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Abstract Title: **Managing Airport Supply Chain: an Ethiopian case study**

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## **Managing Airport Supply Chain: an Ethiopian case study**

### **Abstract**

Airport is one of the most complex facilities which connect several business units to fulfil their roles within the air transport industry. Managing these entire business networks is one of the challenging areas. The characterization of the airport SC is a network of multiple organizations and their relationship. It encompasses suppliers, airlines, airport operators, government agencies such as customs, security and immigration and other service providers. The purpose of this paper is to analyze the supply chain (SC) processes in Ethiopian airports and identify opportunities for enhancing airport performance.

The study involved a combined methodology to data collection, taking Ethiopian Airports Enterprise (EAE) and Addis Ababa Bole International Airport (AABIA) as a case. Data were collected through questionnaire from members of the entire airport SC and structured interview of key stakeholders. The case study provides practical insight for managing airport SC and how to enhance airport performance.

**Keywords:** Airport SC, Efficiency and performance, Case study

## **1. Introduction**

The airport is a service system which is a vital part of the air transportation of today's society. The airports in the 21<sup>st</sup> century form an exciting long-term growth industry with excellent prospects. The industry is undergoing through quick change and becoming much more challenging for airport managers (de Neufville and Odoni, 2003). This is owing to live competition, technology and organizational change, and ever growing public demand for better airport services.

In air transport services, airport act as a provider of the on-ground infrastructure for flight operations. Airport facilitates the link between passengers arriving by different modes and their access to aircraft while airlines offer the transportation services per se (Albers et al, 2005).

Ashford, et al., (1984) pointed out that airports constitute an organization which either supply or administer the following facilities:

- Servicing, maintenance, and engineering of aircraft;
- Airline operations including aircrew, cabin attendants, ground crew, terminal and office staff;
- Business necessary for economic stability of airport (concessions, leasing companies, etc.);
- Aviation support facilities (air traffic control, meteorology, etc.); and
- Government functions- agricultural inspections, customs, immigration and health.

The characterization of the airport SC is a network of multiple organizations and their relationship. It encompasses suppliers, airlines, airport operators, government agencies such as customs, security and immigration and other service providers. Managing these entire business networks is one of the challenging areas.

Supply chain management (SCM) in the airport business involves overseeing relationships among all members in the chain, controlling inventory, demand forecasting and getting constant feedback on what is happening at every link with the aim of adding value to all members down the

SC. SCM decisions have direct impact on airport's operation and financial performance. In turn, this influences all members in the chain.

Many researchers and practitioners have studied SC issues related to manufacturing and some service industry such as retail. Previous studies in the airport industry mainly focused on airport systems design, planning, safety, infrastructure and master planning, and related areas. However, little attention has been paid by researchers to study SC issues in the sector. The industry needs to be examined from an integrated delivery of customer services perspective that is, as a network of airport SCs. In view of that, the purpose of this paper is to understand the SC processes in airports in particular Addis Ababa Bole International Airport (AABIA) and identify opportunities for enhancing airport performance. An Ethiopian airport was selected based on the accessibility to information and willingness to share the information.

This paper is structured as follows. A brief description of the case enterprise and its airport is given. Then, a literature review relevant to SC in the airport context is presented followed by the research methodology and analysis. Findings of the case are discussed next. Finally, conclusions are presented.

## **2. The case:**

The Ethiopian Airports Enterprise (EAE) was established as a public enterprise in January 2003 due to increasing demand for airport services and remarkable changes in the aviation sector to meet international aviation standards by restructuring Ethiopian Civil Aviation Authority (ECAA). The establishment of the enterprise as an independent legal entity to run the airport service delivery is a new phenomenon in the aviation history of the nation. ECAA is restructured to perform the aviation regulatory services. The aviation security is organized under the National Security and Intelligent Authority to carry out the security activities (Estifanos, 2002).

At present, the EAE runs 14 airports (4 international and 10 domestic/regional) and airstrips across the country. AABIA located at the capital of Ethiopia is a public major airport and provides international and domestic service. It has having a modern pave runway capable of handling aircraft such as B747/MD11 with five taxi ways. AABIA generates more than 80% of the passenger movements and 90% of total revenue of the EAE (data source: Statistics team of EAE).

The AABIA has served the nation as the main international gateway for more than 44 years. It has witnessed a growth of passenger and freight volumes over the last five years. In 2008, the passenger traffic at AABIA was more than 3 million and freight handled was 80515.28 Ton, implying a growth of 17% in passenger traffic and 36% caro handled over the previous year. <sup>[1]</sup>

AABIA's potential in serving as a hub for air traffic to most of African countries as well as a transfer point to Asia and Middle East, is one of the important drivers and opportunities for the current and future growth of air traffic in Ethiopia. Other drivers include, the country hosts many international organizations such as the African Union, the African Economic Commission and international embassies and consulates and the potential for growth in domestic air transport and significant potential for tourism development.

Currently, 11 international flight operators including the national airline-Ethiopian and other 10 foreign airlines from Africa, Middle East, and Europe are operating at AABIA. Five Domestic Operators are also functioning in the airport. <sup>[2]</sup>

The AABIA provides a wide range of service and facilities to passengers, airlines and other airport users. It is the first airport in Africa to operate bar coded boarding passes for all international flights. Several organizations are also involved in the airport service provision with

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<sup>[1]</sup> <http://www.ethiopianairports.com>

<sup>[2]</sup> Flyer, EAE, prepared by Planning & Market Development Coordination Office, Unpublished Available at: <http://www.ethiopianairports.com/index.aspx>

different ownership and regulatory structure. The national carrier, Ethiopian airlines provides handling services to passengers including ticket and baggage check in, the airport immigration provide passport and visa inspection services, the airport customs perform customs inspection and the airport security provide security inspections.

The EAE presently has about 915 permanent employees of which 33.5% work at AABIA; the other 25% of the workers position at head office and others at regional airports. In general, fully equipped with state-of-the-art facilities, AABIA is one of the best airports in Africa. EAE was awarded a corporate achievement award for excellence in aviation industry at the 15th aviation and allied business leadership conference in 2009. The award was in recognition of EAE's contributions to the development of the aviation industry in Africa. <sup>[1]</sup>

### **3. The airport SC**

Realizing success in a competitive environment calls for managing activities involved directly or indirectly to fulfil customer requirements. Activities should be designed to reduce operational costs, to improve flow of supplies and to increase customer satisfaction. The processes of SCM integrate intra and inter-company activities through cooperative organizational relationships and results effective business processes (Handfield and Nichols, 2002; Mentzer, 2001).

Several initiatives are mandatory for the successful implementation of SCM practices/processes that offer companies a sustainable competitive advantage and success. Some of the factors which directly support or enable organizations achieve their SC objectives found in literature include: creating corporate culture (Chin, et al., 2004; McIvor and McHugh, 2000); deploying technology to support SC decision making (Tummala, et al., 2006; Chin, et al.,2004; Davis, 2003); skill and responsibility to manage, operate and to make SC better; alignment of SC strategy with firms' business strategy; adaptability and agility of the system (Hau, 2004; Hugos, 2003; Kidd, 2001;

Christopher and Towill, 2001). Researchers have identified enablers to SC performance including long term relationship, communication and cooperation, cross-sectional teams and supplier's relationship, risk and reward sharing, agreed vision and goals, information sharing (Chen and Paulraj, 2004), effective performance management and reward for best performance (Chin, et al.,2004), process integration and continuous process flow (Fish and Forrest, 2006; Donlon, 1996), quality and customer relations (Tan, et al., 1998) and elimination of excess stock levels (Alvarado and Kotzab, 2001).

The SC success can be measured through end customers, operational and financial benefits. Customer benefits include improved product/service quality, timeliness, flexibility, and added value delivered to customers. Operational benefits are waste reduction, time compression, flexible responses, and unit cost reduction. The financial benefits are profit margins, cash flow, revenue growth, and return on assets.

From SC point of view, the airports' service provision represents the cumulative effect of multiple organizations and their relationships to offer products and services to the end customers. In its daily business, airport involves several suppliers, airlines, operators, stakeholders, government agencies such as customs, security and immigration, passengers and other users. It is part of an interconnected network of its own suppliers and customers. This network is the context in which its SC is developed. SC structure for an airport with the key players and their business functions are illustrated in figure 1. The various players those who interact with the airport operator in an airport are shown in figure 2. It is obvious that several players play their role in order to deliver services and products to the end customer. Close cooperation and coordination among the players is required for effective service. For airports to function efficiently, equilibrium between the main players and all their associated organizations must be achieved.

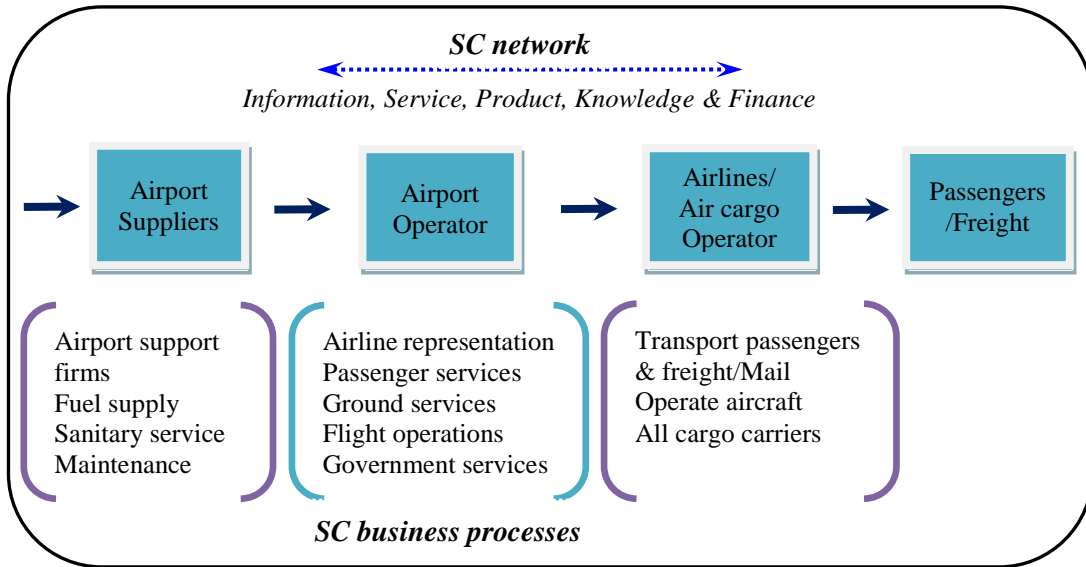


Figure1: Conceptual SC structure with most important players and their business functions

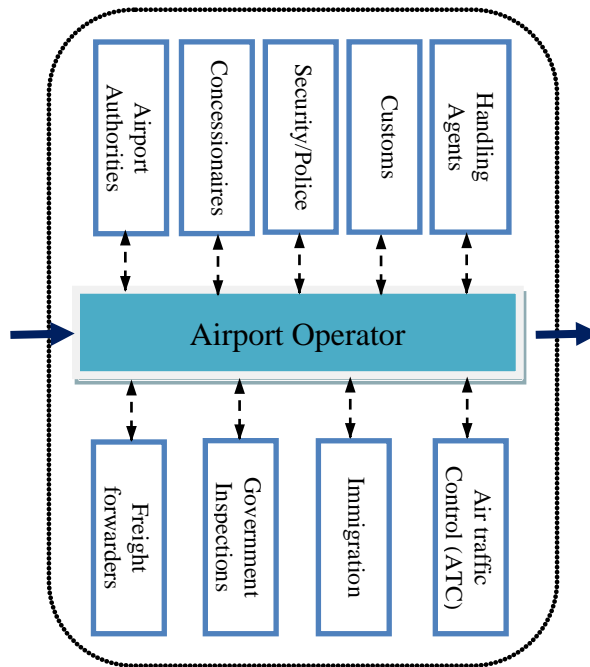


Figure 2 Various players who interact with airport operator

So, a high degree of coordination for position of other parties' is vital otherwise sub-optimal conditions exist leading to failure in service delivery. Thus, each and every entity of the airport SC is responsible towards creating a SC environment which is a source of competitive advantage.

#### **4. Methodology and Data collection**

This research is based on the case study methodology aimed at obtaining an in-depth knowledge of the SCM processes and practices in one of the Ethiopian airports. Survey was conducted during the period from March 15 to August 15, 2009 of 110 respondents from EAE, AABIA, airlines operating in the airport and other stakeholders.

The study involved a combined methodological approach to data collection (Eisenhardt, 1989), namely; documentary and archival data from EAE, semi-structured interviews and self administered questionnaire. An on-site visit to the case study airport and reviewing secondary sources helped to collect data about physically taking place activities in the airport industry in their usual contexts and enabled to map the entire airport business SC. This also led to the development of interview with its protocol and questionnaire. Data collection was along the entire supplier, focal airport and airlines' network. Different functional groups and employees in each business unit are participated for more comprehensive information. As a result, the principal unit of analysis constitutes the entire airport SC as opposed to one participant along the chain. Hence, it has increased the reliability of the case study and construct validity is assured (Yin, 2003).

82 questionnaires were returned from the respondents with 78 completed/valid responses from a total of 110 questionnaires sent; implying an overall response rate of 78.37%. It was very satisfactory indicating validity of the result as opposed to 15-20% response rate assumed as normal (Gilgeous and Gilgeous, 2001).

## 5. Survey findings and analysis

The survey findings from the first section of the questionnaire describing background information about the respondents and their company and preliminary data about their airport SC structure are discussed in brief.

The composition of the respondents representing major players in the airport industry is illustrated in figure 3. The sample characteristics indicated as others (8%) include respondents from audit and inspection, legal services, customs and so on.

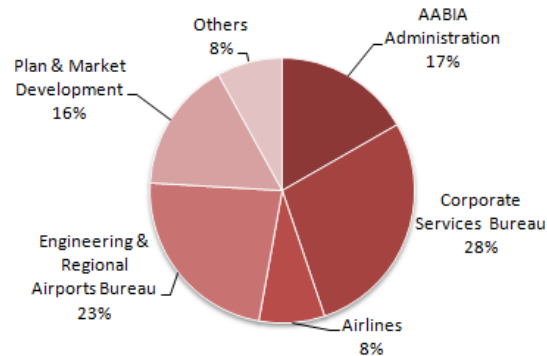


Figure 3: Composition of respondents'

The respondents were requested to rank the first five airport business value drivers. The survey findings are shown in table 1. Respondents were also asked to identify some of the SC activities in AABIA. Customer service, purchasing, procurement, and sourcing are the first two primary SC activities mentioned by respondents as illustrated in figure 4.

Table 1: Value drivers and key customers for airport

Rank	Value drivers	Key customers
1 <sup>st</sup>	Passenger growth	Airlines
2 <sup>nd</sup>	Aircraft movement	Passengers
3 <sup>rd</sup>	Nonaeronautical services	Concessionaires
4 <sup>th</sup>	Concession rates	Government
5 <sup>th</sup>	Aeronautical services	Tour operators

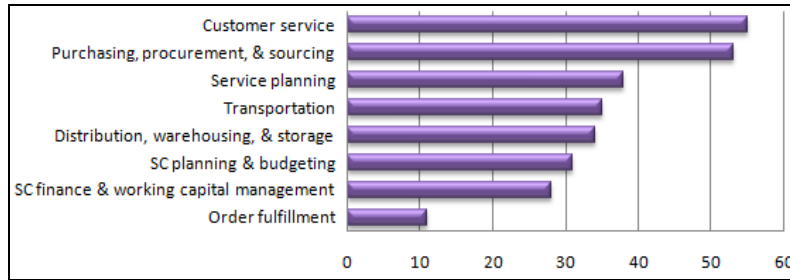


Figure 4: Importance of SC activities in airport business

Figure 5 exhibits the list of tools, techniques and methods the airport has employed to improve its SC performance. As it is evident from the figure, about half of the respondents viewed BPR as one of the methods used in the airport to improve its performance followed by benchmarking (20%). The study found that, some of the respondents considered a combination of two/three of the given alternatives. BPR, technology and benchmarking were included in most of the combinations.

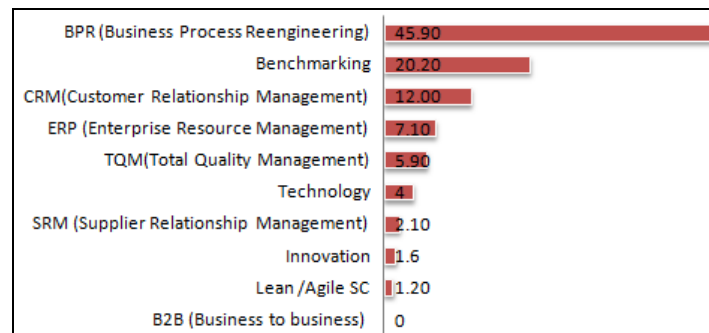


Figure 5: Methods and tools used by the airport

The second section, the main part of the questionnaire consists of the five themes of the SC processes/practices that were identified as key SC processes/practices from literature. The respondents were requested to show their level of agreement to statements given on a seven-point scale for each of these themes. Our observation and findings from the responses are as follows:

### ***Corporate culture and decision making in the airport SC***

Corporate culture and decision making is a major task of organizations' leadership to achieve SC and business strategy. People success is a function also of the corporate culture, how the company sees itself, defines itself and operates, both internally and externally. The culture can be a facilitator of processes or an inhibitor (Craig, 2003). The way management think, feel and act in managing SC operation in any organization have direct impact in its SC capability. In this context, with the aim of describing this practice in the SC of AABIA, the study revealed that the corporate culture and decision making practice operated in the airport are not appropriate.

The corporate culture and decision making practices in the SC of the airport seem to lack most of the components mentioned in literature. Lack of measurable quality service culture, unavailability of cross functional teams, unable to evaluate the existing SC system and corporate culture for the benefit of all members are the major ones.

The airport must view SC as a strategic asset and should create alertness for all involved in the network and its value to the airport business. To tackle airport operational, technical and commercial confront of the current and future, EAE should have a staff development program. It also needs to consider continuous training in SCM processes. In general, the change in corporate culture is compulsory for EAE as it is a prerequisite for successful SCM. These fundamentals if put into practice, can lead to continuous step up and improved SC performance.

### ***Partnership and collaboration in the airport SC***

SCs by nature and definition require organisations to work together in close relationships and collaboration with all involved throughout the chain purposefully to add value to the end customer (Handfield and Nichols, 2002). The literature suggests that high level of integration is associated

with high level of performance (Frohlich and Westbrook, 2001). Partnership and collaboration should be both internal (employees, departments, teams, sections and functional units) and external to the organization (Bowersox, et al., 2000). In the airport industry, the latter includes suppliers, airlines, service providers and customs, security, immigration and other players. A long term partnership and collaboration across organizational boundaries enhances competitiveness to all involved in the chain. It also extends commitment to achieve SC excellence with airport partners. Unable to create such a working environment results likely ineffective SC (Fish and Forrest, 2006; Davis, 2003; Tummala, et al, 2006).

The status of partnership and collaboration in the SC of AABIA is not up to the mark but is being developed (advancement in SC partner integration process is slow). The services delivered at airports involve employees, airline operators, immigration, customs, airport security, airport support service providers and other players. It calls for effective coordination and partnership among these players.

EAE and AABIA should initiate to collaborate better with both internal and external partners and business units. Emphasis should be placed in three dimensions of the airport SCM coordination and integration: within each function of the EAE (intra-functional), among the functional areas (inter-functional) like marketing and operations, and to coordinate all the multiple enterprises (inter-organization) from supplier to airlines. This effort should start from internal and proceed to external by improving efficiencies first within functions, then across functions, and between and across multiple firms (Carter et al., 2000). All members should contribute their share for effective service delivery and enhances competitiveness to all parties involved in the chain. The EAE and its airport need to take step forward to build collaboration and partnership on priority basis as it takes longer to build partnership.

### *Airport SC information management system*

Information sharing is identified as one of the key drivers for improving airport SC performance and enhancing competitive advantage (Zhang and Li, 2006). Effective information flow which is visible, frequent, and accurate in the SC enable firms to better create, process and deliver product and services to their ultimate customers. To identify the SC information management system processes/practices in the airport, respondents were requested to indicate their level of agreement to the six statements that capture the effectiveness of information management system. It is surprising to note that respondents do not consider these important as shown in figure 6.

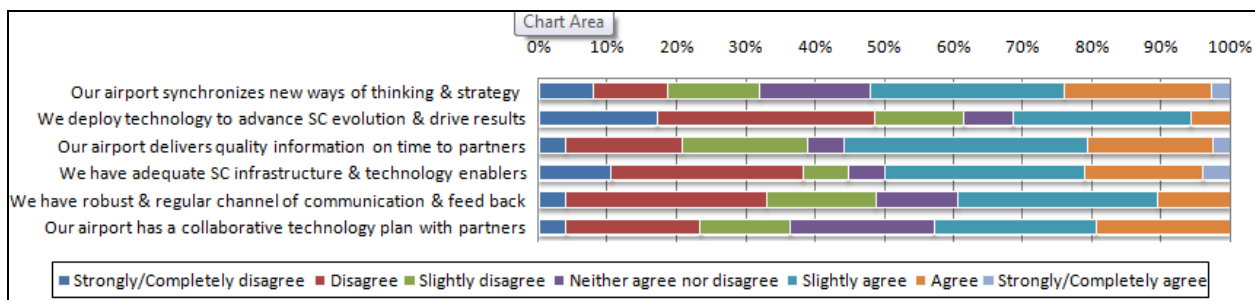


Figure 6: Airport SC information management

This clearly suggests that EAE and AABIA need to synchronize new ways of thinking and strategy to reduce cost and enhance partners' satisfaction. The AABIA should improve its management process, working system and capacity building concern based on SCM principles. It should build adequate SC infrastructure and technology plan with partners. It also needs to deploy technology and techniques to deliver quality information on time to partners along with regular channel of communication and feedback. This is critical for both EAE and AABIA to attain SC excellence and drive outcomes.

### ***Performance measurement in airport SC***

For airport industry it is a necessity to know how the network of businesses and relationships would perform at each stage including airlines, users and other stakeholders. Hence, periodic monitoring and improvement of the activities and outcomes leading to value creation is essential. This is the primary task of performance measurement system (Hailemariam and Jain, 2009). Accurate performance measurement is helpful in knowing how well airports are meeting customers' requirements as well as how they are handling their SC operation and business. Holmberg, (2000) and Lai, et al., (2002) argue that a number of researchers and practitioners have highlighted the need for vital performance measurement and measures in the SC which is aligned to desired outcomes.

The study found that the SC performance measurement system in the airport is not considering the factors that are critical to measure performance. In effect, there is no a well organized performance measurement system.

To create value and remain competitive in the changing business environment AABIA will require effective performance measurement system based on the key performance indicators used in airport industry. It is crucial that the EAE also develops well designed, forward looking performance measurement system having relevant metrics aligned with goals that enable appropriate decision making (Hailemariam and Jain, 2009). The system must enable the management to improve procedures and processes continuously, and evaluate the success and failure of SC operations of the airport.

### ***Value adding and optimizing in the airport SC activities***

During examining airport SC processes, it is meaningful to determine the values that are being added by the individual activities/processes. It is also vital to identify activities and processes that

add value. Non value added activities in the SC exist in airport SC operations such as check in, flight operations, terminal operations (safety, security and emergency services) and ground services like passengers handling, ticketing, luggage, in-flight and cargo-mail handling and other services .

It is interesting to note that the airports has initiated efforts towards reducing non value add activities in the airport SC (figure 7).

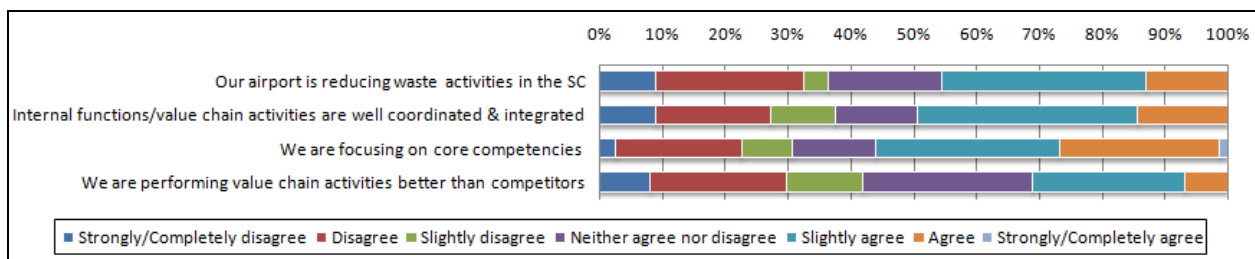


Figure 7: Value adding and optimizing airport SC activities

In a competitive business environment, to become a world-class service organization it is necessary to create value to the customer and achieve operational excellence to enhance financial performance. This can be ensured by minimizing non value added (waste) activities throughout the system while accomplishing the mission. In general, anything that classifies as waste within company will also be waste from SC point of view (Phelps, et al., 2003). Hence, EAE and AABIA must coordinate and integrate internal functions or value chain activities.

The EAE must focus on core responsibilities and improve them by outsourcing non core activities and ensure that it does value chain activities better than its competitors. It is useful to conceptualize a SC process improvement scenario for EAE based on the above findings and discussions. Hence, a SC process improvement framework consisting of three core dimensions is proposed and illustrated in figure 8. The first dimension represents the working culture and its

impact on SC decisions. It is this dimension that plays crucial role in the improvement initiatives of the airports' performance. The second dimension is the collaboration among the partners of the airport SC. The third dimension is the core capability of partners'. For each of the dimensions we have listed some of the considerations to improve the performance of the airport SC and airport.

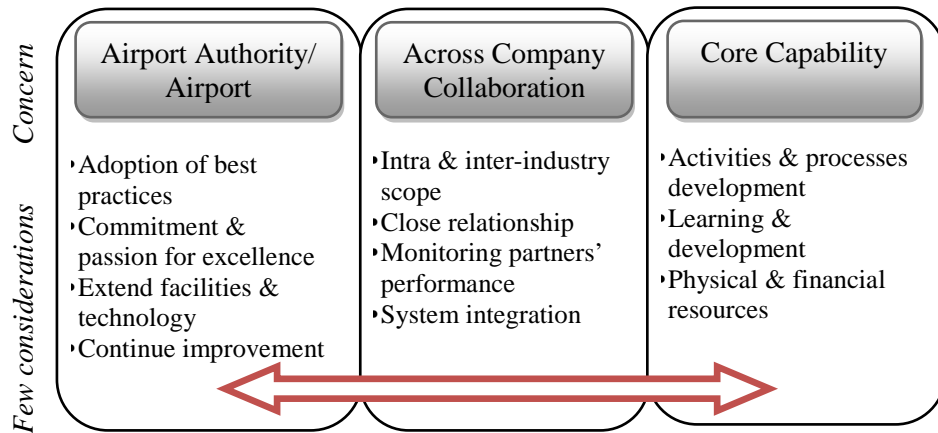


Figure 8: The proposed SC process improvement framework

## 6. Conclusions

Due to continuous increase in the number of passenger, aircraft movement and the need for ever growing public demand for better services, airport industries need to continually strive to achieve operational success better than anyone else. The only way to meet current and future airport challenges is to build capability and competency in SCM. In this case study, we have studied the SC processes/practices in an Ethiopian airport industry. We have found that some SC processes are critical for airport operations. It is remarkable to note that our findings match with the findings of the study conducted by IATA team (2008). The findings of IATA study permit the EAE and AABIA to recognize the importance of SC as a source of competitive advantage to their operational and financial efficiency. Our study has also identified five areas of SCM processes/practices relevant to the airport industry.

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