

Information Management, Lean and Efficiency: Are We Focusing on the Customer?

Karin Ahlin

*PhD student Mid Sweden University
Akademigatan 1, SE-831 40 Östersund, Sweden
karin.ahlin@miun.se*

Pernilla Ingelsson

*PhD; Mid Sweden University
Akademigatan 1, SE-831 40 Östersund, Sweden
pernilla.ingelsson@miun.se*

Abstract

Purpose: The purpose of this paper is to examine what happens with the internal view an organisation has on information management when a holistic view is diminished into a blinkered view and the consequences it conveys for the customer. The customer consequences are divided into two parts – creation of external customers' values and creation of value for the internal customer explored in terms of efficiency.

Methodology/Approach: Interviews with both outsourced co-workers and project leaders still in the organization.

Findings: The organisations lack of listening to the external customer affects all three areas lifted in the analysis. The studied organisations have great opportunities for developing their process for producing TI, both regarding their mutual relationship as well as in regards to the external customer with the help of Lean and by applying a more holistic view on the production of Technical Information.

Keywords: Information management, Lean, Customer value, Technical Information, Efficiency

Paper type: Case study

Introduction

In the manufacturing process, the production of various products is the base (Storga 2004). The product consists of different parts as does the information connected to it (Porter and Millar 1985). The classic value chain contains product and information within closed boundary organizational walls. However the information that belongs to the organization also has an impact on the customers as well and therefore creates its own boundaries. The former organisational boundaries change due to information's impact and give rise to information boundaries (Sawy, Malhotra et al., 1999). As a result, in this extended value chain, customers, in combination with products' information, have more impact on the internal organizations, an impact which has developed and increased due to improved information technology during the last decades (Wallace 2011). The rise of technology has improved our access to the information and for the manufacturing process, this means easier and better access to the technical information, in pragmatic ways categorized as the structured information (Wallace 2011). Technical Information (TI) is characterized by information that enables a safe and environmentally-friendly introduction, usage, maintenance and destruction of products and services (Asproth, 2011). In other words TI is connected to its product life cycle and due to its tight connection has a high impact on the quality of it.

Focusing on quality and thereby creating value for the customer is the foundation of most initiatives within Quality Management. One initiative that is gaining more and more attention and is being applied in many different organizations is Lean. Within Lean long-term thinking, a system view, and customer focus are fundamental alongside the notion of eliminating waste in the organization's value flows. Liker (2004) describes Lean by means of 14 principles divided into four parts of a pyramid, the '4 P' model. The bottom of this pyramid and the most important factor for success is the value 'Long term thinking' (ibid). According to Bicheno & Holweg (2009), a system approach is very essential for Lean. They define a system approach as focusing on the organization as a whole before paying attention to the parts (ibid). Emiliani (2010) states that the reason for applying Lean has to be for the benefit of the customer, not for internal company reasons since understanding what the customer really needs and what builds customer value in an organization is essential for business success.

The context for this study is a manufacturing company which uses Lean, with technical information as an outsourced sub-process. In general, the view on TI and its contribution to businesses in different business sectors is seldom clearly expressed (Slumpi, Ahlin et al. 2012). If it is expressed, it is more in terms of softer valued benefits and rarely in terms of financial incomes. To look upon the product, containing a physical and information part (Porter and Millar 1985) is to look at and develop only a single part of it and not take a holistic view. This blinkered view flows through this study's whole organization and also occurs in discussions with the customers. The purpose of this paper is therefore to examine what happens with the internal view an organization has on information management when a holistic view is diminished into a blinkered view and the consequences it conveys for the customer. The customer consequences are divided into two parts – creation of external customer values and creation of value for the internal customer explored in terms of efficiency.

Theoretical pictures

To discuss this paper's purpose we have made a theoretical framework containing pictures from both the field of Information systems and Quality Management. The starter is the holistic system view from both fields continuing with management of information and completing with the two customer perspective, external in eyes of value and internal in eyes of efficiency.

System view

Overall distinctions of system views or an epistemological way to describe system are to divide them into hard system and soft system thinking (Checkland, 1985). The hard system thinking describes an efficient way of seeking solutions to problems and thereby reaching the goal. The engineers who design the systems are, in this sense, providing the users with rational ways to reach the organization's goals. The soft system is oriented towards learning and acknowledges that there are human ingredients in problem-solving, which makes the world problematic, but understandable by using different models. These aspects of hard and soft system thinking can be seen as being represented by the values continuous improvement and focus on people within Lean (see, for instance, Liker, 2004 and Emiliani, 2007). Furthermore, the system approach is defined as focusing on the organization as a whole before paying attention to the parts (Binero & Holweg 2009). Lean emphasizes the supply chain, where the production within the organization is a part of a value stream from the sub-suppliers to the ultimate customer (Womack & Jones, 2003). Seddon (2005) claims that managing the organization as a system is, among other things, to have an outside-in perspective and has a design based on customer demand, value and flow. Deming (1994) defines the system as a network of independent components that work together to try to accomplish the aim of the system. There has to be an awareness and understanding that functions and activities are held together in processes (ibid).

Information Management

One part of the product system is the information which from an internal perspective in an organisation can be viewed from different angles. The operational view and its connection to the process is one angle (Davenport and Prusak 1997). From an information management (IM) view, information is looked upon as a resource which has to be governed in a lifecycle perspective and where different questions are raised during different lifecycle parts (Best, 2010). Managers have to face responsibility for planning, deciding and focusing on governance of the whole lifecycle of operational and organizational information (ibid; Reponen, 1993). Best (2010) argues that the purpose for implementing yet another management structure is to increase the internal organizational performance. In close relation to Best's declaration is Detlor's (2010), which states that IM's goal is to help both individuals and organizations to access, process and use information efficiently and effectively. The expected result will hereby be that the organization operates better and more in alignment with their strategic goals.

The strategic view of IM is a holistic one, operationally given by guidelines for lifecycle perspectives on digitalized information (Reponen, 1993). As a result of the planning phase, a strategy profile is produced and the organization's attitudes towards the specified topic are also included (ibid). Inside organizations, information can be managed operationally on a scale from solo monarchy to the other end point of the scale, in an anarchistic way (Davenport, Eccles & Prusak, 1993).

A practical way to discuss information as such is achieved by describing its formalization (Yeo, 2002). Usually categorization for information is done in structured- or unstructured information (Ferruci & Lally, 2004; Wallace, 2001) and data (Rodrigues, 2002). The structured information has metadata connected to it and is therefore easy to obtain an overall view of big quantities. These quantities can be used as a foundation for different kinds of decisions and thereby create new information (Langefors, 1996). Commonly viewed extract from structured information is seen as knowledge (Rowley, 2007), in a pyramid metaphor, where the individual or/and organization has impact on the creation and maintenance of knowledge.

External customer satisfaction – value

The word quality raises a lot of different associations and expectations and according to Dale (2003), the fact that the customer makes the quality judgment seems to be something present in most definitions of quality. The definition that forms the basis for this article is the one given by Bergman & Klefsjö (2010); “The quality of a product or service is its ability to satisfy, or preferably exceed, the needs and expectations of the customers”. Customer value is often described as the difference between the total customer value and the total customer cost (monetary and sacrifice) of a product (goods or services) (Kotler, 2000). Delivering customer value requires a clear understanding of exactly what kind of value is desired by customers. Importantly, customer value is not inherent in the product or services themselves; rather it is experienced by customers as a consequence of using the supplier’s product and services for their own purposes (Woodruff & Gardial, 1996). Value can only be defined by the ultimate customer according to Liker (2004).

In this paper the customer is seen as the person or persons using the TI. The external customers are viewed as the end customer or user and the internal customers as users within the organization that has outsourced TI. From a product or service point of view value can be seen as the sum that the customer is willing to pay for it (Barber & Tietje, 2008).

Information as such is valuable for the entire organization and more valuable when it contains certain qualities (Wallace, 2011). Although the customer satisfaction given by information quality is hard to predict and changeable between different customers given characteristics are overall predictable. The design will also be affected by the different customer requirements (Löwgren & Stolterman, 2008). As designers tend to use templates to produce systems, the more user and customer requirements, the greater the number of templates. Quality, and as a result of this customer’s input, can therefore also be seen in the number of templates used to modularize and design a system.

Internal customer satisfaction – efficiency

Ljungberg and Larsson (2012) states that all processes are part of a network of processes, that information is exchanged between different parts throughout the process and that resources need to be available. According to Egnell (1999), the advantages of focusing on processes are: decreased risk of sub-optimizing and discrepancy between different functions in the organization, fewer unnecessary activities, higher work satisfaction, reduced costs, clearer aims and a higher inclination to do the right thing from the beginning. Modig and Åhlström (2012) state that Lean is a change from resource focus to customer focus and that the processes are central for creating value for the customers. They believe that processes are the building blocks of an organization and that the processes need to be defined from the perspective of what flows through them not from the various functions within an organization (ibid). Both Womack and Jones (2003) and Liker (2004) are clear about the importance of defining value from a customer point of view,

arranging the processes, or value streams, to create this value and then making the value flow through the processes. This value flow should also include the information flow since these are two sides of the same coin (Rother and Shook 2004). Waste reduction is something many people associates with Lean. According to Bicheno and Holweg (2009), value is the converse of waste and waste elimination is seen as a means to achieve Lean – not an end in itself. The elimination of waste is closely linked to creating flow in an organization’s processes (Womack and Jones 2003 and Liker 2004). Bicheno and Holweg (2009) list the traditional seven types of waste defined by Taichii Ohno as: overproduction, waiting, unnecessary motions, transporting, over processing, unnecessary inventory and defects. Very often an eighth type of waste is added, that of untapped human potential (ibid)

To work with the things the customer requires, organizations have to confront two different questions – “Are we working with the right activities inside our organizations?” and “Are we doing appointed activities the right way?”. The first concept is named effectiveness and the second efficiency (Luftman, 2000). In this study we will discuss efficiency that puts pressure on the organization to be curious and think in new directions (Ljungberg & Larsson, 2012). These authors claim that in order to create permanent new thinking, structural preserving components like norms, culture and structures need to be changed. Modig & Åhlström (2012) state that within Lean the focus for creating efficiency needs to be flow-oriented instead of resource-oriented. Measuring is the starting point for improving operational performance but the challenge lies in measuring the right things and using those measurements as the basis for managing performance improvement (Radnor and Barnes, 2007). Saad and Patel (2006) also stress that there have been few attempts to measure the performance at inter-organizational level and these have been essentially focused on tangible and financial factors.

Research approach

The aim of the paper was met by combining two different search fields within the academic world – Quality Management and Information Systems. The connecting bridge between these two fields is spelled Management, both included in the definitions of the academic fields. In Total Quality Management this is done by i.e. Hellsten and Klefsjö (2000):

“A continuously evolving management system consisting of values, methodologies and tools the aim of which is to increase external and internal customer satisfaction with a reduced amount of resources.” (Hellsten & Klefsjö, 2000 p.241)

And in Information Systems by (Holmberg 2005):

“Structure and properties of information and communication as well as theory and methods for the transfer, organizing, storage, retrieval, evaluation, and distribution of information, and furthermore information systems, networks, functions, processes, activities that mediate knowledge from source to user and are based on general systems, cybernetics, automation, and technology for human work environments in timely and current praxis.” (Holmberg 2005,p. 3)

Method

In practice we conducted this by using a qualitative research method to meet the study's purpose. A single case study (Yin 2009) was used and looked upon as a single case even though two different organizations were included. The connecting part of these two organizations is the production process of TI and therefore they are viewed as an entirety. The two organisations cooperate in the same production process of TI due to an outsourcing project. Since the study was held on a general level and used to illustrate theoretical material one case was deemed sufficient by the authors. The theoretical pictures were built with earlier research from the area of Information Management and Quality Management. Since the study is undertaken in order to understand the theoretical pictures, the study may be categorized as an explorative study. The theoretical pictures are compared with the study's organizations where primary data is collected via interviews of employees. Data, in smaller quantity, was collected through the website's of respective company. A few documents were also available through Alpha's management. The analysis was conducted via an interpretative research process, which basically involves collecting and interpreting theoretical and empirical data in an iterative way (Walsham, 2006). This study has an inductive analysis, which is seen as inferences made from particulars to generalizations (Krippendorff 2012).

Content to the empirical material was collected by five interviews held at the office of each respondent. In table 1 is the working role and organisational belonging to each respondent.

Person	Working role	Organisation
A	Team manager Technical Information location A	Alpha
B	Team manager Technical Information location B	Alpha
C	Responsible outsourcing location B	Beta
D	Project manager delivery location B	Beta
E	Project manager deliver location B	Beta

Table I: The study's respondents

The interviews lasted between 70 and 90 minutes and one of the authors attended all the interviews. Afterwards the interviews were transcribed verbatim and content were categorized according to the four categories:

- Studied organisations
- Context description technical information
- External customer perspective - value
- Internal customer perspective - efficiency

The categories were constructed in coordination to the purpose of the paper – to analyse consequences for information management, internal and external customer in the study's context.

Empirical pictures

In this chapter the two organizations Alpha and Beta are presented and also empirical pictures from the interviews. The empirical pictures are divided into: Context description technical information; External customer perspective – value; and Internal customer perspective – efficiency.

Studied organisations

Alpha is a consulting company specialized in management and operational development of TI and they have been working in the field of TI since the mid 1990s. The company operates in seven countries around the world, including Sweden, and the total number of employees is approximately 600. In Sweden there are seven different office locations and the company is part of a group organization. Discussed on their web-site is their strategic goal, which is to be a: "... leading, global supplier of information services. We will deliver best-in-class services, solutions, and quality to our customers."

Beta is a part of a worldwide group of technical companies in the process industry and they are in total more than 27 000 employees. The group has companies working with mining, construction, recycling, pulp and paper, power and oil and gas. Beta is specialized in manufacturing, maintenance of equipment and services for pulp and paper industry and has approx 700 employees.

Context description technical information

Beta outsourced the technical information department in 2010. The company which won the outsourcing contract was Alpha. Stipulated in the contract is that Alpha is responsible for producing and delivering customer documentation connected to the products both to the internal and external customer. The staff at the TI department are now employed by Alpha, but they are still working with the same tasks as before the outsourcing was done. Beta has implemented Lean in their organization and uses it when they, for example, develop new products in their projects. The TI department is not involved in this way of working and the Lean initiative has not been extended to include the sub-supplier of TI; they are working alone in their process without any influence from others.

The technical documentation that is produced consists of customer documentation that includes instructions for installation, operation, maintenance and quality documentation. The customer documentation is created by Alpha partly in collaboration with Beta and also partly in cooperation with sub-contractors providing the developed products.

From an organizational point of view, Beta's construction department is responsible for the documentation and the documentation is seen as a part of the product, but not as a part of the core business. This is the underlying reason why the outsourcing has been done to Alpha. The purpose of the outsourcing was to get better competence in producing TI, better efficiency in the production process of TI and as a result of this a decrease in costs when making the TI. It also provides access to more convenient information systems. Since documentation is not viewed as a part of the core business and yet is still a part of the product delivery this makes its position ambiguous and dependent on what the paying customer demands. Some customers view TI as extremely important to be able to install and use delivered products and therefore have a clear demand picture whereas other customers just put the covers on the shelf. Internally, in Beta, TI has low status and for them it just is something of a necessary evil.

External customer perspective - value

Requirements on TI can be seen from different customer's perspective. Beta's overall requirement is that TI has to be produced in an efficient way and the internal installation assembler wants it to be correct and delivered on paper. TI is brought to the external customer in a standardized way and Alpha's experience is that the external customer seldom imposes any requirements on TI, except translation. Neither Alpha nor Beta have done any surveys or investigations of the external customers'

2. Karin Ahlin, Pernilla Ingelsson *Information Management, Lean and Efficiency: Are We Focusing on the Customer?*

requirement of nor what could make their work more efficient by using TI. Both Alpha and Beta have thoughts and ideas about making external customer surveys in the future. New features or requirements of the content of TI are posted by the employees themselves and are almost always connected to the outsourcing contract where financial efficiency is estimated. New laws and regulations can put demand of new content, especially as regards the quality documentation. These new requirements occur little by little and Beta's respondents think that there will be an increased number of quality documents in the future.

When discussing what kind of value TI brings to the internal and external customer, several of Beta's respondents answers that we measure the value of TI in numerical values, like punctual delivery. If the delivery is not made in time, Beta's contracts with external customers stipulate a delayed payment penalty. In the outsourcing contract between Alpha and Beta all stipulated measurements refer to cost aspects and the internal customer aspects, such as number of hours of discussion with the Beta's ordering part.

As regards TI's value, the overall value perspective is the external customer – like an assembler, montage company, user and Beta's own support staff. Occasionally Beta views TI as valuable in form of marketing material or education material. The external customers often use the digitalized TI as a part of their own product management systems and the paper version is used as a moveable reference book.

The respondents refer to the independent and standardized production process and discuss its value result in terms of correct terminology, a uniform and user-friendly layout and good traceability for the documentation. The rest of the organization looks upon the process as stand-alone and do not want to be involved at all. This view has been the unspoken rule for a long-time and has not changed due to the outsourcing. When we asked the respondents whether it was possible to stop producing and publishing TI, the answer was no and reference was made to the external customers' knowledge process.

Internal customer perspective - efficiency

There is an overall intention in the outsourcing contract to make the production process of TI more effective during the contract period. To make it more efficient is symbolized by reducing cost and nothing else. Follow-ups of this overall intention are done yearly and in line with the agreed roadmap. The measurements are done by appreciations of percentage and seen in form of reductions in working hours or cost for a special activity. At the annual contracting meeting, the perceived percentage is negotiated and agreed upon.

Despite the fact that there are measurements for reprocessed working hours or costs, both parts experience difficulties in measuring efficiency. They discuss the difficulties in terms of not measuring on the needed detail level, not enough historical measurements and that both parts do not agree upon produced measurements. They have not agreed upon which source for time estimate to use – one respondent uses the financial Information system and one other respondent knowledge from a long work life at Beta.

Analyse and discussion

Information Management

The study's information context is technical information in the form of structured information (Wallace 2011), where organisational management of the information is clear in its different roles. TI has a low priority from the organizational owner, the construction department. In

2. Karin Ahlin, Pernilla Ingelsson *Information Management, Lean and Efficiency: Are We Focusing on the Customer?*

37

the life cycle perspective information should be managed in all phases to obtain its full value (Best 2010). In this case production of information is outsourced and management is diversified between the two organizations. Since information is not seen as a full valued part of the product (Porter and Millar 1985) the conclusion is that a strong and one-handed management is not considered necessary. As a result, information is used neither to its full extent nor as a competing advantage. This is also emphasized by the low competence about customers' requirement for the information. This view should be seen in the context of one respondent's answer to the question about stopping production of all TI, where the answer is that this would decrease the customers' knowledge about delivered products. Today's information design is based on a hard systems thinking rather than a soft systems thinking (Checkland 1985) as rationale causes like strict process thinking is used when TI is produced. In contrast to soft systems thinking which is oriented to learn and also the Lean-perspective based on designing the organization to meet the customers' demands (Seddon, 2005). There is no intention to use the knowledge of the staff within the TI production process or involve them in the organization's main processes, which can be seen as the eight waste within Lean, that of untapped human potentials (Bicheno and Holweg 2009).

To further analyse the lack of interest in producing required information is also by extension to discuss the degree of freedom for the customer. The freedom is limited when decisions have to be taken (Langefors, 1996) and in long-term product knowledge. For Beta this is a failure to use its full business potential and the competitive advantage information can bring.

External customer perspective - value

In the extended definition of process the customer has a central role (Ljungberg and Larsson 2012). Womack and Jones (2003) use the customer and their requirements as a starting point for the processes, or the value streams. To Alpha the customer Beta is very concrete and they have a clear view about their relationship and what they require in the form of output. This knowledge is due to the close connections achieved by sitting in the same office locations and the knowledge gained from previous employment. What are missing are the requirements from the user of the information, foremost the external customer. As a result, produced information is created without any response from the customers. The design of such a production system could be used by using standardized templates (Löwgren and Stolterman 1998) and hereby produce more and more opportunities for the customer. From the customer requirements the information systems in use for producing TI could be upgraded and new features installed and used.

The value of a product or service is the sum that the customer is willing to pay for it (Barber and Tietje 2008). At Beta they only look at the cost part of TI and never on the income part. Due to this way of considering TI, as just rendering cost, it is hard to understand what the income could be.

The value creating activities that exists within a process will be defined as activities that the customers see as valuable (Ljungberg and Larsson 2012). For Beta and the overall process description there is a difficulty in describing what the external customer considers as important since this knowledge does not exist. The clarity towards the external customer is vague as regards new thinking and by this line of action the process as such is not developed, something which Ljungberg and Larsson (2012) discuss in terms of curiosity and change of culture. The internal customer, Beta, views quality as something important and believes that activities related to the quality aspect should be rewarded however today there is no such measurement value among the existing ones. In addition the definition given to quality is mainly based on internal company

opinions on what the customer wants and not based on external customer requirements. This in turn can lead to a failure to meet the real needs and expectations in accordance to Bergman and Klefsjö (2010) definition of quality.

Internal customer perspective – efficiency

Efficiency can be described in terms of doing activities the right way (Luftman 2000). In this study, Alpha and Beta are doing this by follow an agreed roadmap where there is a mapped path for increasing the process efficiency. In other words, the producer and the internal customer are deciding the efficiency of the process. In order to define measurements for efficiency, there has to be agreement about what to measure and how (Ljungberg and Larsson 2012). As Radnor and Barnes (2007) point out, the challenge lies in measuring the right things and using those measurements as the basis for managing performance improvement. The studied organizations could benefit from gaining more information on what the customer values in order to agree upon what measurements that are right for them. An improved clarity will raise the joint effort for a more efficient process. Today's measurements concern hours or money and appeal to a hard system thinking and not the softer values (Checkland 1985). The purpose of outsourcing was only partly to reduce cost and the aspects of gaining knowledge and more convenient technology are not being measured even though this was also part of the purpose and could represent the softer measurements. Broadening the selection of measurements and using softer values like perceived quality or knowledge will give another focus on the process and in combination with customer surveys, will probably mirror the customers' perception of quality in a better way. The quality measurements will be inherited from the customer and therefore the importance of the customer impact will be raised more and more.

In addition and in connection to Lean's ideas of only delivering what creates value for the customer and eliminating waste (Bicheno and Holweg 2009) the effectiveness of the process for producing TI could also be measured since this focuses on doing the right activities in a process (Luftman 2000).

Conclusions

Not taking the starting point in what the external customer needs and expects can have consequences in a number of areas – i.e. missed business potentials that TI could give the company in the shape of TI as a way of increasing the value of the product if adapted to customer needs. It could also affect customer satisfaction negatively given the internal perspective on defining quality, which in turns could lead to the customer not getting what he or she really needs in the day-to-day operation (Woodruff and Gardial 1996). This also has an effect on what the organizations measure in form of efficiency and could influence the choice of measurements to better reflect the customer's perception of what is value and quality in TI.

As TI is not seen as valuable Beta, the owner of it, see no potential in developing it and in the long-term perspective no need for new technical implementations, like new information systems or new technical aids. Connected to the management of information the full customer value in terms of information as a base for knowledge is not supported (Reponen 1993).

In conclusion, it can be said that Alpha and Beta have great opportunities for developing their process for producing TI, both regarding their mutual relationship as well as in regards to the external customer. If Lean were to be used in the process for producing TI and to develop the sub-suppliers of TI, this could give new business opportunities, a greater internal understanding of the values of TI as well as better use of the TI personals competence; thus creating a fruitful bond between the internal and external customer perspective.

References

- Asproth, V. (2011). Slutrapport för projektet Teknikinformationscentrum 2007-2011. *Projektet TIC*. V. Asproth. Östersund, Institutionen för Informationsteknologi och Media.
- Barber, C. S. and B. C. Tietje (2008). "A Research Agenda for Value Stream Mapping the Sales Process." *Journal of Personal Selling & Sales Management*, Spring (2): 155 - 165.
- Bergman, B. and B. Klefsjö (2010). *Quality: from Customer Needs to Customer Satisfaction*. Lund, Studentlitteratur.
- Best, D. P. (2010). "The future of information management." *Records Management Journal*, 20 (1): 61-71.
- Bicheno, J. and M. Holweg (2009). *The Lean toolbox : the essential guide to Lean transformation*. Buckingham, PICSIE Books.
- Checkland, P. (1985). "From Optimizing to learning: A Development of Systems Thinking for the 1990s." *The Journal of the Operational Research Society*, 36 (9): 757 - 767.
- Dale, B. G. (2003). *Managing Quality*. Malden, Blackwell Publishing.
- Davenport, T. H., R. G. Eccles, et al. (1993). «Information Politics.» *Sloan Management Review* Fall.
- Davenport, T. H. and L. Prusak (1997). *Information Ecology*. New York, Oxford University Press.
- Deming, W. E. (1994). *The new economics for industry, government, education*. Cambridge, Mass., Massachusetts Institute of Technology Center for Advanced Engineering Study.
- Detlor, B. (2010). "Information management." *International Journal of Information Manage-*

ment, **30**: 103-108.

Egnell, P.-O. (1999). *Processer och processororientering*. Luleå, Centrum för kvalitetsutveckling.

Emiliani, B. (2010). *Moving forward faster : the mental evolution from fake Lean to REAL Lean*. Wethersfield, Conn., The Center for Lean Business Management, LLC.

Ferrucci, D. and A. Lally (2004). "Building an example application with the Unstructured Information Management Architecture." *IBM Systems Journal*, **43**(3): 10.

Hellsten, U. and B. Klefsjö (2000). "TQM as a management system consisting of values, techniques and tools" *The TQM Magazine*, 12 (4): 238-244.

Holmberg, S. C. (2005). *Systemisk Information vid Mituniversitetet*. Mid Sweden University

Kotler, P. (2000). *Marketing management*. Upper Saddle River, N.J., Prentice Hall.

Krippendorff, K. (2012). *Content Analysis*. Thousand Oaks, SAGE Publications Ltd.

Langefors, B. (1995). *Essays on Infology*. Lund, Studentlitteratur.

Liker, J. K. (2004). *The Toyota way : 14 management principles from the world's greatest manufacturer*. New York, McGraw-Hill.

Ljungberg, A. and E. Larsson (2012). *Processbaserad verksamhetsutveckling Varför - Vad - Hur?* Lund, Studentlitteratur.

Luftman, J. (2000). "Assessing Business-IT Alignment Maturity." *Communications of the AIS*, **4**(14).

Löwgren, J. and E. Stolterman (1998). "Developing IT Design Ability Thorough Repertoires and Contextual Product Semantics." *Digital Creativity*, **9** (4): 223-237.

Modig, N. and P. Åhlström (2012). *This is lean : resolving the efficiency paradox*. Stockholm, Rheologica publishing Bulls Graphics AB).

Porter, M. E. and V. E. Millar (1985). "How information gives you competitive advantage." *Harvard Business Review*, July - August, 1985: 149-174.

Radnor, Z., J. and D. Barnes (2007). "Historical analysis of performance measurement and management in operations management." *International Journal of Productivity and Performance Management*, **56**(5): 384-396.

Reponen, H. (1993). "Information Management Strategy - an evolutionary process." *Scandinavian Journal Management*, **9**(3): 189 - 209.

Rodrigues, L. C. (2002). "Business Intelligence: the management information system next step". *Third International Conference on Management Information Systems Incorporating GUS and Remote Sensing*, Southampton, WIT Press.

Rother, M. and J. Shook (2004). *Lära sig se. Att kartlägga och förbättra värdeflöden för att skapa mervärde och eliminera slöseri*. Stockholm, Edita Norstedts Trycker.

Rowley, J. (2007). "The wisdom hierarchy: Representations of the DIKW hierarchy." *Journal of Information Science*, **33**(2): 163-180.

Saad, M. and B. Patel (2006). "An investigation of supply chain performance measurement in the Indian automotive sector." *Benchmarking: An International Journal*, 13(1): 36-53.

Sawy, O. A. E., A. Malhotra, et al. (1999). "IT-intensive value innovation in the electronic economy: Insights from Marshall industries." *MIS Quarterly*, 23(3): 305 - 335.

Seddon, J. (2005). *Freedom from command & control : rethinking management for lean service*. New York, Productivity Press.

Slumpi, T. P., K. Ahlin, et al. (2012). "Intraorganizational benefits from product configuration information - a complementary model". *International design conference - design 2012*. Dubrovnik, Croatia.

Storga, M. (2004). *Traceability in product development*. International Design Conference - Design 2004 Dubrovnik.

Walsham, G. (2006). "Doing Interpretative Research." *European Journal of Information Systems*, 15(3): 320-330.

Wallace, P. (2011). *Information Systems In Organizations*. New Jersey, Pearson College Div.

Womack, J. P. and D. T. Jones (2003). *Lean thinking: Banish Waste and Create Wealth in your Corporation*. London, Simon & Schuster.

Woodruff, R. B. and S. F. Gardial (1996). *Know your customer - New approaches to understanding Customer Value and Satisfaction*. Blackwell Business.

Yeo, K. (2002). "Critical failure factors in information system projects." *International Journal of Project Management*, 20: 241 - 246.

Yin, R. K. (2009). *Case Study Research – Design and Methods*. Thousands Oaks, Sage Publications.