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A Framework for Transparency

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Abstract

Effective and timely information and knowledge sharing in modern complex organizations is pivotal to their competitiveness. Challenges in such sharing often become particularly visible in the cooperation between organizations and organizational units. We outline a framework for understanding transparency drawing on 1) literature on information and knowledge sharing in operations management and knowledge management, and 2) a case from a highly complex environment - health care - and one from a highly competitive environment - the leisure boat industry. Both organizations are characterized by craft work. We further discuss how coordination could be better supported by schedules, routines, roles, and sharing of knowledge and information. Particularly, we focus on how well suited such tools, methods, and mechanisms are for increasing transparency. Finally we suggest how transparency may be enhanced by novel use of information and communication technology.

1 Introduction

Modern organizations and enterprises are increasingly intrinsically complex, and although reducing the complexity to a minimum could be desirable, it cannot completely be avoided (Shalloway, Beaver et al. 2009).Cooperative work involves a large number of interdependencies, a problem that multiplies as competitive pressure necessitates closer and parallel collaboration (Loch and Terwiesch 2005). Effective management of these interdependencies – i.e. coordination (Malone and Crowston 1993) – is pivotal.

According to the Merriam-Webster Online Dictionary, the act of coordination aims to achieve «the harmonious functioning of parts for effective results» (2010). However, "For customers and suppliers to connect in harmony with your processes, they must be open and visible" (Champy 2003). Expedient approaches to information sharing and transparency seem necessary in order to facilitate coordination.

What makes knowledge valuable to organizations is in the end the capacity to make better decisions and actions (Davenport and Prusak 2000). A range of disciplines has developed insights into how information and knowledge should be shared. There is, however, a need to connect the dots from these fields of research to provide a more comprehensive understanding of transparency.

The purpose of this paper is to develop a rudimentary framework for transparency, focusing largely on an operational level. We draw on the fields of supply chain management, operations management, knowledge management, and computer supported collaborative work. Furthermore, we apply the framework to two cases, one from a large university hospital, and the other from a highly competitive environment of leisure boat production. Finally, we suggest how transparency may be enhanced by novel use of information and communication technology.

2 Theoretical background

2.1 Existing concepts of transparency

The concept of transparency has the longest history in relation to governance, when one excludes notions of physical transparency. Within governance, the main application of transparency concerns acting according to published rules, based on information that is accessible for the public, under the presumption this secures good governance (Hood 2001). The same presumption applies to corporate governance as well, though a primary concern within the field is dealing with information asymmetries between stakeholders as corporate managers, stockholders, the financial markets and various officers within the organization (Hood and Heald 2006).

Operations management regards transparency as a tool for improvement. For instance transparency is essential in order to reveal and banish waste. Womack and Jones emphasize the importance of transparency to the lean enterprise, defining transparency as "The placement in plain view of all tools, parts, production activities, and indicators of production system performance, so the status of the system can be understood at a glance by everyone involved" (Womack and Jones 1996). Transparency can further provide feedback on performed activities, fascilitate coordination by revealing interdependencies, support decision-making and enable improvements (Bausch 2004). A common denominator, according to Klotz, Horman et al.(2008), is how transparency enables increased participation, and how it provides stakeholders with the ability and authority for decision-making. The human factor of transparency is emphasized by (Drucker and Maciariello 2009):

"There are, indeed, some principles of organization. One is surely that organization has to be transparent. People have to know and have to understand the organization structure they are supposed to work in. This sounds obvious – but it is far too often violated in most institutions (even in the military)."

Inspired by phenomena and characteristics of materials from geology, Lamming, Caldwell et al. (2004) develop three *degrees* of transparency: opaqueness, translucency and clarity. With allusion to the geological term, transparency is characterized as an element of, and not only a property of the substance – the substance in this case being enterprises in supply chain relationships. "Black hole" and "dazzle" are used to describe the two unmanageable situations where no information is released from the enterprise or too much information is available, respectively. There can also be a "transparency illusion" – a gap between nominal and effective transparency (Heald 2006). If there is to be effective transparency, one is dependent on receptors capable of using the available information. Abscence of capable receptors may lead to an overall reduction in effective transparency if nominal transparency increases (cf "dazzle").

The concept of integration of supply chains is also relevant to our conceptions of transparency. Muckstad, Murray et al. (2001) present the following characterization of supply chain collaboration:

1. *Communicators* - companies with basic integration. Customers place orders and the company is expected to deliver within a requested lead-time. The level of information systems- and business process integration is low;

2. *Coordinators* - such companies capture and share more detailed operational data, but decision systems are not integrated at strategic or tactical levels. Business processes are usually not highly integrated;
3. *Co-operators* - supply chain relationships where customers share information to the extent that they communicate plans that are out of the ordinary. This require both integrated information infrastructure and business processes support;
4. *Collaborators* - companies work together at strategic and tactical level. They execute collaboratively to achieve the maximum system effectiveness. Information systems and business processes are highly integrated.

2.2 Management of interdependencies

«Coordination is management of interdependencies between activities»(Malone and Crowston 1994). Interdependencies include sharing of resources, synchronization of activities, and prerequisites activities. The components of coordination are illustrated in Figure 1. Coordination can be either predefined or situated (Lundberg and Tellioğlu 1999). Predefined coordination takes place prior to the situation being coordinated. It typically consists of establishing written or unwritten rules, routines, procedures, roles, and schedules. With perfect predefined coordination, the actors involved in the coordinated activities need not inform each other of what to achieve (goal), who does what, how the work can be divided, in what sequence subactivities should be done, when to act etc.

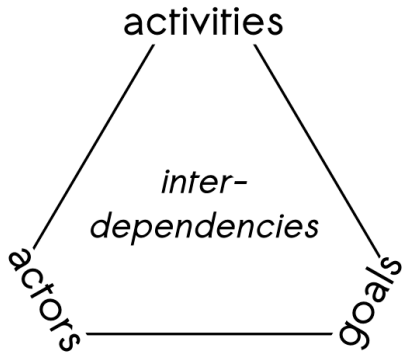

Figure 1: Relation between actors, activities and goals

Situated coordination, on the other hand, occurs when a situation is unknown and/or unanticipated. Those involved in the situation don't know in advance how they should contribute. They lack knowledge of what to achieve, who does what, how the work can be divided, in what sequence subactivities should be done, when to act, etc. Consequently, they have to improvise and coordinate their efforts ad hoc.

Even with extensive predefined coordination, work often also requires situated coordination to deal with variation and unforeseen events. In most collaborative efforts there is a mix of predefined and situated coordination. Involved actors may for instance already know the goal, but not who performs what, or they may know who does what but not when to do it. To compensate for lacking predefined knowledge of how the actual unfolding of activities will be, actors must update themselves on the status of the activity/situation. They need awareness of what is going on. An actor – by virtue of having knowledge of rules, roles, procedures, flow of work, joint goals, etc – is able to understand the progress of work without having to explicitly ask for it or be informed about it by his coworkers. Sufficient transparency enables actors to see changes in their common workspace and interpret the current status, enabling

alignment of ones activities with those of coworkers. Bardram refers to this type of coordination as «instrumental coordination» (Bardram 2000).

2.3 Dimensions of transparency and mechanisms for coordination

According to Heald (2006), transparency may take four directions: Upwards, downwards inwards, and outwards. 'Upwards transparency' is meant to describe a hierarchical principal-actor situation where the subordinate actor's actions can be observed by the principal. Beeing able to see and understand what actors do, the principal makes decisions and integrates and coordinates the work of several actors. Thus 'upwards transparency' facilitates 'direct supervision', one of six basic mechanisms for coordinating work in organizations suggested by Mintzberg and Glouberman (2001). The other five coordination mechanisms are: mutual adjustment and standardization of work, outputs skills and norms.

Downwards transparency is the opposite of upwards, ie. when the principal can be observed by subordinate actors. Downwards transparency is fundamental in democratic theories and is an important component of accountability (Heald 2006). 'Downwards transparency' facilitates coordination by standardization of output. Being able to communicate to actors about updated goals of the organization, total performance, consequences of breakdowns and current/preliminary results, enables the actors to adjust their efforts accordingly.

Inwards transparency describes the ability of outsiders to observe what is going on inside organizational boundaries. Inwards transparency constitutes a fundament for freedom of information, also an important democratic principle. Outwards transparency, on the other hand, describes the observers' inside the organizational boundaries ability to observe the surroundings and monitor its peers and competitors. Inwards and outwards transparency enable organizational units to mutually adjust. Mintzberg and Glouberman (2001) claim that mutual adjustment is the most direct of the six basic coordination mechanisms. Mutually adjustment requires understanding of ongoing activities. Having a mental model of the activities of coworkers is referred to as 'mutual awareness' (Schmidt and Simone 2000). Mutual awareness enables individual workers to coordinate themselves by adjusting their own work to the work of others during the unfolding of activities. In summary, situated coordination is facilitated by mutual awareness, and mutual awareness is facilitated by inwards and outwards transparency.

«Reciprocal awareness is a special case of mutual awareness» and should be understood as «A's awareness of B's monitoring of A»(Schmidt and Simone 2000). In other words, «I know that you are aware of what I am doing». Reciprocal awareness enables A to modify his actions if he wants to emphasize (or hide) certain queues about his activities or intentions. Inwards transparency facilitates transmission of such queues, but without a balanced level of inwards and outwards transparency, reciprocal awareness becomes low and one or both actors may have a sensation of surveillance.

The timeliness of information significantly influences transparency. Instant and continually refreshed information on the operational level is fundamental to modern production paradigms such as lean (Womack, Roos et al. 1990) and agile manufacturing (Gunasekaran 1999). The Toyota Production System deploys a number of tools to achieve real-time operational transparency (Ohno 1988). Among these are huge overhead displays with information on performance, zones with different colors on the floor along the conveyor belt to expose where additional resources are needed to avoid delays, and kanban cards that

communicate a need for parts. The techniques used within Toyota Production System are generally closely related to visualization and visibility.

Klotz et al. (2008) suggest nine dimensions of transparency, using them in an attempt to measure effects of process mapping. They stratify their nine dimensions into three distinctive groups – recognition, facilitation and enabling. Their nine dimensions are: Recognition of status; Recognition of problems; Recognition of responsibilities; Recognition of interdependencies; Facilitation of system performance understanding; Facilitation of feedback on performed activities; Facilitation of communication; Facilitation of improvements; and Enabling decision making.

3 A framework for understanding transparency

Based on the presented theoretical background, we now develop a rudimentary framework for transparency. We use the dimension of time to organize our framework because the purposes of and the mechanisms and tools for obtaining transparency pre-, per-, and post-activity differ (see Table 1). Pre-activity transparency pertains to plans for an activity. Per-activity transparency is related to an ongoing activity. Finally, post-activity transparency has to do with completed activities. Each of these types of transparency may be provided real-time or with a time delay. Moreover, an activity can have a duration of anything from less than a second to many years. Activities can also be divided into sub-activities. The differentiation between pre-, per-, and post-activity transparency is not dependent on activity duration and activity-level hierarchies.

	PRE	PER	POST
Dimensions of transparency	Recognition of: - Responsibilities - Interdependencies	Recognition of: - Status - Problems	Fascilitation of: - Performance understanding - Feedback
Mechanisms	Predefined coordination - Standardization	Situated coordination - Supervision - Mutual adjustment	Learning - Improvement
Tools for obtaining transparency	Production plan Schedule Procedures/Scripts Roles Specialization Strategies Establish company culture	«Walking the factory floor» Shared workspace Visual control Common information space Kanban Enhanced communication	Measurement Accounting Evaluation

Table 1: A rudimentary framework for transparency

We adopt six of Klotz et al's nine dimensions, stratifying these by the dimension of time (pre, per, and post). Recognition of responsibilities and interdependencies is primarily of concern before the realization of a given activity. Recognition of status and problems on the other hand, are primarily related to transparency into an ongoing activity. Similarly, post-activity

transparency can improve understanding of performance and feedback. We omit Klotz et al's three remaining dimensions as we consider these to be integral consequences of providing transparency in the first six dimensions.

Each of the described transparency dimensions can be characterized as inwards, outwards, upwards, and/or downwards. Finally, we adopt the described levels supply chain collaboration to denote the level of integration between parties.

4 Transparency in a hospital and a leisure boat manufacturer

4.1 Transparency in perioperative processes

We use perioperative processes to demonstrate transparency in hospitals. A patient's journey or trajectory from a hospital ward to the operating room, onwards to the recovery room, and finally back to the ward constitutes the in-patient perioperative process in such hospitals. This process involves the patient's crossing of the organizational boundaries between the ward and the operating room, between the operating room and the recovery room, and between the recovery room and the ward. The patient's journey also involves the passing of work and information across these same organizational boundaries.

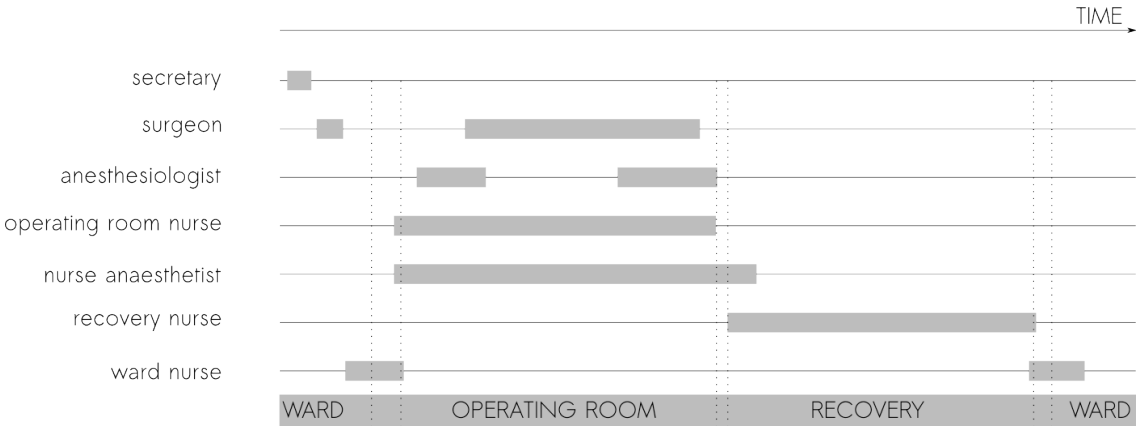

Figure 2: The in-patient perioperative process

A number of roles are involved in the work required to ensure the success of patients' perioperative patient trajectories. Some roles are required for all perioperative patient trajectories, while other roles are required for specific cases and patient groups. The involved roles can be characterized as "stationary" (i.e. mostly work with activities in one room/location), "nomads" (i.e. work with activities in several locations), or "coordinators" (i.e. work with coordinating involved actors, resources, and patient trajectories). Figure 2 illustrates a patient trajectory and how different roles contribute to it. Examples of nomad roles include the anesthesiologist and the surgeon. The prior is responsible for providing anesthesia in two operating rooms in parallel, while the surgeon has duties to attend to between cases. The operating room nurses and anesthesia nurse involved in the trajectory have more stationary roles, residing in the operating room throughout the case. Finally, a coordinator (not shown in figure) manages the interdependencies between involved actors (or resources), goals, and activities, ensuring the effective realization of the patient's perioperative trajectory.

Pre-activity transparency in the perioperative environment involves actors' recognition of responsibilities and interdependencies pertaining to a particular patient. For instance, surgery requires the availability of an operating room and surgical equipment, the presence of one or more operating room nurses, one ore more surgeons, and anesthesia service (may be provided interchangeably by anesthesia nurse and an anesthesiologist). Predefined coordination for the specific case involves detailing out an operating room schedule. Roles, specialization, and procedures are also instances of predefined coordination, but these are more static with validity for all cases of the particular type (not only the particular patient).

Per-activity transparency in the perioperative environment involves actors' recognition of status and problems. For instance, the previous case in the operating room where the operation will take place may have incurred a delay, thus delaying the start of our patient's case. Similarly, hospitals some times cancel cases, e.g. due to other patient illness. By recognizing this problem in time, the operating room may be able to put a different operation on the schedule, utilizing the freed capacity. For personnel with responsibilities for parts of a case that is cancelled, recognition of the occurred problem may allow them to attend to other tasks without wasting time. Recognition of status and availability of needed resources and problems in ongoing activities enables situated coordination and adjustment of plans.

Post-activity transparency in the perioperative environment involves the facilitation of performance understanding and feedback. Getting feedback and understanding performance is a prerequisite for learning and improvement. Operating room suites typically measure performance in terms of e.g perioperative times, turnover times, utilization operating rooms and operating room teams, and cancellation rates. By monitoring such measures, one can detect systematic shifts in performance. When detected, action can be taken to stop and reverse deterioration in performance. Similarly, improved performance can be awarded and reinforced. Feedback and performance understanding allows for improvement and double loop learning on both an individual and system level (Argyris and Schön 1996).

4.2 Transparency in leisure boat manufacturing

Traditional "high end" leisure boat manufacturers are largely craft manufacturing companies. Nevertheless, their performance and the quality of their end product depends on their suppliers. We use one such "high end" leisure boat manufacturer and a key supplier for this company to illustrate transparency within and between two actors in a leisure boat manufacturing supply chain. This particular part of the supply chain is illustrated in Figure 3.

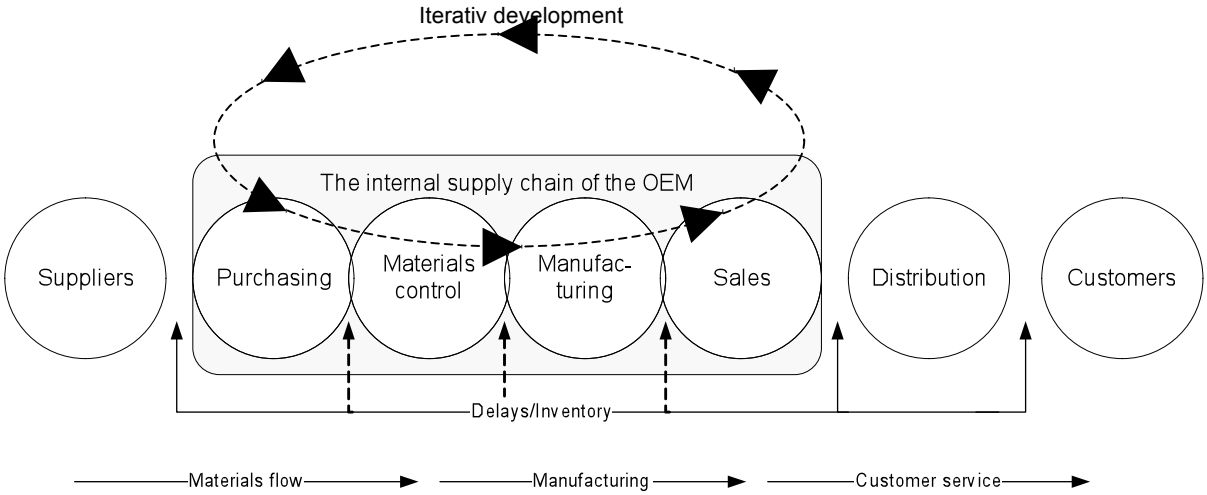

Figure 3: Leisure boat manufacturing supply chain

Pre-activity transparency within and between the two companies involves actors' recognition of responsibilities and interdependencies. The activity of manufacturing one of the popular boat models takes approximately 8 weeks. This requires predefined coordination of production and deliveries from the supplier. It also requires predefined coordination of the concerted internal effort of the manufacturing company to produce the hull, mount the engine, water tanks, interior, and equipment – an effort that involves a multitude of roles and skills and several organizational units. This predefined coordination is made explicit in a production schedule, and is also rooted in set roles and generalized responsibilities for specific tasks

Per-activity transparency within and between the two companies involves actors' recognition of status and problems. Examples of status include the supplier's progress in manufacturing required parts, what activities the production engineer, electrical engineer, and carpenter are engaged in, and how far the production and assembly of the leisure boat has come. Problems can for instance be sub-standard quality of parts delivered by the supplier, difficulties in mounting e.g. the engine, and challenges in balancing the boat. The leisure boat manufacturer conducts 15 minute "stand-up-meetings" each morning in order to support situated coordination and provide per-activity transparency to involved workers by going through current status and problems

Post-activity transparency within and between the two companies involves the facilitation of performance understanding and feedback. In these companies, post-activity information is primarily shared on an informal basis in personal contact. Personal notes about the manufacturing processes are common, but the developed knowledge remains with each worker. The companies are currently working to develop approaches to improve post-activity transparency in order to facilitate learning and continuous quality improvement.

5 Concluding remarks

This paper presents a rudimentary framework for transparency. It consists of six dimensions of transparency and mechanisms and tools for achieving transparency, all stratified by the

dimension of time. Although thoughtful organization of work can improve transparency, the complexity of modern organizations calls for solutions based on information and communication technology. The design of such technologies should be based on an understanding of the different components of transparency.

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