions such as "how much inventory should one keep on hand?". Recently, a number of newsvendor experiments seek to understand the "behavioral" effects. These efforts reach consensus on the presence of pull-to-center effect but disagree with the asymmetry of pull-to-center effect. This paper attempts to reconcile this descrepancy by highlighting the role of payoff coefficient of variation.

020-0560 Who Controls the Channel? A Study of Inventory Risk on Supply Chain Performance

Andrew Davis, Penn State University, United States
Elena Katok, Penn State University, United States

We investigate how shifting the inventory risk between parties affects supply chain performance. Specifically, we study push, pull, and advance purchase discount (APD) contracts from an experimental standpoint. Under a push contract, a retailer incurs the inventory risk; under a pull contract, a supplier incurs the inventory risk; and under an APD contract, the inventory risk is shared between both parties. Our results suggest that a pull contract results in a higher supply chain efficiency compared to a push contract, and that the pull contract's efficiency is equivalent to the efficiency achieved by the coordinating APD contract. We proceed to explore alternative theoretical models to explain our data, such as fairness, risk aversion, and reference dependence, and use maximum-likelihood estimation to determine which model fits our experimental data best.

230 Sunday, 01:30 PM - 03:00 PM, Tuscan 10 *Track:* ICM, 9 *Chair:* Thomas Makuschewitz
Session: Inventory Methodology

020-0945 An Automated Verification Based Approach for Analyzing Safety Stock in Probabilistic Supply Chains

Li Tan, Washington State University, United States
Shenghan Xu, University of Idaho, United States

Probabilistic model checking is an automated verification technique that provides a “push-button” approach for algorithmatically analyzing probabilistic systems. Probabilistic model checking has been successfully used for analyzing the performance of a variety of dynamic systems in Computer Science and other fields such as bioinformatics. In this research we will apply probabilistic model checking to the performance analysis of probabilistic supply chains. Particularly we formulate the cost structure of supply chains using reward mechanism in probabilistic model checking. As an application, we will use probabilistic model checking to analyze the impact of different risk factors on the holding of safety stock. We will show that a probabilistic model checker such as PRISM provides an efficient decision procedure for safety stock.

020-0455 Stable, Non-oscillatory Solution of the Inventory Balance Delay Differential Equation

Árpád Csík, Széchenyi István University, Hungary
Péter Földesi, Széchenyi István University, Hungary

In the present paper we consider an analytic investigation of the continuous time representation of the inventory balance equation. We derive complex exponential solutions to the system that is driven by a step function representing the demand. The corresponding characteristic equation is solved in term of the principal mode of the Lambert W function. This construction incorporates both oscillating and non-oscillating exponentially decaying solutions. In recent literature the oscillatory solution is popularized as the optimal choice to the problem. In contrast to these ideas we derive stable, oscillation-free solutions that are not prone to permanent inventory deficit. This choice is favourable in a real life scenario, since it provides the more natural non-oscillatory response to a steady demand. Consequently, the bullwhip effect can be considerably reduced, increasing the efficiency of inventory management.

020-0226 Risk-Reward Analysis in Stochastic Dynamic Programming

Preetam Basu, Indian Institute of Management Calcutta, India
Suresh Nair, University of Connecticut, United States

Stochastic dynamic programming models are extensively used for sequential decision making when outcomes are uncertain. These models have been widely applied in different business contexts such as inventory control, capacity expansion, cash management, etc. The objective in these models is to deduce optimal policies based on expected reward criteria. However, in many cases, managers are concerned about the risks or the variability associated with a set of policies and not just the expected reward. Considering risk and reward simultaneously in a stochastic dynamic setting is a cumbersome task and often difficult to implement for practical purposes. Here we develop heuristics that systematically track the variance and the average reward for a set of policies, which are then utilized to construct efficient frontiers. We apply our heuristics to the inventory control model. Our heuristics perform creditably in providing efficient risk-reward curves.

020-0613 Assessing the Price of Robustness for Dynamic Production Processes

Bernd Scholz-Reiter, BIBA at the University of Bremen, Germany
Thomas Makuschewitz, BIBA at the University of Bremen, Germany

Expected and unexpected perturbations, like scheduled maintenance or a temporary machine-breakdown, reduce the available production capacity and can put the timely satisfaction of customers at risk. A robust capacity allocation to the production processes enables a supply chain to cope with perturbations of a certain magnitude. In this paper we model dynamic supply chains as multiclass queueing networks and present an approach to robust capacity allocation with respect to perturbations of the production processes and the price of capacity. To this end, we consider the fluid model as an approximation of the multiclass queueing network and use its stability radius to measure the robustness. The stability radius reflects the smallest perturbation that destabilizes the network. Based on findings concerning this measure, we set up an optimization problem for the price-oriented capacity allocation. This approach allows assessing the price of robustness that is related to a certain certain stability radius.

020-0542 Analysis of VMI Benefits in a Single Echelon Supply Chain System

Kannan Govindan, University of Southern Denmark, Denmark
Maria Cristina Grigore, University of Southern Denmark, Denmark
Devika Kannan, Indian Institution of Industrial Engineering, India

Within a vendor-managed inventory (VMI) agreement, the upstream supply chain member (vendor) takes responsibility for managing the inventory of the downstream member (customer) within specific levels previously agreed upon without the need of orders from the customer side to be placed. Therefore, the vendor can focus on optimizing production efficiency and capacity planning, while the customer has to improve forecast accuracy. This paper analyzes the benefits which a VMI agreement could bring, for one supplier and multiple customers case, through analyzing three cases: a traditional supply chain case, VMI case, and VMI when both the vendor and the customer belong to the same organization. The analysis is based on EOQ formula and its related total cost, and the novelty is captured by considering and evaluating the impact of transportation costs in the different cases. The modeling is done to capture the needs that occur within a pharma industry.

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231 Sunday, 01:30 PM - 03:00 PM, Tuscan 11 *Track:* SOM, 9 *Chair:* Aleda Roth
Session: Networks and Service Operations

020-0896 Uncovering the Relevant Actors and Organizations in Service Operations Management Research: A Social Network Analysis Approach

Kirk Karwan, Furman University, United States
Jeffery Smith, Florida State University, United States

A number of recent papers have assessed the productivity of individuals and institutions with respect to contributions to research in the service operations management (SOM) arena. While interesting, these studies often do not measure the impact that individual researchers and their institutions have had on others within the field. In this paper we employ social network analysis to provide a relational model of SOM research and a different understanding of the key contributing authors and universities to the field. A set of network metrics is employed to demonstrate the interconnectedness of researchers and their organizations, and to characterize the dynamics within the SOM sub-discipline. Articles included in the study are drawn from the period 1990-2006 and are taken from the leading POM journals.

020-0548 The Influene of B2B Service Buyer Network Structure on Supply Disruption: Brazilian Telecommunications Services

Rafael Teixeira, Unisinos University, Brazil
Aleda Roth, Clemson University, United States
DeWayne Moore, Clemson University, United States

This paper introduces, operationally defines, and empirically tests a model of how telecom service buyer’s network structure (SBNS) affect disruptions. We

conceptualize B2B service buyer network structure (B2B-SBNS) in terms of both the buyer's own physical network configuration (PNC) complexity factors (e.g., distance among its organizational subunits) and the service offering configuration (SOC) complexity (e.g. number of services purchased from the provider). We posit that PNC and SOC complexity factors influence the service performance and we hypothesize how these factors can influence the likelihood and mean time of service disruptions. Secondary data on 194 B2B customers from a telecommunication company from Brazil was used to test empirically our model. Results show that one buyer's physical network explains the variability in the performance of service disruptions; and importantly, three complexity factors associated with the SOC factors are statistically significant and dominated the traditional measures of supply chain complexity.

020-0777 Blurring the Boundaries: Convergence of Service and Industrial Operations Management

Joel Goldhar, Illinois Institute of Technology/Stuart School of Business, United States
Daniel Berg, University of Miami/College of Engineering, United States

Based upon a review of the evolution of traditional manufacturing and service operations, the economics of Operating Systems, and the more recent integration of both goods and services into products and 'experiences', we support the argument that services must eventually evolve into 'industrial' operations in order to be profitable. We offer new models for developing improved operations systems design and management with special emphasis upon concepts useful for teaching OM courses.

232 Sunday, 01:30 PM - 03:00 PM, Roma 1,2 *Track:* LOM, 5 *Chair:* Péter Németh Wolfgang Kersten
Session: Logistics Performance

020-0520 The Concept of Logistic Space in the Modelling of Supply Chain Performance

Péter Németh, Széchenyi István University, Hungary
Péter Földesi, Széchenyi István University, Hungary
Árpád Csík, Széchenyi István University, Hungary

In this paper we propose a systematic framework to derive quantitative measures that accurately reflect the performance of supply chains from a practical point of view. We define the concept of "logistic space," which is formed by the union of all possible states of consumer goods as they travel along the chain. The transition between states is represented by a graph. The problem is reformulated as moving a set of consumer goods from their initial position (e.g. manufacturer) to their destination (retailer) along a trajectory that is optimal from a prescribed point of view. We consider time and cost as two important factors related to a trajectory. The dimension of the logistic space is reduced by defining time and cost equivalency of certain dimensions. The resulting model provides an efficient tool to establish a scenario that is favourable according to the requirements of a given application.

020-0071 Measurement of Distribution System Complexity - A Vectorial Approach

Wolfgang Kersten, Hamburg University of Technology, Germany
Thorsten Lammers, Hamburg University of Technology, Germany

The distribution system as the downstream part of a supply chain has to cope with inter-organizational complexity in its dynamic material and information flows. A lack of feasible complexity management strategies for distribution activities in the relevant literature highlights the need for further research. In order to efficiently analyze and handle complexity in the distribution context, a methodology to measure complexity levels is required. Inspired by the concepts of using a vector to characterize complex networks and production systems (as done by Costa 2007 and Scholz-Reiter 2006, for example) and based on a comprehensive literature review with a special emphasis on complexity drivers, we develop a complexity vector for distribution systems. By this means, we aim to provide a way to visualize inter-organizational logistics complexity and make individual systems comparable for supply chain managers. Additionally, first results of practical applications within manufacturing companies as well as logistics service providers will be provided.

020-0863 Contribution of the Reverse Logistics Systems in Business Sustainability: A Study in Supermarkets in Dourados-MS

Antonio Carlos Lopes, UFGD, Brazil
Danielly Saruwatari, UFGD, Brazil
Sergio Brun, UFGD, Brazil
Jouliana Nohara, UNINOVE, Brazil
Rolf Erdmann, UFSC, Brazil

This article aims to analyze the adoption of the practice of Reverse Logistics Systems (RLS) in the supermarket and its contribution to corporate sustainability. The research strategy used to perform the work was the study of multiple cases in supermarkets in the mid-size city of Dourados, Mato Grosso do Sul - Brazil. Data were collected through semi-structured interviews with logistics managers and employees in logistics, document analysis, and observation visits to the organizations surveyed. It was verified that although companies have not institutionalized a department of reverse logistics practices, they adopt the reverse logistics of post-sale and post-consumption as separation and classification and proper disposal of solid waste of various categories of products like food packaging, reuse of materials for recycling, and the fate given to the remains of the food packaging container among others.

020-0840 Effect of Supply Chain Competency on Supply Chain Performance: An Empirical Study of Brazilian Organizations

Arshad Alam, The George Washington University, United States
Prabir Bagchi, The George Washington University, United States
Fernando Seabra, Universidade Federal de Santa Catarina, Brazil

Improved supply chain performance results in enhanced organizational competitiveness. This calls for a renewed focus on different factors affecting supply chain and logistics performance of an organization. While some factors such as supplier involvement and use of information technology are internal to an organization, supply chain performance is also impacted by the overall locational environment as defined by infrastructure, absorptive capacity and supplier environment in which the firm operates. To analyze the impact of a country's overall supply environment along with that of individual factors on a firm's supply chain performance, data was collected and analyzed on various supply chain measures of sixty Brazilian organizations. The study presents the results of the empirical study. Analysis is carried out to arrive at Supply Chain Competency scores of individual organizations. Hypotheses are proposed and results of regressions are presented.

233 Sunday, 01:30 PM - 03:00 PM, Sorrento 1,2 *Track:* QPJ, 10 *Chair:* Enido Ramos
Session: Session 10: International SCM (2)

020-0652 An Analysis of Six Sigma Implementation in Service Companies Operating in Brazil

Paulo Miguel, UFSC - Universidade Federal de Santa Catarina, Brazil
Marly Carvalho, USP - Universidade de São Paulo, Brazil

Six Sigma programs improve operational performance in order to enhance customer satisfaction through a company's outcomes. Many of the top manufacturing

companies have implemented Six Sigma programs and, more recently, service organizations have also adopted such programs. In this sense, service organizations from different sectors that apply Six Sigma in an emerging economy were investigated. Aspects of human resources and full-time specialists, infrastructure, top management leadership, customer requirements, focus on financial and non-financial results, structured method and strategic project selection are analyzed through case-based research. It was verified that Six Sigma programs were successfully implemented in those companies--however, with some drawbacks. The studied companies adopt Six Sigma in association with other quality management approaches, mainly ISO 9000: 2000 and lean production.

020-0765 Exploring a Causal Model for the Brazilian National Quality Award

Enido Ramos, Fundação Getulio Vargas (FGV) - São Paulo Business School, Brazil
Alexandre Pignanelli, Fundação Getulio Vargas (FGV) - São Paulo Business School, Brazil
João Mario Csillag, Fundação Getulio Vargas (FGV) - São Paulo Business School, Brazil

This study is based on the Brazilian National Quality Award (PNQ) implemented in 1992, adopting the criteria of the Malcolm Baldrige Award (USA). In 1994 and 1995 PNQ studied the European, Swedish and French National Quality Awards plus topics of ISO 9004. Some South American and Canadian Quality Awards provided additional subsidies in 1996. In 1997, the PNQ participated in “Improvement Meeting Day,” a basis for the changes to the 2000 model. From 1992 until 2000 the PNQ showed a causal model of Quality Criteria, but from 2001 to 2010, the PNQ model proposes that "everything connects to everything." This idea may come under criticism in business due to the complexity and difficulty of implementation. This study analyzed year by year between 2001 and 2010 to suggest an Actual Causal Model to PNQ that can support an empirical study and evaluate these causal relationships.

020-0864 The Moderating Role of Contextual Factors on Quality Management Practices

Dongli Zhang, Fordham University, United States
Kevin Linderman, University of Minnesota, United States
Roger Schroeder, University of Minnesota, United States

This study investigates how contextual factors influence the relationship between Quality Management (QM) practices and manufacturing performance. It contributes to the contingency theory of QM effectiveness. Drawing on the management literature, we differentiate two different kinds of QM practices: Quality Exploitation and Quality Exploration. The analysis empirically investigates the moderating effects of two contextual factors (organizational structure and environmental uncertainty) on the relationship between Quality Exploration, Quality Exploitation, and operational performance. The results provide strong support that context affects the QM practices (Quality Exploration and Quality Exploitation) differently. The findings also provide insight for managers on how to customize QM programs to gain optimal performance benefits.

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Sunday, 01:30 PM - 03:00 PM, Sorrento 3,4 *Track:* SAP, 9 *Chair:* Michael Needham

Session: Sourcing and Procurement: Theoretical and Empirical Research

020-0027 An Exploration of the Role of Knowledge within Outsourcing

Michael Needham, University of Ulster, United Kingdom

The study aims to contribute to the literature by exploring the critical role that knowledge plays on outsourcing performance as viewed by changes over time. To date research has tended to focus on the pre-select decision making process on whether or not the outsourcing decision makes sense at a specific point in time. From a knowledge-based perspective this analysis tends to be based on quantitative measures (for example financial and operational ratios), as defined by the concept of absorptive capacity. However, research has indicated that this neglects the softer non-cost elements such as trust and relationships. It is suggested that these are both critical in determining the optimal transfer of knowledge between the buyer and supplier. Hence, this paper proposes a conceptual framework for exploring the role that knowledge plays within outsourcing.

020-0367 International Purchasing Offices: Literature Review and Directions for Research

Guido Nassimbeni, University of Udine, Italy
Marco Sartor, University of Udine, Italy

An international purchasing office (IPO) is an offshore buying office or buying house set up to procure components, parts, materials and other industrial inputs to be used by manufacturing plants globally. The creation of an IPO is a solution year by year more frequently adopted by companies to manage their international sourcing activities. Motivated by the increasing relevance of this phenomenon, this analysis is aimed at profiling the literature on IPOs. The paper summarizes and organizes this literature according to different perspectives. The main research fields (IPOs' functions, organization, advantages and problems related to their establishment and management, factors influencing the choice of their location, human resource management possible approaches) are then discussed. The paper closes offering some suggestions for future(operations management) research.

020-0811 Do We Really Strive for Zero Maverick Buying? Insights From a Quantitative Decision Analysis

Alexander Rothkopf, EBS University, Supply Chain Management Institute, Germany
Volker Groetsch, EBS University, Supply Chain Management Institute, Germany

Supply Management still has not solved the problem of maverick buying (MB). Despite all information systems, enforcing compliance depends on top management support. However, the board faces a trade-off between MB and costs of control and standardization. We model this trade-off as a principal/agent problem between the management board and multiple operational managers (OMs). To show how to efficiently reduce MB, we apply a hierarchical decision model. On the top level the management board allocates purchasing budgets to the OMs, anticipating purchasing costs on the basis of frame contracts. On the base level the OMs decide whether or not to buy compliant. The aggregate of all OMs’ choices influences the terms of the frame contract, leading to inflated budgets in the next period. In our analysis, we propose alternative mitigation mechanisms on the basis of generally accepting the desirability of a certain level of MB within a firm.

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Sunday, 01:30 PM - 03:00 PM, Naples 2 *Track:* GEN, 9 *Chair:* Rolf Erdmann

Session: Knowledge management

020-0551 Competitiveness Factors for Production Systems

Darlan Roman, Universidade Federal de Santa Catarina, Brazil
Rolf Erdmann, Universidade Federal de Santa Catarina, Brazil
Sandra Lopes, Universidade Federal de Santa Catarina, Brazil
Marilei Osinski, Universidade Federal de Santa Catarina, Brazil

This article aims to identify and characterize the factors of competitiveness in production systems. It begins by addressing the organizational competitiveness and factors that enable better performance for productive organizations. Based on the methodology of content analysis of scientific articles, it identifies 15 factors of competitiveness. The factors were validated by researchers from the production area, members of the faculty of graduate courses in Management and Production Engineering. The validation of the factors was also made with professionals of the production area of three companies: two manufacturing companies

and one services company. The results suggest that the 15 factors identified in the literature influence the competitiveness of the production system, with emphasis on Quality, Innovation, Knowledge, Human Capital and Customer Relationship. We conclude that productive organizations can provide performance improvements by observing and incorporating the 15 factors of competitiveness in their strategic and operational activities.

020-0557 A Structured Treatment for Knowledge Management

Maria Aparecida Santos, UNIP, Brazil
José Paulo Fusco, UNESP, Brazil
Ana Lucia Atrasas, UNIP/ EMBRAPA, Brazil

Increasing technological, social and scientific knowledge in the 1990s required from organizations an ongoing effort of updating and innovation. Knowledge has become an important asset in adding value to the business by increasing the interest in organizational learning and knowledge management. This article explores the possibility of developing a structured approach for the continuous increase of knowledge in a postgraduate program in order to ensure an adequate literature review by students, allowing the aggregation of new knowledge through academic research. The methodological approach was exploratory. The results signaled the first phase to build a database with search system facets. In the second phase, we created a prototype database to support the selection process, organization, storage and retrieval of information about the "business network" as proof of our concept.

020-1034 Organizational Differences In India

Priyanka Goel, Jagannath Institute of Management Sciences, India

The research of Hofstede`s, Trompenaars and Hampden, and Schneider's has provided the framework for many countries to clarify cultural differences thus making it easy for an analyst to view the culture of a particular country. A brief view of the cultural variations in India and U.K. will be studied in this research.

236 Sunday, 01:30 PM - 03:00 PM, Naples 1 *Track:* OMF, 6 *Chair:* Alejandro Serrano
Session: Session 6: Budget and Capital Structure Decisions

020-0236 A Day Late and a Dollar Short: The Benefits of Inventory Financing in Supply Chains

Margarita Protopappa-Sieke, EBS Business School, Germany
Marcel Sieke, Barkawi Management Consultants, Germany

Recent years have witnessed a growing wave of customers delaying payment and asking for longer credit windows, resulting in the search of alternative supply chain financing solutions. In this paper, we examine a promising type of financing based on transfer of inventory ownership. We study a supply chain consisting of a buyer, a seller, and a third-party logistic/service provider, who in collaboration with a financial institution, offers to finance the inventory of the buyer. We investigate different bankruptcy scenarios of the buyer and quantify the trade-off between bankruptcy cost and revenue that drives the carrier's decision. Furthermore, we determine the limit of the buyer's credit rating and the pricing policies that the carrier can accommodate when taking the inventory ownership and the corresponding risk. Our results suggest that a traditional revenue-sharing contract translates to a bankruptcy sharing risk under this inventory financing setting.

020-0087 Inventory and Capital Structure Decisions under Bankruptcy Risk: A One Period Model

Yasin Alan, Cornell University - Johnson School of Management, United States
Vishal Gaur, Cornell University - Johnson School of Management, United States

We investigate the inventory and capital structure decisions of a firm in the presence of bankruptcy risk. The key aspect of the paper is that we model the simultaneous decisions of an equity investor, the manager of the firm, and a bank. The investor is an expected value maximizer and decides how much to invest in the firm. The firm is a newsvendor who takes the investor's decision as starting equity and decides its borrowing amount and inventory in order to maximize the total return to the investor. The bank observes the firm's equity and sets an asset based credit limit in order to prevent the firm from over-borrowing. Our model determines the values of inventory, capital structure, and risk of bankruptcy of the firm that would be realized at equilibrium in the marketplace.

020-0593 Risk Propagation in a Supply Chain

Alejandro Serrano, Zaragoza Logistics Center, Spain
Santiago Kraiselburd, Zaragoza Logistics Center, Spain
Rogelio Oliva, Mays Business School, Texas A&M University, United States

We study how risk, measured by the variability of payments from customers, propagates upstream in a supply chain when firms have limited access to external funds and unilaterally exceed trade credit agreements. We model a chain with three players, where the downstream player faces random demand. Using numerical Markov chains, we study the impact of firms target leverage, demand variability, and agency costs on risk propagation.

237 Sunday, 01:30 PM - 03:00 PM, Naples 3 *Track:* BOM, 11 *Chair:* Santiago Kraiselburd
Session: Supply Chain Management

020-0256 Deliberate or Intuitive: Decision Speed in Demand Forecasting Behavior

Brent Moritz, Penn State University, United States
Enno Siemsen, University of Minnesota, United States
Mirko Kremer, Penn State University, United States

This research analyzes how decision speed in time series forecasting impacts forecast performance, and how individual differences specifically may impact performance. Data from behavioral experiments shows that across a range of time-series settings, forecasts tend to have lower error when individuals take a moderate amount of time to generate a forecast. We find evidence that a forecaster's tendency to make decisions within that optimal time frame depends on their cognitive reflection score, i.e. their ability to balance intuitive judgment with cognitive deliberation. We also present results of an experimental intervention designed to facilitate lower forecast errors by limiting decision duration.

020-0846 Analysis of Local Modifications to Automated Restocking Decisions

Santiago Kraiselburd, MIT Zaragoza Program/INCAE Business School, Spain
Rogelio Oliva, Texas A&M University/MIT Zaragoza Program, United States
Noel Watson, MIT Zaragoza Program, Spain
Luis Herrero, Zaragoza Logistics Center, Spain

In this paper, we study empirically a large retailer that has implemented a store level automatic replenishment system, but that allows store managers to intervene directly by overruling the system´s decisions and indirectly by changing the system´s parameters. We recorded over 330,000 decisions made by 63

managers over a period of 10 to 15 weeks, and compared the stores´ performance with and without direct managers´ interventions. Even though the software without direct manager intervention performs very well in benchmark studies with other retailers and solutions, our analysis suggests that the observed hybrid human-software system that allows direct manager interventions performs significantly better.

020-0300 Coordination in Supply Chains

Kyle Hyndman, Southern Methodist University, United States
Santiago Kraiselburd, Zaragoza Logistics Center, Spain
Noel Watson, Zaragoza Logistics Center, Spain

We study the coordination problem of a two-firm supply chain in which firms choose a capacity before demand is realized. When both firms have common information about demand, multiple Pareto rankable equilibria are possible. When firms have private information about demand, we provide conditions for a unique equilibrium in monotone strategies to exist. We experimentally test various mechanisms and analyze how well aligned capacity decisions are and how close they come to the Pareto efficient equilibrium. Specific mechanisms analyzed include information sharing, message sharing and the sequential choice of capacities.

020-0879 Enabling Concurrent Engineering in the Supply Chain with Weak Commitments

John Hanson, University of San Diego, United States
Joachim Henkel, University of Munich, Germany

Lead time reduction is a central concern of Supply Chain Management, particularly in the initial launch of newly designed or revised products. Early supplier involvement is often advocated for reducing lead times, but empirical studies have shown equivocal results. We find that significant lead time reduction requires not just early supplier involvement, but early supplier selection. This in turn requires a commitment in the face of uncertainty that exposes the buyer to the risk of opportunistic behavior by the supplier. In these situations we observe that parties frequently make weak commitments, i.e., commitments to future actions from which they may deviate, but at some cost. This paper shows that a mechanism based on weak commitments can lead to a situation where cooperation is the dominant strategy for both parties even when there is a single interaction between the parties.

238 Sunday, 01:30 PM - 03:00 PM, Naples 4 *Track:* CSC, 11 *Chair:* John Aloysius
Session: RFID in Operations Management II

020-0025 Leveraging Technology-Enabled Revealed Preference Information by Sequentially Pricing Multiple Products

John Aloysius, University of Arkansas, United States
Cary Deck, University of Arkansas, United States
Amy Farmer, University of Arkansas, United States

Technological advances enable sellers to price discriminate based upon a customer's revealed purchasing intentions. E-tailers can track items in "shopping carts" and RFID tags enable retailers to do the same in brick and mortar stores. In order to leverage this information, it is important to understand how this new visibility impacts pricing and market outcomes. We examine the theoretical implications of sequential pricing of multiple products that are independently-valued, are positively or negatively correlated, or have super-additive or sub-additive values. The results indicate that sequential pricing can increase profits relative to simultaneous components pricing for substitute goods due to a reduction of intra-seller competition. When sellers can condition the second good's price on the buyer's decision to purchase the first good, sequential pricing can also increase profits relative to mixed bundling when customer's values for the goods are highly positively correlated.

020-0111 Item-level RFID in a Retail Supply Chain with Stockout-based Substitution

Gary Gaukler, Texas A&M University, United States

In this paper I present a model to help evaluate the impact of an introduction of item-level RFID in a retail store environment where stockout-based substitution is common.

020-0643 Process Conformance and Store Execution: The Role of RFID Technology

Bill Hardgrave, Auburn University, United States
Matthew Waller, University of Arkansas, United States
John Aloysius, University of Arkansas, United States

RFID Technology has the potential to significantly improve store level execution and improve fill-rates, though we do not yet understand the issues in operationalizing RFID enabled systems. We report the results of a large-scale field experiment using an untreated control group design with pre-test and post-test, including more than 4,000 unique stock keeping units (SKUs) in 24 stores of a large general merchandise retailer. We examine the joint roles of process conformance quality and the automation provided by the track-and-trace technology.

020-0259 Item-level RFID Tagging and Inventory Record Inaccuracy

Bill Hardgrave, Auburn University, United States
Sandeep Goyal, University of Southern Indiana, United States
John Aloysius, University of Arkansas, United States

Previous research has demonstrated that case-level RFID tagging can improve inventory record accuracy for consumer packaged goods. The increased visibility provided by item-level tagging, however, enables tracking items in-store right up to the point-of-sale. We report the results of experiments in the field that investigate the potential of item level tagging in the retail store.

239 Sunday, 01:30 PM - 03:00 PM, Naples 6 *Track:* ACL, 4 *Chair:* Mark Davis

Session: Service OM: Interactive In-class Exercises

020-1039 Class Exercises for Service Operations Management

Mark Davis, Bentley University, United States

One of the benefits of teaching service operations management is that students can directly relate many of the course topics to their everyday experiences. This tutorial introduces several interactive exercises that can be used in a course on service operations management. In addition, given that today's students are very comfortable with technology, especially with the Internet, several Internet-related exercises are presented and discussed along with several readily available online videos that reinforce course topics. Topics that are addressed through these exercises/videos include: service guarantees, service blueprinting, waiting line management, and service quality.

243 Sunday, 03:30 PM - 05:00 PM, Tuscan 1 *Track:* HOM, 12 *Chair:* Roy Stratton
Session: Theory of Constraints in Healthcare

020-1014 TOC in Healthcare

Kevin Watson, Iowa State University, United States

As healthcare has become an increasingly important issue in the national consciousness, healthcare operations has received significant interest from academics. A number of authors associated with the Theory of Constraints have floated ideas on how TOC tools and techniques can be utilized to improve healthcare operations. Many of these tools have received application in the British National Health Service. This paper will discuss the application of TOC in the healthcare environment.

020-0567 Examination of the Use of Variability Buffers in Healthcare

Sriram Venkataraman, Clemson University, United States
Lawrence Fredendall, Clemson University, United States
Kevin Taaffe, Clemson University, United States
Nathan Huynh, University of South Carolina, United States

This paper explores how the decisions that firms make over a period of time create variability buffers in their operating systems. We examine Hopp and Spearman's (2004) conceptualization of variability buffers and variability in a peri-operative system (POS) of one large teaching hospital. We use the eight categories of manufacturing decision variables proposed by Hayes and Wheelwright (1984) as a framework for our discussion. Hayes and Wheelwright argue that the collective pattern of these decisions over time creates the firm's capabilities, which should be represented by the firm's use of each variability buffer and the amount of variability in their operating systems. Case observations and historical data from the POS are analyzed using the econometric framework developed by Olivares et al. (2008).

020-0719 Elective Patient Scheduling and Control Using Time Buffer Management

Roy Stratton, Nottingham Trent University, United Kingdom
Alex Knight, QFI Consulting, United Kingdom
Alex Dinham, QFI Consulting, United Kingdom

The purpose of this paper is to evaluate the application of Time Buffer Management (TBM) to the scheduling and control of elective surgery from a theoretical and a practical perspective. TBM has long been used in manufacturing under the title of Drum-Buffer-Rope and in project management under the title of Critical Chain. In the last 5 years hybrids of these traditional applications have been successfully developed in the management of patient flow. However, it has only recently been applied to the scheduling and control of elective surgery. This paper begins by reviewing the issues surrounding elective surgery scheduling and control before identifying how the TBM planning and control functions relate both theoretically and practically. Two case applications are used to investigate how the theory has been translated into a practical tool before evaluating the theory and discussing the results.

020-0667 Lessons from a Multi-Site Lean Healthcare Experiment

Norman Faull, University of Cape Town, South Africa
Anton Grutter, University of the Western Cape, South Africa
Chipo Mupure, University of Cape Town, South Africa
Zameer Brey, University of Cape Town, South Africa

The paper reports the lessons from 18 week-long improvement workshops commissioned by South Africa's national department of health in the second half of 2010. Each workshop comprised 3 "rapid improvement events" and averaged 18 delegates (6 per RIE), all of them managers. The nation's neediest hospitals were prioritized and a team of facilitators undertook the workshops, usually working solo. The objective was to demonstrate that rapid improvements are possible and that a standard approach to improvements is possible. A "lean" methodology was used.Pre-visits were undertaken to brief hosting hospital CEOs as to the purpose and what was expected of them. At the close of each workshop the RIE teams presented their reports, and the facilitator collected written and verbal feedback, and completed a workshop report. Several weeks later the facilitator returned to assess further progress if any. Results were mixed and lessons abound.

020-0172 An Implementation of Quality Tools and Techniques in the Planning of Healthcare Infrastructure

Benjamin Dehe, University of Manchester, United Kingdom
David Bamford, University of Manchester, United Kingdom
Jim Bamford, NHS Bradford and Airedale, United Kingdom

The aim of this paper is to discuss the implementation of techniques that have been applied to improve the planning and design of future healthcare infrastructures. The paper demonstrates how the Quality-7 and more advanced improvement techniques such as Benchmarking and Quality Function Deployment (QFD) have been implemented within a PDCA cycle to enhance the quality of healthcare premises. The developing conceptual model represents a non-prescriptive approach to plan and design new healthcare infrastructures using operations management techniques. This model can be implemented as a best practice by the local Trust to speed up the planning phases and enhance the design quality of future developments, generating substantial financial benefits. It is believed that this framework allows the decision makers to adopt a robust methodology to make informed and rational strategic choices for planning modern and bespoke infrastructures. As far as the authors know no such methodology has been developed in healthcare.

244 Sunday, 03:30 PM - 05:00 PM, Tuscan 2 *Track:* GOS, 6 *Chair:* Linda Hendry Nigel Caldwell
Session: Supplier Selection and Supply Disruptions

020-0912 Supplier Selection in the Global Aerospace Industry

Brian Simons, Honeywell International, United States
Linda Hendry, Lancaster University Management School, United Kingdom

The research presented in this paper aims to improve supplier selection in the global aerospace industry. Whilst there has been much previous research into the supplier selection process, for example through the development of the Total Cost of Ownership concept, there has not yet been adequate research to address the specific needs of the aerospace sector, including an understanding of the pertinent costs in this case.This paper addresses this research gap by first describing case study research using 21 participants from Honeywell Aerospace and Goodrich Aerospace to investigate why and how global supply chain decisions are made. Secondly, three cycles of action research within Honeywell Aerospace will be described, which led to the development of an improved supplier selection process/tool. This tool reduces the burden of collecting information, includes additional automated analysis, includes a wealth of external data, and presents results in a meaningful format for decision making.

020-0817 Exploring and Analyzing Supply Chain Disruptions

Brian Squire, University of Bath, United Kingdom
Emma Brandon Jones, University of Bath, United Kingdom
Nigel Caldwell, University of Bath, United Kingdom

This study examines the causes and consequences of a decade of supply chain disruptions. Using a proprietary database developed from publicly announced disruptions, we analyze over 2,400 disruptions between 2000 and 2009. We examine characteristics of the disruption, such as the location, causes, geographical spread, duration and position in the supply chain. We then proceed to analyze the directly impacted party as well as the affected party (usually the customer), in terms of the disruption's consequences, impact, and total loss. Finally, we look to establish relationships between the disruptions and their consequences both across the complete database as well as for specific industries and products. Our results have interesting implications for the academic study of supply chain risk as well for managers challenged with developing resilient and robust supply chains.

020-0397 Landing Cost as a Parameter to Measure the Degree of Subsidiary Embeddedness: Initial Assumptions

Omar Salgado, Tecnologico de Monterrey, Mexico

One of the considerations for manufacturing transfers is the overall production cost gained from such location. Hence, foreign plants would compete for projects based on economic figures they are able to produce under the specific interaction of subsidiary capabilities and location characteristics. If HQ grants a mandate, it is expected that projected figures come true. However if production start-up delays or planned budget increases occur, it would impact not only on economic figures but also on future chances to gain new mandates. The purpose of this paper is to analyze the cost of landing and its relation with the degree of subsidiary embeddedness with the aim to highlight the need to convey efforts towards the embedding process. Cost of landing is defined as a function of quality, efficiency, and time/deep of training. The paper suggests 'experience on', 'embedding on' and 'acculturation to' as transfer characteristics that impact on cost of landing.

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Sunday, 03:30 PM - 05:00 PM, Tuscan 3 *Track:* SCH, 8 *Chair:* Chikong Huang
Session: Location Problems in Scheduling

020-0065 A Study of Multi-trip Vehicle Routing Problem and Distribution Center Location Problem

Chikong Huang, National Yunlin University of Science & Technology, Taiwan, Taiwan, Republic of China
Chien-Ming Lee, National Yunlin University of Science & Technology, Taiwan, Taiwan, Republic of China

This research solves both the multi-trip vehicle routing problem and the distribution center location problem simultaneously. A mathematical model is developed and the objective is to minimize the total costs including the transportation costs and the activated vehicle costs. A heuristic algorithm is then developed for solving the problem which consists of three phases. The first phase is to find an initial location and routings. The second phase applies exchange algorithms to obtain better routings by using Simulated Annealing (SA) logic. The final phase is to improve the location which is controlled by the current temperatures of SA method. Results from the numerical examples show that the proposed algorithm can effectively solve the location routing problem. Finally, the numerical experiments indicate that: (1) using larger capacity of vehicle is better for reduction of transportation distance, and(2) increasing service time can effectively reduce the number of vehicles required.

020-0470 Optimization of Mixed Logistics Network Considering Impedance Effect

Li Sun, Southeast University, China
Lindu Zhao, Southeast University, China

Mixed logistics network has the advantages of Hub-and-Spoke network and PTP network. In order to solve the capacitated multiple allocation p-hub problem, this paper presents a non-linear model to optimize the network. Due to the fact that the current research has some limitations, the capacity of materials disposal at hubs and the timeliness of transportation are added as constraints in the model based on the analysis of characteristics of mixed logistics network. In the process of optimization, an impedance function is introduced to balance material flow in logistics network in order to avoid local congestion. Additionally, we provide a genetic algorithm that finds a satisfying solution within a reasonable time. Then an example and simulation are given to verify the validity of the model. This research provides new and realistic insights into the mixed logistics network design problem.

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Sunday, 03:30 PM - 05:00 PM, Tuscan 4 *Track:* ESO, 12 *Chair:* David Drake
Session: Carbon Footprint II

020-0800 Carbon Footprint Analysis in Latin America: The Colombian Case

Vivian Rangel, Center for Latin-American Logistics Innovation (CLI), Colombia
Edgar Blanco, MIT Center for Transportation & Logistics, United States
Isabel Agudelo, Center for Latin-American Logistics Innovation (CLI), Colombia

The new requirements of international markets in terms of environmental response to climate change are creating an increasing pressure on companies to measure and show their efforts to reduce negative impacts generated by the emission of greenhouse gases (GHG). This represents a big challenge for emerging markets like Latin America, including Colombia. Due to Colombia's intensive agro-industrial economy along with the industry's high dependence on fossil fuels and the pressure from its main export destination-the United States, interest from Colombian companies to measure their carbon footprint is increasing, both to enhance their competitiveness and reduce the related environmental risks. In this paper we will discuss the results of the corporate carbon footprint measurement for a group of the most important Colombian companies from the food and beverage sector. The methodology presented is based on the Greenhouse Gas Protocol Initiative, but takes into account local conditions in order to identify and compare the contribution of different emission sources to the corporate carbon footprint. Moreover, we will show the opportunities to reduce and compensate for the GHG emissions.

020-0803 Developing Carbon Metrics for Truckload Transportation Procurement

Anthony Craig, Massachusetts Institute of Technology, United States
Edgar Blanco, Massachusetts Institute of Technology, United States
Yossi Sheffi, Massachusetts Institute of Technology, United States

Current methods for evaluating the carbon footprint of truckload carriers focus on measuring the overall performance of the carrier. While these metrics are appropriate for a traditional procurement process where service level scores are used to qualify carriers to participate in the bidding process, they are insufficient to capture the full advantage of optimization based procurement auctions. In this research we analyze the truck movements for a large truckload carrier and present a method for developing lane-level carbon metrics. The results of this analysis are compared against the single carrier-level carbon footprint score and presented in context with the transportation procurement process.

020-0812 Sustainable Fleet Operations: Partnerships and Intermediation as Electric Vehicle Enablers

David Drake, INSEAD, France

Vanessa Chocteau, La Poste, France
Paul Kleindorfer, INSEAD, France
Renato Orsato, FGV/EAESP, Brazil
Alain Roset, La Poste, France

Using cooperative game theory, we characterize the joint payoffs for the primary stakeholders in the electric vehicle (EV) adoption decision -- the fleet manager, auto manufacturer, and electricity supplier -- to determine the conditions under which EVs become economically feasible for commercial fleets. We first analyze a scenario where all three stakeholders cooperate in the EV adoption decision, a setting pertinent in regions such as France where a national electricity supplier makes such an arrangement feasible. We next analyze a scenario where the fleet manager and auto manufacturer cooperate but the electricity supplier participates as an independent actor, a setting pertinent in regions such as the United States where no single electricity supplier possesses the market power to become involved in the EV decision on a national scale. Comparing the regions of EV adoption in these two settings provides insights into the conditions under which inter-mediation can add value.

020-1072 A Structural Equation Model (SEM) for Flexible Product recovery System

Jitendra Madaan, Indian Institute of Technology, Roorkee, India

Enterprises have shown substantial evidence demonstrating value and inevitability of returns. These returned products represent a sizeable flow of potentially recoverable assets. A large proportion of the returned product value just erodes away due to processing delays; therefore enterprises have initiated efforts to design a flexible product recovery system (FPRS). In this paper, Structural equation modeling (SEM) will be used to explore the existence of a higher level construct of flexible product recovery system. These models provide an opportunity to achieve greater parsimony in explaining relationships among observed variables and constructs such as regulations, environmental concerns, management commitment, and recapturing value from returns and advantage from making the appropriate reverse supply chain design choices. Finally, we illustrate our approach with specific examples from different industries and then examine how industry generally affects the choice between a dedicated and a flexible returns network.

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247 Sunday, 03:30 PM - 05:00 PM, Tuscan 5 *Track:* OEE, 9 *Chair:* Youyi Feng Adriane dos Santos
Session: Managing Operations in Oil and Gas Industry

020-0413 Optimal Strategies of Refilling Fossil and Bio Fuels and Trading Emission Credits for a Road Fuel Supplier under an Emission Ceiling

Youyi Feng, Zaragoza Logisitcs Center, Spain
Jianjun Xu, Zaragoza Logistics Center, Spain

We consider optimizing dynamic fuel refilling decisions for a road fuel supplier of two different kinds of fuels. The supplier sells a fossil and a bio fuel to stochastic demand of vehicle drivers and periodically refills the fuel tanks. The drivers pay an extra fuel tax on the fossil fuel as burning the fossil fuel emits more tons of CO2 than burning the bio fuel and the fossil fuel has a larger environmental impact than the latter. The supplier, however, is given a ceiling on CO2 emission over the planning horizon which restricts the supplier to a maximum amount of fossil fuels to sell. But, the supplier can purchase the emission credit from an open trading market to increase the allowance quota for the fossil fuel sales. This project studies the optimal strategies of refilling fuels and trading emission credit in the trading system with a given ceiling.

020-0311 Analysis of Aspects of Logistics Used by the Group Mime: A Study of Distribution and Network of Station Fuels

Ubiratã Tortato, Pontifícia Universidade Católica do Paraná, Brazil
Adriane dos Santos, Pontifícia Universidade Católica do Paraná, Brazil

The subject of this paper is to analyze aspects of logistics used by the oil distributor and gas station chain in Group Mime. We used qualitative techniques and document analysis. The study population was composed of the manager group. The article details aspects such as modal, amount of stock, number of customers, strategic partnerships, etc. The chain of stations started in the city of Jaraguá do Sul/SC, Brazil in 1977. At the beginning, the Group had one gas station only, and today it includes the matrix and 22 more branches. The activities of the Petroleum Distributors started in 2002 and now supply products to nearly 500 gas stations. The Group is controlled by the four partners. The results showed that the organization under study has efficient logistics and creates competitive advantage. The study concludes that the Group has competitiveness strategies, seeks to manifest integration, speed, flexibility, service quality and cost management.

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248 Sunday, 03:30 PM - 05:00 PM, Tuscan 6 *Track:* TEC, 4 *Chair:* Nigel Caldwell Janice Carrillo
Session: Technology Management in the Supply Chain

020-0815 Antecedent Factors to Supply Chain Resilience and Robustness

Brian Squire, University of Bath, United Kingdom
Nigel Caldwell, University of Bath, United Kingdom
Emma Brandon Jones, University of Bath, United Kingdom

This study examines the antecedents to creating resilient and robust supply chains. We use information processing theory to develop a conceptual model that assesses the fit between uncertainty, information processing capability, supply chain structure and buffers. Following extant theory, we hypothesize that uncertainty has a positive effect on information processing needs, while buffers, in terms of stock, capacity and supplier, reduce these needs. Furthermore, ICTs, such as collaborative planning and forecasting and vendor managed inventory, and supply chain structure, in terms of centralization and postponement boost information processing capability. Finally, we test the impact of 'fit' between these two sets of variables and two 'performance' variables of supply chain resilience and robustness. Based on a survey of UK manufacturing firms, we test our hypotheses to generate specific implications for industry.

020-0216 Performance Evaluation of Integrated Information Systems across the Value Chain

Rupak Rauniar, University of Houston- Victoria, United States
Dewaynna Cates, Prairie View A&M, United States
Greg Rawski, University of Evansville, United States

Integrated supply chain information systems increases the richness of communications among the channel partners through greater interactivity between the firm and the customer and helps businesses to meet the challenges of business activities (Watson et al., 1998; Graham and Hardaker, 2000; Gunasekaran and Ngai, 2004; Devaraj, Krajewski and Wei, 2007; etc). This work-in-progress research is first of its kind to study the performance of such strategically important complex information across the upstream and downstream users in the student loan industry that includes students, colleges and universities, intermediaries, and the government.

020-0401 Knowledge Creation and Knowledge Transfer in New Product Development Projects

Wenli Xiao, College of Management, Georgia Institute of Technology, United States

Cheryl Gaimon, College of Management, Georgia Institute of Technology, United States
Janice Carrillo, Warrington College of Business Administration, University of Florida, United States

We consider three stages of an NPD project which proceed in parallel: prototyping, pilot line testing, and on-line experimentation. Two models are introduced (continuous and discrete) that characterize linkages among the three stages. An important feature of our research is that we recognize that by transferring prototyping knowledge to the pilot line testing stage, the manager enhances the ability of knowledge creation at the pilot-line stage. Similarly, transferring pilot line knowledge enhances the ability of knowledge creation at the on-line stage. In both models, the manager determines the extent of knowledge development at each stage over time. In one model knowledge is continuously transferred between stages (as within a single team); in another model we determine the discrete times and quantities of knowledge to be transferred (multiple teams). Finally, we provide a deep understanding of the nature of knowledge transfer by analyzing how various parameters drive different solutions.

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249 Sunday, 03:30 PM - 05:00 PM, Tuscan 7 *Track:* PDI, 12 *Chair:* Jack Crumbly
Session: Organizing Product Development

020-1051 Organizational Structuring, Team Structuring and Project Performance

Rupak Rauniar, University of Houston - Victoria, United States
Greg Rawski, University of Evansville, United States

Despite the advantages of superior project performance, implementing integrated product development projects has proven to be very challenging and complex. To be successful, an IPD project needs to have a well-structured management approach that promotes the downstream team effort across concurrent execution of the project with the upstream strategic planning phase of such a project. Based on the existing literature, we hypothesize that managing IPD projects with organizational structuring and project team structuring can lead to reduced product glitches which can enhance overall IPD project performance. We define organizational structuring of the IPD project as the extent to which the project is provided with strategic alignment, and is lead by heavyweight product manager. Similarly, we define project team structuring of IPD projects as the extent to which the cross-functional teams of IPD project have a shared project mission, cross-functional integration, and have clarity of project targets tradeoffs.

020-0272 Does IT and SCM Staff Provide Sufficient Innovation for Supply Chain Networks?

Jack Crumbly, Tuskegee University, United States
Mark Freeman, Tuskegee University, United States

As supply chains rely on innovation from information technology and expertise from logistics and supply chain managment staffs, the effectiveness of both on improving supply chain effectiveness is unclear. This study will look at this issue through a case study of supply chain management and IT staff. Results of the case study will be discussed along with future research.

020-0346 New Product Development (NPD): Industry and Country Effects on Practices and Performance

Debasish Mallick, University of St. Thomas, United States
Sohel Ahmad, St. Cloud State University, United States
Roger Schroeder, University of Minnesota, United States

We use a survey of 266 new product development projects to explore the differences in NPD practices across three industries and nine countries and the impact of such differences on NPD performance.

020-0046 Innovators vs. Imitators: Strategic Moves to Avoid Endgame in Pharmaceutical Industry

Arvinder Loomba, San Jose State University, United States
Kimberlee Heldt, NeoVista, Inc., United States

Major pharmaceutical companies recognize that drug development is a high-risk enterprise. It has an intricate product lifecycle spanning over a decade, has an abysmal success rate, and a development price tag exceeding $100 million dollars. However if the drug development were to prove successful, the rewards are immense. With the 1984 Waxman-Hatch Act, generic drug makers got an accelerated backdoor to get generics on the market, reshaping the industrial landscape. As generics manufacturers (imitators) salivate for blockbuster drugs to come off patent, pharmaceutical companies (innovators) reconsider their strategic moves and explore yet another phase to the lifecycle of their product: patent extension management. In this paper, we address strategic games played by innovators and imitators in the pharmaceutical industry. Our discussion focuses on the management of patent extension and specific strategies generated by the project team to extend the patent life of blockbuster drugs so as to avoid an endgame scenario.

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250 Sunday, 03:30 PM - 05:00 PM, Tuscan 8 *Track:* ERS, 12 *Chair:* Andrej Baranek
Session: Topics in Empirical Research IV

020-0193 Investigating the Applicability of the Rules underlying Toyota's Performance Advantages in British Auto Engine Re-manufacturing Industry

Andrej Baranek, Nottingham University Business School, United Kingdom
Kim Tan, Nottingham University Business School, United Kingdom
Mike Byrne, Nottingham University Business School, United Kingdom

Spear and Bowen (1999) attempt to lay out how Toyota's system works by describing four rules that enable replication of Toyota's performance. Despite these attempts, lean implementation remains a challenging task that requires contingent application, which is unique to a particular system and industrial sector (Hines et al., 2004). This promotes the question of whether devoting time and energy to mastering the rules enhances organization's ability to improve performance (Spear and Bowen, 1999). Starting from these considerations this research intends to be a stimulus to theoretical and empirical investigation of when and where the rules are applicable. This paper investigates applicability of the rules in the British automotive engine re-manufacturing industry. Empirical data collection was carried out through a series of extensive case studies in three companies. The paper contributes to improved understanding of how the rules might need to be adapted in their application when material recovery is the core objective.

020-0319 How Firms Are Using Networking Decisions to Achieve Strategic Objectives: Building Theory from Four Case Studies

Francesca Riccobono, University of Palermo, Italy
Manfredi Bruccoleri, University of Palermo, Italy
Giovanni Perrone, University of Palermo, Italy

Many research studies in OM literature have investigated how different kinds of focal firm decisions regarding business vertical relationships (i.e. with both suppliers and buyers) can positively affect firm's operations performance and thus improve its competitive position. In this paper we extend this genre of study by also considering business horizontal relationships (i.e. with competitors and firms that own complementary capabilities) and by considering the impact of business relationships not only on focal firm's operations performance but also on its resources endowment. We present four cases that describe the strategic

manager intents when making decisions about both vertical and horizontal business relationships (i.e. Networking Strategy). Using theory building through case studies, we identify four archetypes of networking strategy. The archetypes capture different connections between the “set” of strategic objectives that managers are willing to pursue, and the “set” of networking decisions.

251 Sunday, 03:30 PM - 05:00 PM, Tuscan 9 *Track:* BOM, 9 *Chair:* Paulo Goncalves

Session: Forecasting and Inventory Risk Management 2

020-0644 Forecast Information Sharing in China and the U.S.: The Impact of Culture on Trust

Yanchong Zheng, Stanford University, United States
Özalp Özer, University of Texas at Dallas, United States

With human-subject experiments, we investigate how cultural distinctions between China and the U.S. affect the efficiency of forecast sharing in a supply chain. We consider the inventory decision of a supplier who solicits demand forecast information from a retailer. To assure abundant supply, the retailer has an incentive to inflate her forecast. Ã- zer, Zheng, and Chen (2010) show that trust fosters cooperation in the supply chain and risk has a greater impact on trust than uncertainty. We verify these findings in both countries with the new data. More importantly, we focus on the interactions among culture, risk, and uncertainty to study how they jointly affect trust and cooperation in both countries.

020-0633 Impact of Information Visibility on the Bullwhip Effect

Mohammad Moshtari, University of Lugano, Switzerland
Paulo Goncalves, University of Lugano, Switzerland

Previous research on the Bullwhip Effect (Croson & Donohue 2003, 2005, 2006) shows that information visibility (supply chain partners' inventory information or Point-Of-Sale (POS) data) can reduce the amplification of orders in a supply chain. Our research compiles and analyzes the data on previous experiments to get insight on the specific mechanisms that decrease order amplification. By structuring the data as a panel and using a Poisson fixed-effect model, we find that forecasting power progressively increases with additional information (Point-Of-Sale data and supply chain partners' inventory information). In addition, the aggressiveness of the response to own inventory decreases when members have access to more information. Finally, our results suggest that downstream customers do not use POS and inventory data to their full advantage. However, upstream members use such information to anticipate and adjust for downstream members' orders.

020-0636 Influence of Framing on Inventory Prepositioning Decisions

Jaime Castaneda, University of Lugano, Switzerland
Paulo Goncalves, University of Lugano, Switzerland

Previous laboratory experiments in newsvendor settings have shown that inventory prepositioning decisions differ from the prescribed optimum. In an experimental design based on cognitive dissonance theory, we argue that the perceived importance of an item in joint decisions may de-bias newsvendor decisions. The design considers two manipulations: a cognitively consonant manipulation, where we bundle a high safety stock decision with a high-importance item and a low safety stock decision with a low-importance item; and a cognitively dissonant manipulation, where the safety stock conditions are reversed. We compare their results against the results of a baseline treatment where such decisions are made independently. Results show that bundling two consonant decisions improves results, while bundling two dissonant decisions worsens them. Moreover, for low safety stock items, the consonant decisions outperform the dissonant ones. Our results suggest that bundling newsvendor decisions that differ in their perceived importance may de-bias such decisions.

020-0131 An Experimental Investigation of the Effects of Supply Risk on Supply Chain Performance

Alessandro Ancarani, University of Catania, Italy
Carmela Di Mauro, University of Catania, Italy
Diego D'Urso, University of Catania, Italy

We present a series of controlled human experiments investigating the impact of supply risk on buyers’ inventory management. The experiments focus on one specific source of SC risk, namely stochastic lead times, within the framework of the “beer game”. Specifically, we study the impact of stochastic lead times on supply chain performance and on the formation of the bullwhip effect. Next, the impact of players’ SCM skills and game experience is investigated. Two between subject treatments were run, a standard beer game (SBG) and a beer game with stochastic lead times (SLT). A total of 104 MBA students and 24 purchasing managers participated. Results show that SLT gives rise to higher costs and a more marked bullwhip effect than the SBG. Both effects decrease with experience in the game. However, they do not disappear, even when real managers are involved in the game.

252 Sunday, 03:30 PM - 05:00 PM, Tuscan 10 *Track:* ICM, 10 *Chair:* Milton Vieira Junior

Session: Industrial Applications I

020-0032 Group Technology Applied in the Supply and Procurement Area: A Case Study

Jackson Da Silva, UNINOVE, Brazil
Milton Vieira Junior, UNINOVE, Brazil

This article aims to demonstrate the application of Group Technology in the supply and procurement area. The lack of organization and planning of this department can generate large costs and expenses to organizations, causing loss of competitiveness. This analysis was done using a case study accomplished in a large company in the industrial sector, which has implemented Group Technology in its procurement and supply department. Great benefits and improvements have been realized that will be shown in this work, such as large cost reduction, more organization of the materials registered in the procurement integrated system, greater speed and agility in the procurement process, greater reliability of the materials provided to avoid damage to the productive process, and other improvements.

020-0287 A Methodology for the Planning of Worksheet Inventory in Tuition Centers Following the Systematic Progression of Students through Levels

Iris Ann Martinez, University of the Philippines, Philippines

The number of private Tuition Centers is growing in the Philippines. Tuition Centers tackle academic subjects as enrichment to a student’s primary school instruction. Tuition Centers in the Philippines include Kumon, Enopi, Sakamoto and Magikats. Students answer worksheets which are then checked by tutors. The student is required to repeat answering the worksheet until he passes a set score. The student moves to the next level worksheets when he has finished all the worksheets required for his current level.The objective of this paper is to propose a methodology for estimating the correct count of worksheets per level kept in stock in a Tuition Center. Having the correct count of worksheets minimizes the possibility of stockout. The methodology starts with the determination of the factor(s) that influence the total usage of worksheets. Then, it plans for the count of worksheets of a higher level based on the consumption of current worksheets.

253 Sunday, 03:30 PM - 05:00 PM, Tuscan 11 *Track:* SOM, 10 *Chair:* Joy Field
Session: The Customer in Service Operations

020-0254 A Study of Service Environment: The Role of Customer Culture

Erlinda Yunus, Southern Illinois University Carbondale, United States
John Goodale, Southern Illinois University Carbondale, United States

The superiority of service operations is often determined by its customers' perception of the quality of the service. Service environment, through its dimensions of design, ambient, and social factors (Baker et al., 2002), shapes customers' perception of the overall quality of the service, affects customer satisfaction, and, in turn, determines customer behavioral intention. Despite the numerous works establishing the relationships between service environment, customer satisfaction, and behavioral intention, the role of culture in influencing these relationships has been overlooked. This study attempts to enhance our understanding of the impact of customer culture on the relationship between service operations environment, customer satisfaction, and behavioral intention. It is hypothesized that specific cultural dimensions (that is, power distance, individualism/collectivism, masculinity/femininity, and uncertainty avoidance) would either strengthen or weaken these relationships. Implications for research and practice are discussed, as well as the study's limitations, which would open avenues for future research.

020-0552 The Effects of Service Complexity and Frequency of Interaction on Business-to-Business Customer Satisfaction

Rafael Teixeira, Unisinos University, Brazil
Ely Paiva, Fundação Getúlio Vargas, Brazil
Celso Mattos, Unisinos University, Brazil

This paper investigates how the combination of service complexity and frequency of interaction between service provider and B2B customer impact satisfaction with technology services. We posit that complex services are more difficult for B2B customers to buy and manage due to the amount of information that must be processed, and that frequent interactions with the service provider may provide the information these B2B customers need to make the best decisions during the buying and co-production processes. We empirically test our framework with a sample of 238 B2B customers of data telecommunication services from the largest telecommunication service provider of Brazil. Results of MANOVA analysis show that different combinations of frequency of interaction and service complexity have a significant impact on B2B customer satisfaction with telecommunication services.

020-0141 Creating Value by Shifting the Boundary between Service Provider and Customer

Mark Davis, Bentley University, United States
Joy Field, Boston College, United States
Paul Maglio, IBM Research - Almaden, United States

Today, companies recognize the opportunities for co-creating value by shifting the traditional boundary between provider and customer toward either participant. To shift the boundary effectively, service designers need to clearly identify the roles and degree of participation for both the provider and customer. Because boundary-shifting is a dynamic process, we focus on three aspects of the service delivery process that change over time: (a) where the customer-service provider boundary is defined, (b) the tasks that comprise the service, and (c) and the resource capabilities required during the delivery process. In particular, we focus on identifying the capabilities needed by each participant during the value co-creation process and how they might be acquired. We also address how these capabilities might change over time through repeated interactions between the service co-creators. Determining where to set the boundary is also dependent on identifying the appropriate measures of value/effectiveness for the service process.

254 Sunday, 03:30 PM - 05:00 PM, Roma 1,2 *Track:* NCC, 7 *Chair:* Pui-Sze Chow
Session: Session 7

020-0024 Negotiation and Procurement Strategies in a Multi-tier Supply Chain

Yulan Wang, Hong Kong Polytechnic University, Hong Kong
Pengfei Guo, Hong Kong Polytechnic University, Hong Kong
Jeannette Song, Duke University, United States
Baozhuang Niu, Hong Kong Polytechnic University, Hong Kong

In this paper, we investigate the joint impact of price negotiation and procurement strategy on a three-tier supply chain consisting of an original equipment manufacturer (OEM), a contract manufacturer (CM) and a supplier. We model the former as a cooperative generalized Nash bargaining (GNB) process. As to the latter, we consider two procurement strategies, control and delegation. There are two timings for the OEM to make its procurement quantity decision: prebook (push contract) or at-once order (pull contract). We find that delegation always generates a lower procurement price for the OEM, however, it may reduce the supplier's capacity building up incentives. We also find that quantity commitment from the OEM plays a strategic role in coordinating the supply chain when the CM and the supplier have unbalanced capacity set-up incentives and the demand uncertainty is large.

020-0116 Quick Response Fashion Supply Chains with Minimum Order Quantity Consideration

Pui-Sze Chow, The Hong Kong Polytechnic University, Hong Kong
Tsan-Ming Choi, The Hong Kong Polytechnic University, Hong Kong
Edwin Cheng, The Hong Kong Polytechnic University, Hong Kong

Both Quick Response (QR) and minimum order quantity (MOQ) imposition are common practices in the apparel industry, yet the retailer and the manufacturer hold conflicting views on the two. For the retailer, QR can enhance his responsiveness to market changes whilst MOQ limits his ordering flexibility; for the manufacturer, QR may not be that beneficial whereas MOQ serves her as some guarantee of income. Apparently, little to no research has been conducted to explore the integrated effect of the two practices on the performance of the channel members as well as that of the supply chain. In this paper we derive the retailer's optimal ordering policy under QR with MOQ consideration. Afterwards we explore the impact of MOQ imposition on the performance of the agents. Finally we propose a dynamic MOQ scheme that would help coordinate such a supply chain.

020-1052 Fashion Retail Pricing and Inventory Problems with Value-at-Risk Objective: Optimal Decisions and Coordination

Chun-Hung Chiu, City University of Hong Kong, Hong Kong
Tsan-Ming Choi, The Hong Kong Polytechnic Univeristy, Hong Kong
Jinhui Zheng, The Hong Kong Polytechnic University, Hong Kong

Inspired by the popularity of the Value-at-Risk (VaR) objective in finance, we examine its application in fashion retail pricing and inventory decision making problems. We first develop a formal optimization model for the problem in which the fashion retailer's goal is to optimize a VaR objective function. After that, we explore the detailed solution schemes and demonstrate the applications of the proposed model. Finally, we investigate the performance of different supply contracts in enhancing the supply chain's efficiency when the fashion retailer takes a VaR objective. Insights are generated.

020-0023 Cooperative Game Analysis of Retail Space-Exchange Problems

Mingming Leng, Lingnan University, Hong Kong
Mahmut Parlar, McMaster University, Canada
Dengfeng Zhang, Lingnan University, Hong Kong

We analyze retail space-exchange problems where two or more retailers exchange their excess retail spaces. We first investigate the two-retailer space exchange problem and find conditions under which the system-wide profit increases. In order to entice both retailers with different bargaining powers to exchange their spaces, we use the generalized Nash bargaining scheme to allocate the total profit surplus between the two retailers. Next, we consider the space-exchange problem involving three or more retailers, and construct a cooperative game in characteristic function form. We derive the necessary and sufficient conditions under which the game is essential and superadditive, and also prove that the core is non-empty. Moreover, in order to find a unique allocation scheme that ensures the stability of the grand coalition, we propose a new approach to compute a weighted Shapley value that satisfies the core conditions and also reflects retailers' bargaining powers.

255 Sunday, 03:30 PM - 05:00 PM, Sorrento 1,2 *Track:* QPJ, 11 *Chair:* Thiago Hagui
Session: Session 11: Taguchi Methods

020-0579 Application of Taguchi Method in Process of Metallography Analysis of Steel Applied to the Automotive Industry

Thiago Hagui, UNESP - University of Sao Paulo State, Brazil
Ricardo Penteado, UNESP - University of Sao Paulo State, Brazil

This experimental arrangement aims to achieve the greatest statistical use of the results along with lower financial costs and time. The aim of this paper is use the Taguchi method in experiments of metallography analysis of steel applied to the automotive industry, assessing the influence of factors, Nital, etching time and position of taking the sample, the response variable volume fraction average of phases present in the samples. The values of the response variable, volume fraction average of phases, were compared with the composition of Nital, etching time and location of sampling. It is therefore a direct relation between the factors, Nital composition and etching time, and the response variable volume fraction average.

020-0683 Use of the Taguchi Method for Process Improvement of a Cylindrical Turning Process of a Superalloy NIMONIC 80A

Ricardo Penteado, Univ. Estadual Paulista - UNESP, Brazil
Messias Silva, Univ. Estadual Paulista - UNESP, Brazil
Marcos Ribeiro, Univ. Estadual Paulista - UNESP, Brazil
Francyanne Oishi, Univ. Estadual Paulista - UNESP, Brazil

The objective of this work is the study of the machining by external cylindrical turning on a CNC Machining, using a nickel-based alloy (Nimonic 80A) to optimize the variable response Roughness (Ra). Seeking the machining optimization and looking to provide real productivity increases without the need of investments in new production means, the Taguchi Method was used as a tool to improve this process, using the Orthogonal Array L8, operating in two levels. The machining experiments were accomplished considering the machining parameters: cutting speed (75 and 90 m.min-1), cutting depth (0,8 and 1,6 mm), feed rate (0,12 and 0,18 mm.rev-1), kind of tool (TNMG160404R-UX TP2500 and TNMG160404R-UX CP250) and cutting fluid (minimum quantity of fluid (MQF) and abundant). The results indicated by the Taguchi Method were shown to be very useful in quality process improvement, highlighting feed rate and kind of tool as most significant variable in this process.

020-1066 Reduction of Rejections in Engine Valve Manufacturing -QC Story & Six Sigma Approach

Eshwara Koorapati, JNTUH College of Engineering, India
Sreenivasa Mitnala, JNTUH College of Engineering, India

Engine Valves are to be manufactured under tight tolerances. Hence rejections would be very high and subsequently six sigma value is low. The QC story and Six sigma DMAIC approach are used for reduction of rejections. Fish-bone diagram is drawn to identify the factors which affect the quality of the product. The coolant flow, wheel fine feed rate and dwell time are identified as important parameters. The optimal values of the process parameters are determined through six sigma DMAIC approach. It is obsereved that six sigma number is increased from 3.95 to 4.9 and rejection are reduced from 7499 PPM to 940 PPM.

256 Sunday, 03:30 PM - 05:00 PM, Sorrento 3,4 *Track:* SAP, 10 *Chair:* Daesik Hur
Session: Sourcing and Procurement: Empirical Research and Case Studies

020-0404 Reducing Costs and Increasing Product Flexibility: The Materiotecas in the Brazilian Shoe Supply Chain

Giancarlo Pereira, UNISINOS, Brazil
Ilse Biason, ASSINTECAL, Brazil
Miriam Borchardt, UNISINOS, Brazil
Miguel Sellitto, UNISINOS, Brazil

Brazilian shoe producers and their SME suppliers recently created a new sourcing structure called Materioteca. This structure consists of a permanent selling point of “non-exclusive” shoe parts (materials). This paper investigates this new sourcing approach in order to answer the question of how the Materiotecas can influence the shoe industry´s costs.A multiple case study approach involving semi-structured face-to-face interviews with 24 general managers of shoe producers and their suppliers was conducted. The questions were based on the constructs extracted from the literature. Within and cross-case analyses were adopted. Findings suggest that the concentrated offer of highly diversified materials that are sold in small quantities can reduce procurement costs and increase product flexibility of fashion shoe producers (this sort of shoe is produced in small and unique lots). This concentration also reduces the prospecting costs of the materials´ suppliers and increases the total quantity of items sold by them to different shoe producers.

020-0591 The Effects of Perceived Power Sources and Justices on Supply Chain Integration: Evidences from Korean Small and Medium-Sized Manufacturers

Daesik Hur, Yonsei University School of Business, Korea, Republic of (South Korea)
Joonhyuk Bok, Yonsei University School of Business, Korea, Republic of (South Korea)

Firms have enjoyed relational advantage by successfully integrating resources and capabilities of supply chain partners across organizational boundaries. Supply chain integration requires mutual long-term, normative relationship commitment. What would motivate a supplier firm to develop such a positive attitude toward a buyer firm? This study is focused upon social processes embedded in economic exchanges between a buyer and a supplier firm. Underpinned in the social power and justice theories, this study postulates that the use of non-mediated power bases by the buyer will improve supplier's perception of procedural and distributive justices, which in turn will promote supply chain integration. In contrast, the buyer's heavy reliance on rewards, coercive, and legal legitimate powers will be negatively associated with the perceived level of justices by the supplier. Data were collected from a total of 204 Korean manufacturers, and

hypotheses were tested using a structural equation modeling technique.

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257 Sunday, 03:30 PM - 05:00 PM, Naples 2 *Track:* GEN, 10 *Chair:* Xiaoyue Jiang
Session: Optimization method in OM

020-0459 Performance Improvement in Parallel Manufacturing Systems through Scenario Analysis and Optimal Design of Parameters

Vijay Aggarwal, MDI Gurgaon, India
Sidhartha Padhi, MDI Gurgaon, India
Virendra Bhatnagar, Suzuki India Limited, India

With ever-increasing global competition, continuously enhancing the overall efficiency of the manufacturing lines is an important goal for many organizations. Given the variety of disturbances in such lines that continue to occur with surprise, deft handling of disturbances is a key concern for more reliable and robust manufacturing systems. Through a case study of parallel manufacturing lines from an Indian automotive industry, this paper makes an attempt to analyze the underlying dynamics of the processes and the nature of the disturbances, and to offer an approach to enhance effectiveness and efficiency. A discrete event simulation framework is used to map the manufacturing system and to identify the various bottlenecks in it. Thereafter, various scenarios are generated that include effects of product change, technology change, cycle time change, and worker-competency towards designing an optimal set of process parameters for an overall performance improvement of the system.

020-0532 Using Optimization Models to Evaluate Legacy Plant Asset Restructuring Decisions

Agha Ali, UMASS Amherst, United States
Alex Franke, UMASS Amherst, United States
Ahmed Ghoniem, UMASS Amherst, United States

New management paradigms often necessitate changes to legacy plant configurations within the confines of capital investment budget allocations. Directives such as matching production to demand or maintaining lower levels of inventory, while improving efficiency and cost effectiveness, do not necessarily result in accompanying improvements in other managerial objectives such as plant asset utilization and profitability over longer planning periods. Optimization models offer the ability to capture structural interactions of a production process and thereby reveal necessary changes in asset configuration to better accommodate proposed or inherent variation in demand patterns and volumes. We demonstrate the use of optimization models to evaluate tactical and strategic plant asset restructuring decisions for an S & P 500 company in the chemical industry.

020-0804 A Consumer-centric Optimization Model for Structuring Retail Product Lines

Ahmed Ghoniem, UMass Amherst, United States
Bacel Maddah, American University of Beirut, Lebanon

We examine the problem where a retailer seeks to maximize her profit by structuring product lines of substitutable items over a multi-period selling horizon. This prompts a large-scale consumer-centric model that jointly optimizes assortment planning, pricing, and ordering decisions. The problem is formulated as a mixed-integer nonlinear program where demand volumes are driven by exogenous consumer reservation prices and endogenous pricing decisions. While the model turns out to be computationally prohibitive for small-sized instances using a global solver such as Lingo, efficient exact and heuristic solution methods are proposed and empirically demonstrated to solve large-scale problem instances in manageable times.

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258 Sunday, 03:30 PM - 05:00 PM, Naples 1 *Track:* OMF, 7 *Chair:* Nico Vandaele
Session: Session 7: Advances in Operations-Finance

020-0512 The Financial Impact of the Stochastic Lot Sizing Problem

Nico Vandaele, Katholieke Universiteit Leuven, Belgium
Lien Perdu, Katholieke Universiteit Leuven - Campus Kortrijk, Belgium

We present a queuing-based inventory model, specifying a multi-machine, multi-product job shop. We evaluate the financial impact of operational decisions like lot sizing, overtime allocation and outsourcing. The overall objective is of the Economic Value Added type and includes expenses, revenues, cash flows and cost of capital. We use a dedicated ascent method to find the optimum.

020-0704 An Affordable Way to Implement Real Options to Select Optimal R&D Portfolio

Gianluca Enea, University of PAlermo, Italy
Giovanna Lo Nigro, University of Palermo, Italy

Real Option Analysis (ROA) is acknowledged as a powerful tool to evaluate uncertain projects whose uncertainty depends heavily on alternatives available along the project life. The R&D process in the pharmaceutical industry has a long and dynamic life so it is an ideal field of application for ROA. Actually ROA implementation, as widely demonstrated in literature, is narrowed to very limited cases because of its perceived complexity. This research wants to suggest a simplified method, respect the ones available in literature, that could foster the use of ROA: we built up an integer linear programming model, based on a model available in literature, useful for selecting the optimal R&D product portfolio from a set of candidate drugs. This model is quiet easy to implement in a spreadsheet, and as shown in a developed application, able to solve an actual pharmaceutical portfolio selection case study.

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259 Sunday, 03:30 PM - 05:00 PM, Naples 3 *Track:* HOC, 9 *Chair:* Mahyar Eftekhar
Session: Humanitarian Service Operations

020-1018 Transportation Procurement for WFP Ethiopia

Jarrod Goentzel, MIT, United States
Marie-Ève Rancourt, HEC Montréal, Canada

World Food Programme Ethiopia (WFP) provides emergency food assistance to people in Ethiopia affected by famine. In transporting food, WFP primarily contracts with third-party transport carriers rather than utilize its private fleet. We analyze historical contracts using linear regression to better understand which factors influence the transportation rates in Ethiopia. This improves transportation procurement for WFP and refines its cost basis for further distribution analysis. We also aim to provide general insights on how to characterize transportation markets in a developing country, providing useful information for shippers (humanitarian organizations and the commercial sector) and identifying opportunities for carriers.

020-0650 Balancing Provision of Relief and Recovery with Capacity Building in Humanitarian Operations

Paulo Goncalves, University of Lugano, Switzerland

Due to increased requirements for relief, humanitarian organizations (HOs) face increased challenges providing assistance while trying to build and maintain capacity. This paper develops a formal simulation model that quantifies the tradeoff between providing assistance and building capacity in HOs. We explore the performance of two polar resource allocation strategies: one focusing on relief/recovery and another on capacity building. When HOs cannot retain knowledge gained in the field, a strategy that emphasizes relief/recovery is not enduring. However, if HOs can retain a large fraction of lessons learned, they can improve performance with a relief/recovery strategy. Nevertheless, high stress levels, caused by relief requirements significantly above those made available by the organization, increase personnel turnover and limit the fraction of learning that the organization can retain. Our work sheds light on the tradeoff that HOs face between providing relief and building capacity in stressful and demanding environments.

020-0167 Resource Sharing Mechanisms for Humanitarian Relief Organizations

Mahyar Eftekhar, HEC Paris School of Management, France
Andrea Masini, HEC Paris School of Management, France
Luk Van Wassenhove, INSEAD, France

Despite their financial and resource limitations and despite the considerable level of demand uncertainty they face, Humanitarian Relief Organizations (HROs) do not typically share resources. In this paper, we consider the potential barriers to resource pooling, as well as its costs and benefits for individual agencies. Then, we find out the circumstances in which resource pooling could yield higher benefits for individual HROs. Theoretical insights and managerial insights are also derived and discussed.

260 Sunday, 03:30 PM - 05:00 PM, Naples 4 *Track:* CSC, 12 *Chair:* Saravanan Kesavan Stephen Smith
Session: Retail Supply Chain Management

020-0394 An Empirical Study of Queues and Customer Shopping Behavior in Retail Stores

Marcelo Olivares, Columbia Business School, United States
Yina Lu, Columbia Business School, United States

Using video cameras and image recognition, we periodically recorded queue lengths in a retail store over period of six months. We relate this data with point-of-sales transaction data to study how queues and waiting time affect purchase incidence and customer shopping behavior. Our methodology models consumer choice through random utility framework which we estimate with individual customer panel-data. Based on our empirical findings we provide some new insights for queuing design in retail stores.

020-0403 Configuring Optimal Pre-packs for Retail Supply Chains

Stephen Smith, Santa Clara University, United States
Narendra Agrawal, Santa Clara University, United States

We present a dynamic programming approach for determining optimal pre-pack configurations for retail supply chains. Results from Markov Decision Processes are used to develop an algorithm for optimizing the set of pre-packs and the corresponding optimal shipping policies in steady state. A data set from a large apparel retailer is used to illustrate the key results and insights.

020-0099 Retail Execution and Store Associate Incentive Design

Nicole DeHoratius, University of Portland, United States
Saravanan Kesavan, University of North Carolina, United States
Adam Mersereau, University of North Carolina, United States

We determine the extent to which a change in the design of store associate incentives at several pilot stores of a major retail chain drives store associate effort allocation and consequently store performance. We find the adoption of a bonus plan that rewards store associates for sales effort, not surprisingly, drives sales. However, the magnitude of the increase in sales is not uniform across all stores. Instead, the sales lift generated by the change in store associate incentive design depends upon the historical operational performance of the store. Stores that have high levels of past operational performance, defined as low shrink and low inventory accuracy, are associated with a greater increase in sales than stores with poor levels of past operational performance. Our results yield insights useful to a retail chain seeking to maximize long-term profitability when designing store associate incentive plans.

020-0206 Retailers' Asymmetric Assortment Choices in the Presence of Uncertain Consumer Preferences

Steve Gilbert, University of Texas at Austin, United States
Haoying Sun, University of Texas at Austin, United States

For many products, some (uninformed) consumers may need to experience the touch and feel in order to determine their valuation. In addition, consumers differ in their costs of searching for the ideal product. Under such circumstances, we show that heterogeneous product assortments among two competing retailers can emerge as an equilibrium. Specifically, we consider a market with two products and two retailers, and show the conditions under which there exists an equilibrium in which one retailer carries a full line and the other sells one product only, even though the demand structure for the two products is symmetric and the cost structures of the two retailers are the same. Under this equilibrium, the two retailers avoid the head-on price competition that could result from symmetric assortment breadth choices and consequently achieve higher profits.

261 Sunday, 03:30 PM - 05:00 PM, Naples 6 *Track:* CSC, 19 *Chair:* Kannan Govindan

Session: Coordination in Supply Chain

020-0554 Analyzing the Impact of Coordination by Contracts on the Supply Chain Performance

Kannan Govindan, University of Southern Denmark, Denmark
Maria Nicoleta Popiuc, University of Southern Denmark, Denmark

Managing the interdependencies among supply chain members can be a very challenging task. One of the solutions to this coordination problem came in the form of coordination mechanisms, applied in both theory and practice. Contracts as a particular form of coordination mechanisms are regarded as improving the supply chain performance by increasing the total profit of the chain, reducing risks and offering a fair share of risk among the members of the supply chain. In this paper we have analyzed the impact of coordination by various types of contracts on the performance of supply chain members.

020-0120 Production Lot Sizing with Advance Information Sharing

Qiannong Gu, Sam Houston State University, United States
John Visich, Bryant University, United States
Basheer Khumawala, University of Houston, United States

Advance information includes the demand and supply information shared by the parties beyond the immediate connected ones along the supply chain. Advance information can be obtained and shared in a timely manner by adopting automated information capturing systems such as radio frequency identification (RFID) technology. Advance information sharing can improve supply chain performance in inventory management and production scheduling. This research develops a model for manufacturers to determine production lot sizes with advance demand information. Advance supply information in terms of production lead-time is also shared within the supply chain. The numerical examples demonstrate that advance information sharing can reduce supply chain costs by approximately 13%.

020-0909 Determinants of Coordination and Supply Chain Performance: The Case of Fresh Milk Supply Chain in India

Nambirajan Thangasamy, Pondicherry University, India
Mahesh Ramalingam, Pondicherry University, India

The purpose of this research work is to investigate two main issues among the market participating agents in the Indian fresh milk supply chain. Firstly, it identifies and evaluates determinants of coordination mechanisms used in the Indian fresh milk supply chain. Secondly, it identifies and evaluates determinants of supply chain performance in the fresh milk supply chain. Authors collected primary data from a randomly selected sample of 75 milk producers and 75 retailers from two districts in Tamilnadu, India. Descriptive and inferential statistical techniques were used to analyze the collected data. The result shows that milk prices, availability of buyers, and market information are found to be important determinants of supply chain performance in the milk transactions. The present research work is an important contribution to provide a detailed insight into the mechanisms of coordination and supply chain performance in the dairy industry.

020-0903 The Closed-loop Supply Chain Network with Competition, Distribution Channel Investment, and Uncertainties

Qiang (Patrick) Qiang, Pennsylvania State University, United States
Ke Ke, Central Washington Universitity, United States
Trisha Anderson, Texas Weslyan University, United States
June Dong, State University of New York at Oswego, United States

The volume of waste is growing at an alarming rate and environmental recovery is an option that is underutilized since firms are unsure how to mitigate the ambiguity surrounding economic performance. In this paper, a closed-loop supply chain network is investigated with decentralized decision-makers consisting of raw material suppliers, retail outlets, and the manufacturers that collect the recycled product directly from the demand market. The consumer is indifferent in their demand for brand-new products or remanufactured returns into as-new products. We derive the optimality conditions of the various decision-makers, and establish that the governing equilibrium conditions can be formulated as a finite-dimensional variational inequality problem. We establish convergence of the proposed algorithm that can allow for the discussion of the effects of competition, distribution channel investment and conversion rates, combined with uncertainties in yield and demand, on equilibrium quantity transactions and prices. Numerical examples are provided for illustration.

Monday, 08:00 AM - 09:30 AM

265 Monday, 08:00 AM - 09:30 AM, Tuscan 1 *Track:* HOM, 13 *Chair:* Tian Wei
Session: Strategic Infrastructure Decisions in Healthcare

020-0547 Target Selection Strategies in Mergers and Acquisitions in the Medical Technology Industry

Tian Wei, University of Cambridge, United Kingdom
Mike Gregory, University of Cambridge, United Kingdom

This paper identifies attributes of target companies and proposes a theory to explain and support the decision making of acquiring companies. Four in-depth case studies were conducted across three primary sectors in the Medical Technology Industry. Data were collected by series of semi-structured interviews with key people involved in the deal. Data were analyzed to explore the strategies of business development of the big companies in the Medical Technology Industry. Three research findings are implicated to academia. First, a list of target selection criteria is developed to capture the characteristics of the targets in mergers and acquisitions in the industry. Second, crisis assessment theory is proposed as a theoretical foundation for target selection by addressing the strategy which can save the company from danger or put it in a crisis. Third, six constructs of the crisis assessment theory are developed to show the details of the theory and indicate its applications.

020-0245 Performance Measurement Systems and Strategic Management within UK Healthcare

Shulian Zhang, University of Manchester, United Kingdom
Claire Moxham, University of Manchester, United Kingdom
David Bamford, University of Manchester, United Kingdom
Ben Dehe, University of Manchester, United Kingdom

April 2009 was an important period for all National Health Service (NHS) Community Health Services (CHS) organisations as they were formally separated from the commissioning service in the Primary Care Trust (PCT). This had many implications, including the need to establish individual board, develop independent strategy, and set-up autonomous governance. The host organisation was keen to investigate the effectiveness of the current strategy deployment process and subsequently identify areas for improvement. Our investigation looked into adapting strategy deployment systems such as the Closed-Loop Management Systems (Kaplan and Norton 2008) at NHS CHS organisations which can facilitate organisational needs in the area of strategy deployment. As human capital with the suitable skills is required for any successful implementation of a management system, the researchers expanded the scope by including an assessment of the organisation's readiness for adapting formal strategy deployment systems in terms of management skills levels.

020-0517 Implementing Acute Medical Units: Design Choices and Their Logistical Impact

Jos Bokhorst, University of Groningen, Netherlands
Taco Van der Vaart, University of Groningen, Netherlands

Acute medical units (AMUs), hospital units specifically designed and staffed for patients with acute medical illnesses, are implemented in many hospitals over the world. An AMU admits acute patients, mainly arriving from the emergency department, for further assessment, care and treatment up to a maximum designated period. Thereafter, patients who require additional care are transferred to regular wards that also admit elective patients. The literature reports several benefits (e.g. a reduction in in-patient mortality, and in the length of stay), mostly obtained empirically. This paper presents a simulation study to investigate the operational advantages of an AMU in a large Dutch hospital. Design issues like the size of the AMU, the length of the designated period, the departure policy, and the choice of patient groups are found to impact the effectiveness of an AMU, considering the performance of both acute and elective patient flows and the utilization of beds.

266 Monday, 08:00 AM - 09:30 AM, Tuscan 2 *Track:* GOS, 7 *Chair:* Daniel Heiser Linda Hendry
Session: Internationalization and Emerging Markets

020-0368 A Contingency-based Approach to the Internationalization of Operations: A Multi-Case Study Analysis in Argentina

Marta Zorzini, Lancaster University, United Kingdom
Mark Stevenson, Lancaster University, United Kingdom
Linda Hendry, Lancaster University, United Kingdom

This study takes a contingency-based approach to the internationalization of operations, exploring how global operations are configured and coordinated. It also considers how internationalization decisions, such as the offshoring of previously home-based operations, can impact performance. A multi-case study involving 15 Argentine subsidiaries of Italian-owned companies has been conducted. A variety of internationalization practices that lead to good performance are observed in relation to different needs and specific contextual factors - such as competitor behavior, product features and production cost structure. Findings show that global operations can be successfully configured through both incremental and non-incremental paths, while the pace of internationalization can also vary. A number of coordination mechanisms are evident but centralization modes appear particularly effective for integrating the role of a subsidiary's operations with the parent company. The need to revise or adapt an organization's internationalization strategy over time is also identified.

020-0857 Operations Management in Emerging Nations

Daniel Heiser, DePaul University, United States
Paul Schikora, Indiana State University, United States

The presentation will present preliminary research on the challenges and opportunities for Western firms in the rapidly expanding economies of emerging nations. The rapid rise of BRIC countries & other developing markets has attracted enormous attention. However, the less prominent, but impressive growth in emerging markets (e.g., compounded annual real GDP growth in Africa of 4.9% 200-2008 & projected 220 million African consumers by 2015), provides unique opportunities for operations management techniques to build strategic advantage.

020-0539 Conceptual Model for Kaizen Implementation across the International Manufacturing Network

Kodo Yokozawa, University of Twente, Netherlands
Harm-Jan Steenhuis, Eastern Washington University, United States
Erik de Bruijn, University of Twente, Netherlands

In the past few decades, Japanese manufacturers operating in global markets have faced increasing pressures to internationalise their manufacturing. This requires setting up, managing and operating a network of geographically dispersed factories and suppliers. One of their biggest challenges is to adopt Japanese approaches across the manufacturing network. An example is the implementation of continuous improvement, or kaizen. Kaizen has been discussed as one of

the competitive factors of Japanese manufactures in the global market. In the domestic network, known as keiretsu, the kaizen philosophy and methods have been shared and implemented. It made JIT and high quality achievement possible. Kaizen implementation across a global manufacturing network gives rise to managerial challenges with distance in geographic location and national context. This paper presents a conceptual model on kaizen implementation across the international manufacturing network.

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268 Monday, 08:00 AM - 09:30 AM, Tuscan 4 *Track:* ESO, 13 *Chair:* Tortato Ubirata

Session: Sustainability: Case Studies

020-0279 The Concept of a Modal Shift in Sustainable Logistics for Operators in Brazil - The Case Study by ITRI RODOFERROVIA

Washington Luiz Soares, UNISANTA - Universidade Santa Cecília, Brazil
Getulio Akabane, FATEC - Santo Andre, Brazil

This paper demonstrates the contribution of modal shift to reduce CO2 emissions by monitoring each section of the route and identifies the viability of cargo physical distribution in a sustainable manner. This analysis occurs using a third party logistics provider to supply the production plant by container in Brazil. It can be seen in the results, a better eco-efficiency, for a significant reduction in environmental impacts along the chain. The methodology is based in emissions of greenhouse gase inventory collected directly from ITRI, a multimodel logistics operator. The article thus helps in identifying the key constructs in a decision making process of transport as the load characteristics and the available model, for every geographical and political environment.

020-0423 Money That Comes from the Garbage: A Case Study on the Collection and Selection of Recyclable Solid Waste

Marco Murara, Centro Universitário de Jaraguá do Sul, Brazil
Ubiratã Tortato, Pontificia Universidade Católica do Paraná, Brazil

This article aims to describe the collection, distribution and selection of household waste in Jaragua do Sul in southern Brazil. Background information has been raised on the company responsible for performing the selective collection, on the Association of Collectors, and on the company that sells the material separated for the industry. A survey was carried out on the programs created by public power for the awareness of the population on the importance of the selection of recyclable household waste. Qualitative data were obtained through semi-structured and non-participant observation. The analysis showed that the lack of training of members cooperated and their low educational level may explain the lack of planning. It is also possible to affirm that the municipal public power has been developing programs of great importance to raise awareness of the population, but there is still a muted response by the people on the selection of household waste.

020-0796 An Environmental Exploratory Study of Water Treatment Companies in the Gulf Cooperation Council Countries

Annibal Scavarda, School of Business and Management, American University of Sharjah, United Arab Emirates
Hilmi Bahamid, School of Business and Management, American University of Sharjah, United Arab Emirates
Ricardo Santa, College of Business, Alfaisal University, Saudi Arabia

Total investment value of water treatment projects in the United Arab Emirates and the Gulf Cooperation Council (GCC) countries is one of the biggest in the world, and the marketing management in the next decade is essential for the success of these companies. In this paper, the authors assess the implications for marketing management in the next decade of what they believe to be the five most significant changes in the general marketing environment to water treatment companies in the GCC countries. The methodology used is based on environmental scan. Key results with detailed methods of utilization are presented in the paper. Utilizing the scarcity of water in this region in addition to the rapid increase in population are some examples of these results. In addition to that, newly implemented grey and industrial water treatment techniques and water resource management are also found to be quite rewarding results.

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269 Monday, 08:00 AM - 09:30 AM, Tuscan 5 *Track:* OEE, 10 *Chair:* Krisztina Demeter Susan Morton

Session: Managing Decentralized and International Operations

020-0615 Company Globalization and the Level of Country Economic Development

Krisztina Demeter, Corvinus University of Budapest, Hungary

For developing countries, getting access to the most up-to date economic information and knowledge is to globalize. Globalization takes place through export-import activities and/or FDI. Thus the level of globalization in a given country and for companies can be identified through these activities. In this paper companies are typified on the basis of the distribution of import, export and manufacturing activities at local, regional and global level. Manufacturing characteristics of company types, such as their order winners, practices and performances, as well as their relation to the level of development of the hosting country, are analyzed in order to give a full picture of internal and external factors of various types. Two databases are used: the IMSS V database with 750 companies from 21 countries, and the Global Competitiveness report that contains economic data about the countries involved into the analysis.

020-0008 A Dynamic Model to Gain Mutual Understanding in Cross-language Studies

Christopher Pusey, Loughborough University, United Kingdom
Helen Wagner, Loughborough University, United Kingdom
Susan Morton, Loughborough University, United Kingdom

The recent rise of emerging economies and ongoing need for mutual understanding on an international scale results in an increasing interest in understanding differences and similarities when communicating across cultural and language boundaries. There is currently a lack of literature that outlines the options for choosing interpreters, interview methods and cross-language techniques, especially in a business and management context. Therefore a quantitative matrix based method to compare and contrast different studies' approaches, opinions, and understanding, has been developed. Once analyzed and improved, the matrices were sent to professional interpreters for feedback and amended accordingly, alongside further research into project resources and methods. The result is a dynamic model to test and demonstrate the choices made within a project. More importantly however, the model is intended as a platform for development within other research projects worldwide, as a useful tool for researchers to make informative decisions within their own studies.

020-0204 An Evaluation of the Administrative Decentralization Process of the University of São Paulo (USP), Brazil

Cristina Rousseau, University of São Paulo, Brazil
João Amato-Neto, University of São Paulo, Brazil

The aim is to analyze the results of the administrative decentralization process at the University of São Paulo (USP) after the first year of its implementation. The results were evaluated by an interview conducted via e-mail with the coordinators of the 6 USP campuses. In this interview, each Coordinator responded to a semi-structured questionnaire with 12 questions regarding: the importance of decentralization, relations between the Coordinator and the Management Council of the respective campus and administrative bodies that have been decentralized, the role each one played in the process, the difficulties encountered in its implementation, and the changes and the results obtained so far. Most of them considered that decentralization had its importance with regard to reducing bureaucracy and streamlining the processing of cases. Another favorable point expressed by them was the proximity and interaction with the decentralized bodies, while respecting the main directives.

270 Monday, 08:00 AM - 09:30 AM, Tuscan 6 *Track:* TEC, 5 *Chair:* Alberto De Toni

Session: New Frameworks for Technology Management

020-1000 Measuring the Impact of M2M Technology on Operational Performance: A Case Study

Li Zhou, Greenwich University, Business School, United Kingdom
Yong Lin, Greenwich University, Business School, United Kingdom
Eckhard Erbsland, Vodafone Ltd., United Kingdom

M2M (Machine-to-Machine) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same ability. The M2M interface enables corporations to monitor and manipulate remote equipment that is crucial to the business operation, which makes it possible for corporations to address service issues and restore functionality with little or no interruption in operations management. Although it has been recognised that adopting M2M technology can help to improve operations performance, there is very limited research that has addressed how to measure the impact of M2M to the corporations' operation performance, which is the motivation of this research. In this research, an operation measuring matrix has been developed from extended DuPont model to fit the case company. We then try to quantify the impact of M2M via applying the matrix. Through analysing the business model and data, some managerial insights are discussed in the conclusion.

020-0757 An Emerging 'NEM' Framework to Support the Design and Management of Supply Networks for Technology Commercialization

Tomas Harrington, University of Cambridge, United Kingdom
David Kirkwood, University of Cambridge, United Kingdom
Jagjit Srai, University of Cambridge, United Kingdom

This research examines how network configuration approaches can support supply network development for nascent and emergent technologies. The 'NEM' (Nascent, Emergent, Mature) framework is presented and tested using case studies in 'High Value Electronics', capturing Nascent (Organic PV), Emergent (OLED) and Mature (TFT-LCD) technology perspectives. This research examines different stages of network evolution, to explore characteristics for nascent, emerging and various archetypal forms within mature technology supply chains. Key outputs emerging from the case analyses are the identification of potential evolution paths for product supply networks. Within technological commercialization, supply networks may take the form of nascent - 'embryonic, fragmented' (weak, initial product focus and definition), emergent -'inception, expansion, cohesion' (alpha product development), and mature -'established networks with multiple archetypal forms' (e.g. highly centralised networks focussed on standardization, dispersed networks providing tailored solutions etc.). Within each of these industrial maturity levels, product supply network configurations reflect particular business models.

271 Monday, 08:00 AM - 09:30 AM, Tuscan 7 *Track:* PDI, 13 *Chair:* Zoran Perunovic

Session: Topics in New Product Development

020-0355 Innovation in the Maritime Industry

Zoran Perunovic, Technical University of Denmark, Denmark
Jelena Vidic-Perunovic, Technical University of Denmark, Denmark

It has been traditionally perceived that the maritime industry, compared to other industries, is less permeable to innovation, where only explicitly defined strategy with centralized and clearly guided managerial leadership would spark some innovative activities. Nowadays, the industry is undergoing a change, where it is believed that the demands for increase in efficiency, safety and protection of the environment can be only achieved by more innovation. The paper tries to find an answer on the question of why there is a sudden shift in the perception of innovation. We have followed the timeline of innovation in the industry of oil tankers. Three distinctive periods have been identified with specific innovation models. The results show that the level of innovation in the industry started to change when environmental friendliness became one of the most important competitive priorities in the industry. This shift has been officially initiated by the policy imposed innovation.

020-0721 Towards the Next Generation of Innovation Process?

Cristiane Villar, EAESP/Fundacao Getulio Vargas, Brazil
Michele Martins, EAESP/Fundacao Getulio Vargas, Brazil
Luiz Di Serio, EAESP/Fundacao Getulio Vargas, Brazil
Guilherme Martins, EAESP/Fundacao Getulio Vargas, Brazil

In different fields of business management, it is possible to identify maturity models of management practices, in which the use of such practices evolved from internal perspective to external. For instance, quality studies evolved from mass production concepts, statistics process controls and quality control to an organizational issue; logistics evolved from a process focus (internal logistics, warehousing, inventories) to an expanded perception of integrated supply chain. In the field of innovation, Hobday (2005) and Rothwell (1994) analyzed the different evolution stages. Based on Rothwell's (1984) generations we aim to verify if open innovation can be considered the 5th Generation of innovation process. To do that, two exploratory, descriptive case studies were conducted based on documentary and secondary data: IPTV Forum and Threadless community. Our results present how the cases studied explore networks into their innovation process and suggest a possible configuration of the next generation of the innovation maturity model.

020-1065 Introduction of Innovations by Start-up Firms

Sadik Erzurumlu, Babson College, United States
Sreekumar Bhaskaran, Southern Methodist University, United States
Karthik Ramachandran, Southern Methodist University, United States

The financial and operational restrictions under changing market influences contradict some conventional wisdom for small growing firms concerning the target performance and time-to-market tradeoff in new product development. The start-up managers may consider to launch an inferior first version so as to demonstrate the viability of the business or to generate additional capital for the target product development. However, this launch may have an adverse effect on the perception of the firm's future products. A key decision for the start-up in this environment is: Should the first product be launched? In this paper we discuss the product launch decision for the start-up. We identify the tradeoff between the adverse effect of the first launch on the primary product and the revenue stream that it generates, and show how the introduction of different versions of a technology needs to be tailored to the interrelated nature of the versions and the funding.

020-0195 Organizational Factors for Effective Regulatory Compliance in the Biotechnology Industry: An Exploratory Study

Andrey Fendyur, University of Calgary, Canada
Giovani da Silveira, University of Calgary, Canada

Biotechnology, an important emerging industry, has been strongly dependent on regulatory operations in its NPD. Meanwhile, regulatory compliance operations

in the biotechnology industry have been little researched. The lack of regulatory operations strategy has become a challenge for biotechnology NPD. Operations Management academics might develop the theoretical and practical framework for regulatory compliance operations in the biotechnology industry. The current exploratory multiple case study is aimed at identifying organizational factors critical for regulatory compliance operations success in the biotechnology industry. Cases represented both large and emerging biotechnology manufacturers in North America and Europe. The study produced several contributions: (i) revealed the regulatory compliance operations state of affairs, (ii) identified the regulatory compliance organizational critical success factors, and (iii) served as an exploratory qualitative stage to describe components of the regulatory operations strategy construct for further empirical statistical research.

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272 Monday, 08:00 AM - 09:30 AM, Tuscan 8 *Track:* ERS, 13 *Chair:* Chaodong Han Hsiao-Hui Lee
Session: Topics in Empirical Research V

020-0493 Associations between Inventory Performance and Firm Profitability - Evidence from the Manufacturing Industry

Olov Isaksson, École Polytechnique Fédérale de Lausanne, Switzerland
Ralf Seifert, École Polytechnique Fédérale de Lausanne, Switzerland

In our research we examine the financial consequences that inventory decisions have on firm performance. Inventory reductions are typically proclaimed as having only positive effects on financial performance, thereby neglecting the potential consequences of operational disruptions triggered by low inventory levels. In contrast, we hypothesize an inverted U-shape relationship between inventory levels and financial performance of firms. Conducting an econometric analysis using Compustat data for U.S manufacturing companies for the period 1995-2005, we find a non-linear relationship indicating an increasing operational profit margin with lower inventory levels. Our results show that changes in inventory in general have a negative association with firm performance. The strongest negative association is found for big inventory decreases, indeed suggesting a relation between operational disruptions and large reductions in inventory.

020-0693 Industry Clockspeed and Manufacturing Inventory

Chaodong Han, Towson University, College of Business & Economics, United States
Barin Nag, Towson University, College of Business & Economics, United States
Dong Yao, Towson University, College of Business & Economics, United States

Due to increasing globalization and product modularity, firm competition has evolved into supply chain-based competition and industry-specific supply chain design has become a critical factor for firm success. Measuring the rate of industry evolution, industry clockspeed is believed to have profound implications for supply chain design, including inventory and sourcing strategies. However, there is little empirical research on the implications of industry clockspeed on inventory management. Using a panel dataset collected from U.S. Census on all U.S. manufacturing industries over 1997-2008, this research investigates how manufacturing inventories at different stages (i.e., raw materials, work-in-process, and finished goods inventories) are associated with industry clockspeed and other industry characteristics, including value added and capital investment.

020-0979 E-Supply Chain Management Performances: Empirical Research

Francesca Michelino, Università degli Studi di Salerno, Italy
Mauro Caputo, Università degli Studi di Salerno, Italy

Internet adoption to support supply chain management can lead to performance improvements in terms of both effectiveness and efficiency. Better coordination among players implies mistakes and time reductions and contributes to increase in delivery reliability and flexibility, reduction of stock-outs and increase in stock rotation, thus resulting in an increase in customer satisfaction. Besides, new technologies can enhance new ways of creating customer value by widening product range to new complementary products and services and increasing customization capability.The aim of the paper is to analyze how the use of internet-based tools for supply chain management affects both operational and strategic performances.The research is based on a survey on 1458 large Italian firms; a 31,8% response rate was achieved.The effects of the use of internet-based tools for supply chain management are measured from multiple perspectives, in terms of perceived benefits, performance improvements and customer value creation.

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273 Monday, 08:00 AM - 09:30 AM, Tuscan 9 *Track:* BOM, 10 *Chair:* Candido Perez Steven Melnyk
Session: Behavioral Operations 3

020-0317 Self-attribution as a Mediator between Conservatism and Overconfidence in Negotiations: The Case of Purchasing Managers in Venezuela

Candido Perez, Instituto de Estudios Superiores de Administracion- IESA, Venezuela

This paper documents Venezuelan purchase managers' preference for a transactional (short-term) vision instead of a long-term vision (based on confidence and relationship-development) when bargaining. This work sheds some light on the impact of three cognitive biases in the process-decision making, via an experiment with managers who attended an executive seminar on purchasing management. Results show that self-attribution amplifies the effect of overconfidence, and does not limit the effect of conservatism, as the three are related to the short-term managerial focus (transactional view).

020-0009 Impact of Work-life Initiatives on Employee Behavior in Supply Chain Management Organizations in Singapore

Hesan Quazi, Nanyang Technological University, Singapore
Koh Hui, Nanynag Technological University, Singapore
Jing Khoo, Nanyang Technological University, Singapore
Qiaoru Huang, Nanyang Technological University, Singapore

To balance the work and non-work roles of the employees, organizations have responded by implementing work-life programs (e.g., flexi-time, child care facilities, parental leave, etc.) in return for improved satisfaction and performance, and lower turnover. Literature reports very few work-life (W-L) related studies on SCM organizations. In view of this we initiated a W-L related study focusing on SCM organizations in Singapore. Data were collected though a questionnaire survey. Exploratory Factor Analyses were carried out using principal component and Varimax rotation with Eigenvalues above one. Hierarchical Regression analysis showed that both perceived availability and utilisation of Work-Life initiatives were positively related to job satisfaction and negatively related to turnover intentions. In contrast, Affective Organization Commitment was significantly related to usage of W-L programme only. Moderating effects of perceived supervisory support (PSS) on the relationship between usage of W-L programmes and turnover intentions were supported.

020-1011 The Impact of Emerging Institutional Norms on Adoption Timing Decisions: Evidence from C-TPAT - A Government Antiterrorism Initiative

Steven Melnyk, Michigan State University, United States
William Ritchie, James Madison, United States

Drawing upon an institutional theoretic perspective, this study explores the performance outcomes associated with adoption timing and level of investment in a government antiterrorism initiative - the Customs Trade Partnership Against Terrorism (C-TPAT). Using a large-scale sample of C-TPAT certified importers, we found that performance outcomes for high levels of investment in adoption processes differ depending upon the strength of institutional forces. Specifically, early adopters of C-TPAT processes in a weak institutional context who reported high levels of investment performed no better than firms who invested nominally in the processes. In contrast, late adopters in a strong institutional context who reported high investment levels outperformed those who invested nominally. This

finding can be explained by viewing C-TPAT as an “emerging” institution, where the forces take time to become evident.

020-0697 Fundamental Objectives of Family Farming

Marie-Anne Lozano, UFSC - Universidade Federal de Santa Catarina, Brazil
Nelson De Mello, UFSC - Universidade Federal de Santa Catarina, Brazil
Rolf Erdmann, UFSC - Universidade Federal de Santa Catarina, Brazil

The organizational analysis seeks to bring some knowledge about the behavior of organizations in order to better manage them. Following this logic, decision support seeks to understand the behavior of the organization, studying how people decide. The continuity of the family, their social reproduction, economic and cultural life reflected in the continuity of family farming are some of the values considered fundamental in rationality and logic of its operation. Management tools in general advocate merely economic aspects, disregarding the substantive rationality that gives meaning to these familiar organizations. Its main objectives are not always considered, demonstrating the fragility of these tools as mechanisms for decision making. Trying to identify what are regarded as fundamental objectives in the management of family farming units, we conducted interviews with family farmers, researchers and technicians linked to this universe, which we intend to incorporate in their decision-making mechanisms.

275 Monday, 08:00 AM - 09:30 AM, Tuscan 11 *Track:* SOM, 11 *Chair:* David Collier
Session: Modeling Service Operations 2

020-0819 Predicting the ROI of ORTEC’s HARMONY Personnel Planning Package

Patrick Van der Schalk, ORTEC, Netherlands
Rommert Dekker, Erasmus University Rotterdam, Netherlands
Eelco VanAsperen, Erasmus University Rotterdam, Netherlands

ORTEC is a Dutch company selling HARMONY, a workforce scheduling package. We developed a model to predict its return on investment for a specific customer. The model uses a database of reference implementations to find organizations that are similar to the prospective customer. The costs and benefits have been broken down into several factors and we use detailed information from reference implementations to create a prediction for the ROI. In this way we can move from industry-averages for potential savings to a prediction based on actual experiences from similar organizations. This makes the model transparent. The model has been of decisive value for several prospective customers. From the data analysis it appears that organizations can save a lot both on the time needed for planning and on the amount of personnel needed. In most cases, the payback time of the OR software was less than one year.

020-0061 Basketball Analytics: New Criteria for Evaluating Defensive Efficiency

David Collier, Florida Gulf Coast University, United States
James Bartholomew, Florida Gulf Coast University, United States

The global economic impact of basketball requires the efficient use of resources to maximize success on and off the court. This research defines new criteria for defensive efficiency, and uses statistical and data envelopment analysis to evaluate players and team efficiency with insights into defensive strategy, player evaluation, and win-loss outcomes. Today's coaches, players, and owners need to take full advantage of modern analytical methods and video software capabilities to evaluate the most efficient use of resources.

276 Monday, 08:00 AM - 09:30 AM, Roma 1,2 *Track:* LOM, 6 *Chair:* Pedro Reyes
Session: Logistics Operations

020-1004 RFID in Logistics

Pedro Reyes, Baylor University, United States
John Visich, Bryant University, United States
Suhong Li, Bryant University, United States

RFID has received increased attention from practitioners and academics. Due to the mandates from Wal-Mart and the U.S. Department of Defense, January 2005 can be considered as the “big bang” for RFID. Since then, many press reports have revealed Wal-Mart’s starts-stops-and-starts and thus has perceived RFID as a failing technology. Yet, empirical evidence has revealed actual benefits of RFID impacts on supply chain performance. In order to better understand the field, we conducted a survey of logistics professional in order to gauge the current deployment and widespread of RFID implementation. In this paper we extend our prior work and present our most notable findings that suggest indisputable evidence of RFID’s ROI. For practitioners and academics, the empirical evidence presented can help identify implementation areas where RFID can have the greatest impact. The data can be used to build the RFID business case and better estimate ROI and the payback period.

020-0831 Allocation and Scheduling Processes of Truck Loading for Product Distribution in an Emerging Market

Edgar Franco, Universidad de la Sabana, Colombia
Luz Torres, Center for Latin-American Logistics Innovation (CLI), Colombia
Maria Sierra, Universidad de la Sabana, Colombia
Julian Madero, Universidad de la Sabana, Colombia
Alfonso Sarmiento, Center for Latin-American Logistics Innovation (CLI), Colombia

In Latin America, as well as in other emerging economies, retail channel composition includes a high proportion of small and independent stores through which up to 60% of consumer products are sold. These stores are located in highly populated urban and rural areas with difficult and fragmented access. This makes physical distribution within urban centers and rural populations complex and costly. This paper presents a methodology based on a heuristic algorithm to improve the allocation and scheduling processes of truck loading for product distribution in an emerging market such as Colombia. A case study about the distribution process in a Colombian company is presented to illustrate the benefits of the methodology. Moreover, some solutions and approaches are proposed to improve the operations involved in the analyzed processes.

020-0290 A Closed-loop Supply Chain Equilibrium Model with Random Demands and Returns

Younes Hamdouch, United Arab Emirates University, United Arab Emirates
Agachai Sumalee, The Hong Kong Polytechnic University, Hong Kong

In this paper, we propose a new closed-loop supply chain network equilibrium model consisting of raw material suppliers, manufacturers, retailers, consumers and recovery centers. Unlike other studies in the extant literature, we assume that demands and returns associated with consumers at demand markets are random. We model the optimizing behavior of the different decision-makers and show that the equilibrium conditions governing the closed-loop supply-chain network equilibrium problem can be formulated as a variational inequality. We discuss the existence and uniqueness of the solution to this variational inequality and establish conditions under which the proposed computational algorithm is guaranteed to converge. Finally, we illustrate the validity of the model through a

numerical example for which the equilibrium prices and product shipments are computed.

020-0462 Empty Container Allocation between Multi-ports with Lost Sales

Bo Zhang, The Hong Kong Polytechnic University, Hong Kong
Chi-to Ng, The Hong Kong Polytechnic University, Hong Kong

This work studies the empty container allocation problem to minimize the total cost under a lost sales scenario. To begin with, we first find that the optimal policy for a single port at the nth period is characterized by a pair of critical points (An, Sn), i.e., importing empty containers up to An when the number of empty containers is fewer than An; exporting empty containers down to Sn when the number of empty containers is more than Sn; and doing nothing otherwise. We then develop a heuristic algorithm to identify An and Sn for each period. Next, we prove a tight lower bound for the cost function of multi-ports. We then develop a heuristic algorithm randomly generating the parameters from a given uniform distribution to obtain a near-optimal allocation policy for multi-ports. The result shows that the relative error is within five percent. Besides, both algorithms work efficiently.

277 Monday, 08:00 AM - 09:30 AM, Sorrento 1,2 *Track:* QPJ, 13 *Chair:* David Hinds
Session: Session 13: Process Improvement Programs

020-0059 Improvement Program Failures: The Babe Ruth Effect

Richard (Rick) Franza, Kennesaw State University, United States
Satya Chakravorty, Kennesaw State University, United States

As in materials science and engineering failure studies (“stress-strain curve”), our study revealed that Six Sigma improvement projects go through three stages: stretching, yielding, and failing. When multiple projects were simultaneously considered, there was no doubt that some projects were doing very well; however, there were many others failing miserably. When evaluating improvements, executives considered the magnitude of improvement successes more important than the frequency of improvement failures, and continued to support the improvement programs. We are calling this propensity to focus only on the successes the Babe Ruth effect. Ruth, who often struck out, is still considered one of baseball’s greatest hitters. Understanding the dynamics of failures and the Babe Ruth effect provides business insights for avoiding improvement failures.

020-0763 An Evolutionary Framework for Process Improvement

David Hinds, Nova Southeastern University, United States

Process improvement methods such as Six Sigma and Lean Management have become prominent and effective elements of operations management. However, few conceptual frameworks have been offered for explicating their organizing principles and operative mechanisms. In this paper, it is argued that process improvement can be represented with an evolutionary model in which improvement is viewed as the adaptation of an operational system to its environment. Using evolutionary concepts and theories which have been extensively applied in organizational research, a variation-selection-retention (VSR) framework for process improvement is proposed. Various features of process improvement methods are identified, described, and contrasted within the VSR framework. Implications for the development of testable hypotheses are explored and future research opportunities are described.

278 Monday, 08:00 AM - 09:30 AM, Sorrento 3,4 *Track:* NCC, 8 *Chair:* Fidel Torres Delgado
Session: Session 8

020-0011 Relational Connectivity in Supply Chain Triads: An Empirical Study

Chad Autry, University of Tennessee, United States
Brent Williams, Auburn University, United States
Susan Golicic, Colorado State University, United States

Relationships between firms have been studied across multiple business literatures since the 1970s, with primary goals of the research often being to understand (a) how dyadic firm-to-firm relationships are/should be managed, and (b) what the likely outcomes of different relationship types are for the participants. However, the existing work is deficient in a number of ways, including a monolithic view of exactly what constitutes a supply chain relationship, as well as the recurring adoption of an analytical approach that continually has evaluated dyadic relationships at the expense of larger supply chain network structures and their impacts. This study addresses these deficiencies by examining a multidimensional conceptualization of supply chain relationships in a triadic network setting (manufacturer, broker, retailer) within the U.S. restaurant industry. Preliminary findings indicate that depending on the structural configuration of the triad, different relational dimensions are more salient in predicting supply chain performance outcomes.

020-0019 Integration and Coordination of Capacity, Pricing, and Lead Time Decisions in a Decentralized Supply Chain

Xiang Zhu, University of Groningen, Netherlands

We consider a decentralized supply chain consisting of one supplier andone retailer facing price- and lead time-sensitive demand. The decision process is modelled by a Stackelberg game where the suppler, as a leader, determines the capacity and the retailer, as a follower, determines the price and leadtime. The equilibrium strategies of these two players are obtained. By comparing with the performance of the chain without capacity decision, we characterize the impact of capacity decision on the firms' profit: the supplier's profit may always be significantly increased while the retailer's is only increased when the capacity is underestimated. Further, we demonstrate that the integration of capacity decision can also significantly reduce the profit loss caused by double marginalization. Finally, we find that the revenue-sharing and two-part tariff contracts cannot coordinate the decentralized channel. Instead, we propose a franchise contract with contingent rebate that can achieve channel coordination and a win-win outcome.

020-0267 The Dynamics of Price Conflicts in Global Supply Chains

Claude Machline, Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, Brazil

This paper's objective is to analyze recent developments of the price war raging in the iron ore - steel - building industry - and housing sector global supply chain. Materials and services involved are iron ore, coke, refractory bricks and transoceanic freight. In a previous POM paper, at Vancouver in 2010, the theory of the economic bullwhip effect, concerning systemic rises and falls in prices, was presented. It is further developed here. Similarities between global price wars in supply chains and worldwide economic crises are described. Crises create economical bullwhip effects in supply chains. Prices wars in essential supply chains create global economical crises. Minimal conditions necessary to create an economical bullwhip effect are defined. A classification of economic and physical bullwhip effects is presented. The deep causes of price conflicts in supply chains are investigated.

020-0531 Game Theory Analysis of a Producer-Buyer Supply Chain under Vendor Managed Inventory (VMI) Scheme

Marcela Villa Marulanda, Universidad de los Andes, Colombia
Fidel Torres Delgado, Universidad de los Andes, Colombia

During the last decade, several strategies of coordination in supply chains have been developed. One of these is known as Vendor Managed Inventory (VMI).

Despite efforts to achieve coordination between actors, sometimes it happens that each one retains its restrictions and interests, which would impede the orthodox implementation of the strategy of coordination. A game theoretic analysis is proposed for a supply chain comprising a producer (with finite production rate) and a buyer (with known and constant demand), who have a VMI strategy under three schemes: Integrated VMI, Cooperative VMI and Uncooperative VMI. A negotiation model is also proposed so that whoever gets more benefits can stimulate to the other agent who loses with agreement. A sensitivity analysis of models has been performed in order to find the benefits to be gained in terms of savings in inventory costs and how these are distributed among agents.

279 Monday, 08:00 AM - 09:30 AM, Naples 2 *Track:* ICM, 13 *Chair:* Patrik Jonsson

Session: Industrial Applications III

020-0616 The Use and Effect of Master Planning Strategies

Patrik Jonsson, Chalmers University of Technology, Sweden
Linea Kjellsdotter Ivert, Chalmers University of Technology, Sweden

Advanced planning methods and software are developed to deal with complex environments and achieve cost and profit optimal goals. Even though several advanced methods and software products are available, many companies rely on quite simple and manual planning approaches, or they don't get the expected benefits from the method or software use. A master planning strategy can differ regarding the capacity requirements and finite planning methods, planning organisation and planning software. This paper is based on survey data of manufacturing companies. The purpose is to identify clusters of firms applying distinct types of master planning strategies. Contextual variables and planning performance are compared between clusters. The conclusions can serve as a state-of-the-art description of how manufacturing firms work with master planning, and give an indication of the performance impact of various types of planning strategies.

020-0330 New Trends in Inventory Management in Public and Private Enterprises

Adriana Milani, Faculdades Integradas Einstein, Brazil
Andre de Lima, Faculdades Integradas Einstein, Brazil
Milton Vieira Junior, UNINOVE, Brazil

The logistical process, its innovations and improvements have been considered as an innovative element for organizations and as a means to reduce costs and to achieve greater competitiveness. This paper discusses the importance of efficient logistics and inventory management, both in public organizations and in private enterprises by means of a case study of a public organization, with the aim of showing how its inventory management is conducted, its limitations and difficulties in implementing improvements.

020-0543 Performance Analysis of a VMI System for a Producer-Buyer Supply Chain with Stochastic Demand

Fidel Torres, Universidad de los Andes, Colombia
Eliecer Gutierrez, Universidad de los Andes, Colombia

Performance improvement and cost reduction is one of the most challenging tasks in operations and logistics management. Vendor-managed inventory (VMI) is a collaborative approach to coordinate and rationalize customer's inventory levels, fill rates, and inventory management costs. In this work, we analyze the performance of a two-level supply chain under a VMI system by considering stochastic demand for a single product. The buyer inventory is managed by using a continuous review (Q,r) policy, the lead time is constant and unfilled demand is back ordered. A mathematical model is developed to find inventory control parameters for optimizing inventory total costs. A detailed comparison of costs, lot-sizes, and safety stocks between VMI and traditional systems, is done. Numerical examples and a sensitivity analysis are used to evaluate the effect of changes in parameters such as production rate, ordering, shortages and holding costs, replenishing lead time, and demand variability.

280 Monday, 08:00 AM - 09:30 AM, Naples 1 *Track:* ESO, 18 *Chair:* Tonya Boone

Session: Sustainability and Organizational Structures

020-0608 Effective Social Sustainability Strategies in OM through Internal Organizational Factors

Raffaella Cagliano, Politecnico di Milano, Italy
Annachiara Longoni, Politecnico di Milano, Italy

Operations have a wide impact and can provide different opportunities in the achievement of social sustainability, especially affecting internal human issues related to workforce management. In OM literature, environmental sustainability studies prevail and social sustainability remains far behind. Companies around the world are struggling to understand how to translate social sustainability priorities in operations through specific programs and practices. Different studies identify internal organizational factors, such as organizational and human resource management practices, as important aspects in achieving social sustainability. Drawing on existing literature, the paper will propose a framework that distinguishes different dimensions of internal social sustainability (democratic treatments, health and safety level, quality of life and capabilities development). The framework is used to analyze five cases of multinational firms. Based on this evidence, a number of case-based propositions are developed that describe the direct and enabling role of internal organizational factors in pursuing effective social sustainability strategies.

020-0832 Top Management Support for Successful Green Supply Chain Management

Sung Tae Kim, SolBridge International School of Business, Korea, Republic of (South Korea)
Donghyun Choi, University of Nebraska Lincoln, United States

There is a significant movement to adopt green supply chain practice (GSCP) to obtain competitiveness. Successful GSCP contributes to a firm’s performance in various ways. To adopt successful GSCP, top management support is essential. A new strategy negatively affects firm performance or has no effect at all due to lack of attention or support from top management team. Important roles of top managers in GSCP adoption include sharing specific goals, commitment, and motivation of constituents. Since GSCP requires cross-functional groups to work together, top management support can force different teams to collaborate on tasks. Thus we will investigate the relationship between top management support and GSCP.

020-0705 Coordinating Mechanisms to Support Sustainability: The Role of Strategic Fit and Leadership

Tonya Boone, College of William and Mary, United States

Healthcare is one of the largest service industries, with a significant environmental footprint. Yet, there has been little research addressing sustainability in healthcare. Healthcare sustainability encompasses a wide range of processes, ranging from food service to plant management to patient care. This exploratory study examines the challenges of managing sustainability in healthcare. The study uses eight case studies of high performing healthcare organizations. We examine the mechanisms used to coordinate and integrate sustainability-focused activities within the organizations. We examine the role and relative effectiveness of formal and informal sustainability-focused routines, systems and networks in moving a healthcare organization toward sustainability. The findings suggest that the choice and effectiveness of coordinating mechanisms is moderated by the strategic role of sustainability in the organization, as well as the autonomy granted sustainability leaders.

020-0273 Corporate Sustainability Reporting Practices

Petros Christofi, Duquesne University, United States
Andreas Christofi, Monmouth University, United States
Seleshi Sisaye, Duquesne University, United States

Corporate Sustainability Reporting (CSR) is an accounting attempt of incorporating social and environmental measurements alongside the economic performance, in order to provide a complete, or a more in-depth, evaluation of the Bottom Line (BL). While CSR evolved in the mid-1990s, its measurement and reporting practices are neither uniform nor universal. This paper illustrates CSR reporting practices from the Dow Jones Sustainability Index (DJSI) World and the Global Reporting Initiative (GRI) Reporting Framework, that, though they address the same issue, employ different disclosure methods.

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281 Monday, 08:00 AM - 09:30 AM, Naples 3 *Track:* ERS, 14 *Chair:* Darran Clarke
Session: Topics in Empirical Research VI

020-0005 The Use of Thematic Analysis for Performance Improvement within an Aerospace Supply Chain

Darran Clarke, University of Bolton, United Kingdom

The purpose of this research was to examine means of improving the delivery and quality performance of an aerospace OEM's suppliers. An interpretivistic epistemological research design was taken. A predominantly qualitative methodology was used through the use of observational thematic analysis within an action research setting. Organisation Design issues relating to strategy, structure, culture, people and systems & processes were highlighted as the key problems faced by the company and its supply chain. This research will enable the OEM to improve its supply chain performance by focussing on the systemic organisational design aspects of the company, avoiding the tendency for the implementation of simplistic single-point mechanistic solutions to the complex problem environment. This research underscores the validity of thematic analysis as a useful tool in generating holistic solutions to supply chain problems. It also advances the debate about the importance of soft factors and relational behaviours within supply chain management.

020-1054 Factors Affecting the Magnitude of Interrater Agreement (IRA) Measures: A Comparative Study of rwg and AD Indices

Gensheng Liu, University of Memphis, United States
George Deitz, University of Memphis, United States
Emin Babakus, University of Memphis, United States

Past research has suggested different measures of interrater agreement (IRA) and various issues around the use of these measures. However, the answers to two questions are unclear: What factors affect the magnitude of IRA? In addition, which IRA indices are less sensitive to these factors? A systematic examination of the impact of various factors on different IRA measures is lacking in the current literature. The current study identifies some factors that potentially affect the magnitude of IRA. Using an existing data set with a few well-established constructs from the total quality management (TQM) literature, this study examines the impact of these factors on two categories of the most widely used IRA measures - rwg and average deviation (AD) indices. The results show that while certain factors impact both of them, other factors only impact one type but not the other. Theoretical and practical implications of the research findings are discussed.

020-0600 Location Dynamics in Logistics: The Case of a Dutch Province

Frank van den Heuvel, Eindhoven University of Technology, Netherlands
Peter de Langen, Eindhoven University of Technology, Netherlands
Karel van Donselaar, Eindhoven University of Technology, Netherlands
Jan Fransoo, Eindhoven University of Technology, Netherlands

Even though an analysis into geographical concentration of logistics firms is relevant for policymakers and the logistics firms themselves, research on this theme is lacking. Spatial concentration of logistics activities is expected to result in opportunities to combine cargo flows, interchange storage capacity, and pool labor, on top of the synergy effects also relevant for other firms. The combination of cargo flows especially results in important societal advantages, since congestion and CO2 emissions can be reduced. Based on employment data available for all firms located in a Dutch province, it is shown that logistics firms spatially concentrate. To follow up on this conclusion, we test whether location patterns have changed in the last thirteen years and whether new logistics firms tend to locate in dense logistics areas. This analysis serves as input for further research into incorporating synergy effects of spatial concentration in location decision models for logistics firms.

020-0128 The Interface Between Simulation and Empirical Research

Douglas Hales, The Univ. of Rhode Island, United States

Simulation research has traditionally been treated separately from empirical research in OM. However, there are opportunities to use both methods in a complementary way - potentially increasing the value of the research to both literature and practitioners. The purpose of this study is to demonstrate how parameters appropriate for simulation studies can be properly gathered from real world processes. This is important since the opportunity to emulate real world systems in computer simulations can help develop and test new theories that explain complex phenomena in supply chains.

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282 Monday, 08:00 AM - 09:30 AM, Naples 4 *Track:* CSC, 13 *Chair:* William Sawaya
Session: Complex Adaptive Supply Networks

020-0809 A Date Envelopment Analysis Approach to Simulation Output Analysis of Agent-based Supply Chain Models

William Sawaya, Texas A&M University, United States
Sri Jayanty, Texas A&M University, United States

The output analysis of agent-based simulation models is complicated due to the sheer number of agents and variables, as well as issues such as emergent behavior and path dependencies. In supply networks these factors can be compounded by the scope of the models. DEA provides an interesting method which may yield techniques for illuminating models. Its advantages lie in its ability to deal with large numbers of both inputs and outputs. Examples with agent-based models of supply networks are used as illustrations of the technique. It is hoped that this application can provide a fertile overlap for the fields of agent-based modeling, supply networks, and production economics using DEA.

020-0219 Investigating the Network Effects of Supplier Disruptions on Shareholder Wealth

Surya Pathak, University of Washington, Bothell, United States
James Miller, University of Washington, Bothell, U.S. Minor Outlying Islands
Jayanth Jayaram, University of South Carolina, United States
Jeremy Adsitt, University of Washington, Bothell, United States
Rachel Yuen, University of Washington, Bothell, United States

Supply networks have been characterized as complex networks with overlapping interconnections spanning multiple industries. Due to the non-linearities associated with such complex interactions, the effect of supply network glitches on the entire network is difficult to predict. Hendricks and Singhal (2003) have already shown that disruptions in a firm's supply chain affects the shareholder wealth significantly. This research attempts to extend the current state of the art beyond a single dyad, and onto a network. We hypothesize that a supplier glitch not only affects the buyer firm but may affect its competitors and their suppliers positively or negatively depending on the underlying structure of the network. We intend to use secondary data available from number of databases such as Bloomberg, Factiva, Lexis-Nexis, Compustat, SNL financials and combine it with advanced statistical and data mining methods to develop a theory of "network effects" related to supply glitches.

020-0955 Performance Measurement in CASN: Considerations for Applying Systems View of Performance Measurement to a Global Supply Network

Laird Burns, University of Alabama in Huntsville, United States
Fan Tseng, University of Alabama in Huntsville, United States
David Berkowitz, University of Alabama in Huntsville, United States

When taking an end-to-end (E2E) view of complex adaptive supply networks (CASN), one recognizes that they are systems of systems (SOS). Measuring performance in CASN from an SOS view is a new area of CASN research. While performance measurement at the firm level can be challenging, performance measurement of CASN from a comprehensive systems view is particularly difficult due to the complex nature of the systems and difficulty in accessing comprehensive data from actual supply networks. In this study we develop a CASN performance measurement system from an SOS viewpoint, with consideration given to an application of this approach in a large and complex global supply network.

020-0561 On the Integration of Emerging Complementary Technologies

Edward Anderson, University of Texas, United States
Geoffrey Parker, Tulane University, United States

We develop insights into the problems of managing firms in emerging complementary industries by developing a stylized model motivated by the current state of the renewable energy industry. Several immature entrants, including wind and solar power, contest the energy generation portion of this industry. The ultimate success of all these generation technologies depends upon developing a cost-effective energy storage technology. Interestingly, storage manufacturers can co-specialize their systems to a generation technology so as to reduce overall generation-storage costs. However, this implies that a storage entrant must make a bet on a particular generation complement because co-specialization is expensive and these investments are unlikely to fully transfer between generation technologies. The paper describes conditions under which a storage entrant should bet on what it perceives as the most likely winner in the renewable generation arena versus when it should pursue a more balanced strategy.

283 Monday, 08:00 AM - 09:30 AM, Naples 6 *Track:* CSC, 20 *Chair:* Almula Camdereli
Session: Retail Operations II

020-0325 Improving Retail Store Performance by Incorporating Traffic Information

Jayashankar Swaminathan, UNC Chapel Hill, United States
Saravanan Kesavan, UNC Chapel Hill, United States
Vidya Mani, UNC Chapel Hill, United States

Retailers have started investing in traffic counters that enable them to track the number of potential customers walking into their stores. They use this information to plan labor and measure performance metrics such as conversion rate and basket value for their stores. In this study, we explore other ways in which traffic information may be used to improve store performance.

020-0100 Inventory Management with Purchase Order Errors and Rework

Nicole DeHoratius, University of Portland, United States
Yan Jiang, Northwestern University, United States
Diego Klabjan, Northwestern University, United States

In a retail DC, purchase orders occasionally arrive with errors and thus have to be reworked. We study how retailersshould adjust their inventory policies in anticipation of purchase order errors and rework. The performance of our adjusted ordering policy is compared with standard policies using data from one DC of a major retail chain. The comparison helps retailers understand and quantify the cost impact of purchase order errors and rework.

020-1041 The Effect of Online Streaming on Subscription-based Video Rental Services

Almula Camdereli, Georgetown University, United States
Victor Jose, Georgetown University, United States

Video rental retailers have been tending to transition from renting physical media by mail to live online streaming. There is a recent debate among practitioners about whether live streaming will be the future of the video rental industry. For example, Netflix allows their users to order DVDs by mail and watch media instantaneously while Hulu provides a purely online service. In this paper, we consider a subscription-based flat-fee video rental retailer that is deciding how to price their services by providing its clients several subscription packages that will allow them to watch movies and television shows either through the Internet or through DVDs that are sent by postal mail. Using a heterogeneous customer base, we study the optimum bucket pricing strategy and analyze the effects of online media coverage on the pricing policy.

020-1059 Consumer Learning, Word of Mouth, and Quality Competition

Vishal Gaur, The Johnson School, Cornell University, United States
Young-Hoon Park, The Johnson School, Cornell University, United States

In a competitive market, consumers are not well informed about the service levels offered by firms. Instead, they choose among firms based on past experience. Thus, the mean and volatility of demand faced by a firm become functions of the service levels provided by all firms in the marketplace. We analyze this phenomenon, and show how firms may encourage word-of-mouth to mitigate or exacerbate the effects of consumer learning.

020-0850 The Emergence, Value, and Consequences of Category Captainship

Mumin Kurtulus, Vanderbilt University, United States
Alper Nakkas, Vanderbilt University, United States
Sezer Ulku, Georgetown University, United States

Category captainship is a practice where a retailer relies on one of the manufacturers in a category for recommendations about various aspects of category management. We investigate the conditions under which category captainship type of practices emerge and have the highest potential for both the retailers and the manufacturers in a category.

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287 Monday, 10:00 AM - 11:30 AM, Tuscan 1 *Track:* HOM, 14 *Chair:* Todd Boyle
Session: Quality in Healthcare

020-0654 Quality Assessment of Services for Hospitals: A Case Study of Network CQH

Suzana Souza Santos, Mackenzie University in Sao Paulo, Brazil
João Chang Jr., Centro Universitário da FEI, Brazil

Recently several works have been developed to evaluate the quality of services in health, but there is still no consensus on what indicators actually are effective for quality evaluation. Given the complexity that these services involve, it becomes difficult to establish indicators and standards for evaluation of the results in terms of quality. In many cases, the option ends up falling on the meeting of an extensive set of indicators that are already routinely used in this sector, without having made a more detailed analysis of their actual need and usefulness for quality assessment. This paper discusses these issues based on a case study of a Brazilian hospitals network. The CQH's network was formed intentionally to improve the quality of healthcare services of hospitals that are seeking their accreditation.

020-0885 Challenges of CQI Program Implementation in Community Pharmacies: The Case of SafetyNET-Rx

Todd Boyle, St. Francis Xavier University, Canada
Neil MacKinnon, Dalhousie University, Canada
Thomas Mahaffey, St. Francis Xavier University, Canada
Kellie Duggan, Dalhousie University, Canada

The under-reporting of quality related events (QREs), defined as “known, alleged or suspected medication errors that reach the patient, as well as medication errors that are intercepted prior to dispensing,” undermines the safety of pharmacy practice. A formal continuous quality improvement (CQI) program is an effective way for pharmacy staff to better report QREs and identify and address the key organizational and technological factors contributing to such errors. The barriers to implementing CQI programs within community pharmacies are, however, not well understood. This research identifies the challenges faced by community pharmacies as they implement a CQI program designed for improved QRE reporting and learning. More specifically, based on interviews with CQI champions from 60 pharmacies in Nova Scotia, Canada that implemented a standardized CQI program (www.safetynetrx.ca), the key challenges associated with CQI program implementation in community pharmacies are presented.

020-0954 Medical Tourism: Can Developed Countries Compete on Quality with Developing Countries?

Hossein Abouee-Mehrizi, University of Toronto/Rotman School of Management, Canada
Michael Carter, University of Toronto/Mechanical and Industrial Engineering Department, Canada
Somayeh Sadat, Hay Group Health Care Consulting, Canada

We consider a market with two hospitals competing for patients, one perceived to provide higher quality of care than the other. Patients select the hospital that provides the highest utility, which is a function of price, the patient’s perceived quality of life during their life expectancy, and patient characteristics. We provide the existence and uniqueness of the Nash equilibrium by breaking the market down into seven different categories.

288 Monday, 10:00 AM - 11:30 AM, Tuscan 2 *Track:* GOS, 10 *Chair:* Andre Dias Ferreira Antonio Santos
Session: International Operations

020-0463 Organizational Learning Process on Projects Using Virtual Teams

Andre Dias Ferreira, University of Sao Paulo, Brazil
Antonio Santos, University of Sao Paulo, Brazil
Fernando Laurindo, University of Sao Paulo, Brazil

Managing projects using virtual teams is a theme with great relevance in academe and among practitioners. The objective of this study is to understand the organizational learning process on projects using virtual teams. Three concepts are used as ground theory: organizational learning model for environments that are affected by strategic renew; gatekeeper concept; and knowledge management model. This research aims to answer the following questions: How does organizational learning process influence the success of projects using virtual teams? How do virtual teams internalise customer knowledge? How do virtual teams transfer knowledge to customers? The research method used is case study built from a technology consulting company that deliver projects using virtual teams with a high virtualization degree. The project used as analysis unit was executed by a virtual team distributed in three countries. The results found in the case study were compared against the ground theory so that conclusions could be taken.

020-0612 Managing ERP, Interoperability Strategy and Dynamic Change in Enterprises

Yi Wan, Operations & Information Management Group, Aston Business School, United Kingdom
Ben Clegg, Operations & Information Management Group, Aston Business School, United Kingdom

This paper explores the presumptions and importance of uniting ERP engage-abilities and inter-operational activities within the context of dynamic collaborative enterprises, as well as investigating how ERP systems cater for three enterprise forms and the resultant interoperability strategies. Building on the theoretical foundations of “Dynamic Enterprise Reference Grid,” this study has employed an exploratory inductive research approach using multi-case studies and interpretive grounded theory method. The central contribution is a conceptual framework which demonstrates the adoption of ERP within three enterprise paradigms and how one can morph into another for achieving agile interoperability strategy. Findings suggest that the design and governance of new enterprise structures and interoperability strategy can be affected by preferable information systems besides of the core competence. Furthermore, with the implications from this paper, practitioners will be better able to steer their enterprise strategies and improve operational performance through the inter-firm collaboration and ERP systems implementation.

020-0868 Strategic Cost Management Applied to Hotel Activity: Case Study of a Small Hotel in Dourados-MS

Cleber Marin, UFGD, Brazil
Sergio Brun, UFGD, Brazil
Antonio Carlos Lopes, UFGD, Brazil
Rolf Erdmann, UFSC, Brazil

This work is the result of a case study related to the strategic management in the cost of hotels, held in a small hotel in Dourados - MS. It aims to verify whether the manager uses information from hotel costs to develop management strategies, and what methods and procedures are used by the organization. Study is proposing improvements through a system of costing, pointed by the literature as an effective resource for the creation and development of a sustainable competitive advantage and to strengthen the company's positioning in the market. It aims to make improvements in the process of developing a model of costing to the hotel, showing the elements that make up the cost of goods or products offered. The work draws from a review of the literature related to the concepts and methods used in systems costs.

020-0908 Quality Accounting Services: A Case Study of Apollo Accounting Organization

Tiago Montroni, UFGD, Brazil
Sergio Brun, UFGD, Brazil
Rolf Erdmann, UFSC, Brazil
Marie-Anne Stival Lozano, UFSC, Brazil
Antonio Carlos Lopes, UFGD, Brazil

With the advancement of technology and the facility of access to information, clients users of accounting services are increasingly critical and demanding about the quality of service they are receiving from the industry. For this reason all efforts are geared to achieve the highest level of customer satisfaction. The customer perception is different individually, but there is a pattern when it is related to accounting services, thus the implementation of the concept of 5S is a great tool to increase the level of customer perception in an accounting firm. This paper is a case study with the aim of assessing the level of quality offered by the organization Accounting Apollo, identifying potential problems and proposing solutions and improvements to the problems encountered. Through research it was possible to identify some deficiencies relating to the physical structure, physical environment and attendant office.

290 Monday, 10:00 AM - 11:30 AM, Tuscan 4 *Track:* ESO, 14 *Chair:* Gal Raz
Session: Innovation and Sustainability

020-0113 Design for the Environment - Life Cycle Approach Using a Newsvendor Model

Gal Raz, Darden School of Business, United States
Cheryl Druehl, George Mason University, United States
Vered Doctori-Blass, Tel Aviv University, Israel

Introducing innovations into product and process design to reduce environmental impact is becoming increasingly common. Changes in design may affect the environmental performance in the various stages of the product life cycle, from manufacturing, via usage, and all the way to product disposal. These changes in design have the potential to affect the cost and the demand, as well as the overall environmental impact. In this paper, we study a profit maximizing firm (Newsvendor) deciding on both the order quantity to produce as well as the environmental design efforts that affect the different stages of the product life cycle. Using our model, we find the optimal design efforts for each of the life cycle stages; we gain insight into the innovation and design options and how they affect the overall economic and environmental impact. Lastly, using numerical examples, we conduct sensitivity analysis on the results for different product categories.

020-0950 The Role of Product Architecture in Green Product Design

Sezer Ulku, Georgetown University MSB, United States
Vishal Agrawal, Georgetown University MSB, United States
Glen Schmidt, University of Utah Eccles School of Business, United States

In this paper, we examine the effectiveness of modular product architectures in reducing the quantity of e-waste. After characterizing the firm's optimal product introduction and consumer's replacement decisions, we examine firm profits, product quality and environmental impact under modular and integral architectures. Our results suggest that modular product architectures have the potential to reduce e-waste, without slowing down the pace of innovation, while at the same time increasing firm profits. However, the impact of modularity is not always as positive as one may expect. While modularity extends the useful life of components by eliminating the need for full product replacement, in certain cases, modularity may lead to higher environmental damage by unbundling the product, and allowing more frequent replacement. From a regulatory perspective, our results point to the hazards of favoring modular product architectures uniformly.

020-0599 Formation of a New Venture in the Automotive Industry

Michael Naor, George Mason University, United States
Cheryl Druehl, George Mason University, United States
Ednilson Bernardes, Georgia Souhtern University, United States
Yoram Shiftan, Technion - Israel Institute of Technology, Israel
Shalom Hakkert, Technion - Israel Institute of Technology, Israel

The stricter environmental standards of the 21st century require the reduction of air pollution. Furthermore, the recent oil spill at the Gulf of Mexico reminds us of the hazards associated with offshore drilling and the need to reduce oil consumption. Transportation accounts for a large portion of both. In this context, the goal of the current research project is to investigate the formation of a new venture in the automotive industry. We study the case of an entrepreneurial Israeli firm developing and implementing an innovative infrastructure for sustainable transportation in Israel. We focus on the operational challenges at the organizational level to form the new venture, on the challenges with the product/service development and the innovative character of its outcome, and on the challenges with the supply network formation to support the innovative product/service.

020-0750 Waste Heat Recovery: Opportunity or Burden?

Chonnikarn Jira, Harvard Business School, United States
Deishin Lee, Harvard Business School, United States

The Department of Energy estimates that of the 35 quadrillion BTUs of energy used per year by the U.S. industrial sector, up to 13 quadrillion BTU is lost in the form of waste heat that could be recoverable. At the firm level, anecdotal evidence suggests firms may be missing opportunities to improve their energy efficiency and even increase revenues by implementing waste heat recovery solutions. In this paper, we investigate the decision-making process of firms making capital allocation decisions on process improvement projects that also have environmental benefit. We show how these projects fall into a "no-man's land" in a strategic planning framework and present two possible solutions to increase their priority.

291 Monday, 10:00 AM - 11:30 AM, Tuscan 5 *Track:* OEE, 11 *Chair:* Zhiqiang Wang Jing Zhou
Session: Managing Operations in China

020-1061 Production Planning and Inventory Allocation of an Assemble-to-order System with Unreliable Machines

Edwin Cheng, The Hong Kong Polytechnic University, China
Chunyan Gao, Nanjing University, China
Houcai Shen, Nanjing University, China

We consider the optimal production and inventory allocation of a single-product assemble-to-order system with multiple demand classes and lost sales. Each component is replenished by a dedicated machine that is subject to unpredictable breakdowns. We find that the machine state not only influences the production and allocation decisions on its own component but also influences the decisions on the other components. Specifically, the optimal component production policy

is a base-stock policy with the base-stock level non-decreasing in the inventory levels of the other components and the states of the other machines. The optimal component allocation policy is a rationing policy with the rationing level non-increasing in the inventory levels of the other components, the states of the other machines, and its own machine state. We use an exponential distribution to approximate the distribution of the total processing times and propose two heuristic policies to address the production and allocation decisions.

020-1062 A game model between public and private sector in the infrastructure project with BOT scheme

Xiao-ling Wu, Nanjing University, China
Jing Zhou, Nanjing University, China
Xing-guang Chen, Nanjing University, China

According to the lifecycle theory, a BOT project lifecycle (or called a profitable operational period) is introduced to maximize the project's overall investment returns. It depends on BOT project's construction cost by the analysis of optimization. When the government grants one part of BOT project lifecycle as the concession term to the project company, there exists a competition between the project's construction cost and concession term. The competition can be described as a dynamic game model based on the principal-agent theory. Solving the model, both parties' optimal strategies are respectively obtained. The obtained results provide both the government and the project company with a decision-making method for the negotiation of BOT contract.

020-1063 Selling Low Carbon Products to Loss Aversion Consumers

Juan Li, Nanjing University, China
Houcai Shen, Nanjing University, China

This paper establishes a three-stage game model by considering products' green degree and government subsidy. we illustrate how low carbon concerns could be integrated into operational decision making with regard to procurement and contract design.

020-1060 Building product innovation capability of Chinese manufacturers: A longitudinal study

Zhiqiang Wang, The South China University of Technology, China
Xiande Zhao, The Chinese University of Hong Kong, China
Guilong Zhu, The South China University of Technology, China

For the reason of rapid technology change and global competition, manufacturing companies face a more dynamic market and competitive environment than ever before. The innovative capability to develop new product and process will be very important to survive in current economic environments. It has been emphasized that internal and external resources are important for building product innovation capability. This paper investigates the impacts of internal, external resources, and their interactions on product innovation capability of Chinese manufacturers. Panel data from Guangdong Technology and Innovation Assessment Center are used to test the relationships among them. The findings showed that internal and external resources had both direct and significant interacting impacts on product innovation capability. Specially, financial and physical resources significantly moderate the relationship between external cooperated project and product innovation capability. Meanwhile, human resource significantly moderates the relationship between external expert and product innovation capability.

292 Monday, 10:00 AM - 11:30 AM, Tuscan 6 *Track:* TEC, 6 *Chair:* Inga-Lena Darkow
Session: Data Driven Technology Management

020-0730 E-Mobility – A Scenario and Backcasting Approach

Inga-Lena Darkow, EBS Business School, Germany
Heiko von der Gracht, EBS Business School, Germany
Martin Zimmmermann, EBS Business School, Germany

The mobility challenges caused by private and commercial vehicles are tremendous today. Road transport is one of the largest contributors to greenhouse gas emissions and the automotive industry needs to be prepared for the changes to come. The aim of our paper is to develop e-mobility strategies and roadmaps for the future by using a backcasting approach from the field of foresight studies. We exemplify the backcasting process along with a recent scenario study on the future of e-mobility 2030. Our Delphi expert panel discussions (16% academics, 18% politicians, 67% practitioners, in total 140 participants) resulted in more than 2,000 qualitative arguments which were used for scenario writing. More than 40 interviews were then conducted in order to shed light on the path by which the desirable vision on e-mobility can become reality by 2030. Specific focus has been on supply chain challenges for e-mobility solutions.

020-0970 A Data Mining Framework for Product and Service Migration Analysis

Wei Jiang, Hong Kong University of Science and Technology, China

Given new technologies or products, customers may migrate from a legacy product to a new product. This paper discusses a framework and application of time series data mining to product and service migration analysis. We develop a co-integration-based classifier to identifycustomers associated with migration and summarize their time series patterns before, during and after the migration. Customers can then be scored based on the migration index that integrates the statistical significance and business impact of migration customers.We illustrate the research through a case study of IP migration in telecommunications.

304 Monday, 10:00 AM - 11:30 AM, Naples 4 *Track:* CSC, 21 *Chair:* Geoffrey Parker
Session: Supply Chain Strategy

020-1042 Knowledge Based View of Supply Chain Integration

Prakash Singh, University of Melbourne, Australia
Damien Power, University of Melbourne, Australia

The aims of this paper are to empirically test the relationship between knowledge sharing practices within and between trading partners as a framework for integration, and to test for the effect of these practices on firm performance. Data was collected from 418 organizations in the manufacturing industry in Australia. Structural equation modelling approach to data analysis was used. It was found that the three knowledge-related constructs (internal knowledge integration, knowledge integration with customers, knowledge integration with suppliers) were strongly inter-related, providing a case for knowledge-based integration of firms with their trading partners. Further, these three exogenous constructs collectively explained about a third of the variance in the endogenous construct (firm performance). The relationships identified provide support for the efficacy of knowledge-based collaboration. Managers can use this as a way to conceptualize how their firms can develop internal integration and collaborative relationships with their trading partners.

020-0824 Manufacturing Strategy, Supply Chain Management, and Anticipation of New Technologies and their Relationship with Operational Performance.

Andrew Finger, Unisinos, Brazil

Ely Paiva, FGV/EAESP, Brazil

This paper examines how manufacturing strategy and supply chain management influence the anticipation of new technologies (ANT) and the effects of this relationship on operational performance. We consider that manufacturing technology anticipation could be a source of competitive advantage based on the propositions of Hayes and Wheelwrigth (1984). The model incorporates supplier partnership and function integration concepts in the relationship between manufacturing strategy and supply chain management. The data collection uses a survey methodology from the ongoing international project High Performance Manufacturing. The sample has 317 plants from three different industries at 10 countries. We used Multiple Regression analysis to test the hypotheses. The results show that all the relationships are positive and the ANT leads to operational performance enhancement.

020-0820 How Buyer-Supplier Relationships Can Create Value: Integrating Strategy and Operations

Priscila Miguel, EAESP-FGV, Brazil
Luiz Artur Brito, EAESP- FGV, Brazil

The concept of competitive advantage in strategic management, following the resource based logic, is recently evolving to a consensus that defines competitive advantage as superior value creation in relation to competition. Value creation is defined as the wedge between the willingness to pay of firm´s customers and the opportunity costs if its suppliers. This paper integrates this theoretical development with the literature of supply chain management and buyer-suppliers relationships in operations management, tapping into the large body of literature in the area. This integration leads to a more comprehensive and theoretically sound rationale for interpreting the impact on performance of both dyad members of collaborative relationships and supports new propositions of value creation and capture, including the role of trust in this process. The new theoretical approach also allows more rigorous operationalization of the related concepts and can be used for practical implications.

020-0378 The Evolution of Relational Advantage: The Influence of Cognizance, Commitment, and Capability

G. Webb, Georgia Southern University, United States
Stanley Fawcett, Georgia Southern University, United States
Amydee Fawcett, University of Arkansas, United States

Despite sustained interest in relational capabilities, researchers know relatively little about the process through which companies instill collaborative capabilities to achieve differential performance. Collaboration is essential since many skills needed to build distinctive competencies are “embedded in inter-firm resources and routines.” The reality that vital knowledge, technologies, and innovation reside outside the firm makes the firm’s supply network an essential source of differentiation. Extant research, however, indicates firms struggle to build relational capital and achieve collaborative supply relationships. To provide insight into how firms inculcate a relational capability to access dispersed skills and accomplish strategic goals, we pursued a two-period inductive study, interviewing 51 companies in Period 1 and 57 companies six years later in Period 2. Analysis of the interviews reveals the pivotal role of managerial commitment to the transformation process. We present a cognizance-commitment-capability framework to explain why some companies make the collaborative transformation and others do not.

020-0688 Managing IP Portfolios across the Supply Chain

Edward Anderson, University of Texas, United States
Nitin Joglekar, Boston University, United States
Geoffrey Parker, Tulane University, United States

In recent years, great strides have been made in managing flows of physical and service goods across supply chains. Yet, the management of intellectual property (IP) across supply chains remains relatively immature. In this presentation, we leverage recent developments in innovation portfolio theory and platform economics to propose a framework for inventorying, tracking, and valuing portfolios of IP distributed across the supply chain. Furthermore, leveraging work in distributed innovation planning, we also propose a framework for planning IP development throughout the supply chain.

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305 Monday, 10:00 AM - 11:30 AM, Naples 6 *Track:* CSC, 22 *Chair:* Brian Jacobs
Session: Empirical

020-0490 Applying Supply Chain Management Models in the Banking Industry: A Brazilian Case Analysis

Orlando Cattini Junior, EAESP- Fundacao Getulio Vargas, Brazil
Daniel Okino, EAESP- Fundacao Getulio Vargas, Brazil

The study presents the results and recommendations deriving from the application of two analysis models of supply chain management proposed by the Supply Chain Council (SCOR, version 10.0) and by Lambert (1997, Framework for Supply Chain Management) on the logistics of cash transfers in Brazil. Cash transfers consist of the two-way transportation (deposits and withdrawals) of customers' money through the network formed by the bank branches, ATMs, armoured transportation providers, the government custodian, Brazilian Central Bank and financial institutions. Although the logistic operation is so wide-ranged (country-size), complex and subject to a lot of financial regulations and security procedures, it has been detected that it was probably not fully integrated. Through the use of a primary and a secondary data research and analysis using the above mentioned models, the study ends up with propositions concerning the operation improvement and environmental sustainability.

020-0058 Partial Least Squares (PLS) Application to Supply Chain Management (SCM) Systems

Mehmet Karadag, University of Ottawa, Canada
Jonathan Linton, University of Ottawa, Canada

We consider if optimizing across a supply chain gives significantly different outcomes than consideration at a firm level. We analyze manufacture-related supply chain data using a Partial Least Squares (PLS) procedure to determine the crucial factors and indicators that make up each factor in a supply chain system. The research involves an examination of a supply chain process to determine which latent variables are crucial for a given system. This approach allows supply chain members to have a greater understanding of these critical coordination factors and to use these insights to improve their overall supply chain performance. For this purpose PLS is applied to produce components that best describe the output value. The importance of measures from across supply chain partners to each component is the focus of this study. Results and implications give an indication of what performance is possible with supply chain optimization versus local optimization.

020-0047 Shareholder Value Effects of Voluntary Emissions Reductions

Brian Jacobs, Michigan State University, United States

Recent empirical evidence has demonstrated that the stock market reacts negatively to firm announcements of voluntary emissions reductions. We study how certain contextual factors influence the market reaction. Factors include the type of emission (regulated or unregulated), firm and industry characteristics, energy prices, and whether the firm's announcement was standalone or part of a government or NGO initiative.