Lean Implementation

The Significance of People and Dualism

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ABSTRACT

Lean, with its origins at the Toyota Motor Company, is a concept that is known to increase effectiveness in manufacturing. The Lean concept is now argued to be relevant not only in manufacturing but in service and health-care delivery as well. The reported results of Lean implementation efforts are divided. There are reports that most of the Lean implementation efforts are not reaching the goal; on the other hand, there are reports of promising results. The divided results from Lean implementation efforts show how important it is to research and identify factors that are barriers to successful implementation of Lean. This thesis aims to contribute knowledge about barriers to Lean implementation by collecting empirical findings from manufacturing and health care and structuring the perceived barriers and difficulties to Lean implementation. My first study aimed to compare similarities and divergences in barriers to Lean described by key informants in manufacturing and health care. The data was collected via semi-structured interviews. Findings showed that the perceived difficulties and barriers are much the same in manufacturing and health care. The second study was a case study at a manufacturing firm, researching how the views on Lean of the managers implementing Lean influence its implementation. Data was collected via semi-structured interviews with 20 individuals and covered all hierarchical management levels in the company. Findings showed that managers' views on Lean influence the implementation but also that learning during the implementation process can alter managers' views of Lean. The third study aimed to research how management of Lean is described in the literature. This was done through a literature review. The findings showed that Lean management is a matter of dualism, consisting of two complementary systems of action, management and leadership, which are related to the two basic principles of Lean, continuous improvement and respect for the people.

Keywords: Lean, leadership, management, implementation, barriers, comparison, development, health care, manufacturing

FOREWORD

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1 INTRODUCTION

This chapter begins with a brief introduction to Lean. There follows a description of the purpose of the thesis, with research questions. The chapter ends with a description of the research design.

1.1 Lean and concept confusion

Lean, with its origins at the Toyota Motor Company, is a concept that is known to increase effectiveness in manufacturing (Sugimori et al., 1977; Krafsik, 1988; Womack et al., 1990; Cusumano, 1994; Womack and Jones, 2003; Kim et al., 2006; Emiliani et al., 2007). Toyota has been successful, and that has inspired a lot of organizations around the world to start a "Lean journey." The Lean concept is now argued to be relevant not only in manufacturing but in service and health-care delivery as well. The relevance in health-care delivery is argued to be the Lean concept's improvement approach through waste elimination, value adding for the customer and flow focus (Kim et al., 2006; Kollberg and Dahlgaard, 2007; de Souza, 2009; Joosten et al., 2009). The reported results of Lean implementation efforts are divided. There are reports that state that most of the Lean implementation efforts are not reaching their goals (Sohal and Eggleston, 1994; Spear and Bowen, 1999; Bhasin and Burcher, 2006; Emiliani, 2006). On the other hand there are reports of promising results for Lean in health care organizations (de Souza and Pidd, 2011; Mazzocato et al., 2012) and from industry. A successful example of Lean implementation is Wiremold (part of Legrand) (Womack and Jones, 2003; Emiliani et al., 2007) and Jacobs Engineering Group (Emiliani, 2006).

The definition of Lean has been highlighted as one reason behind the problem with Lean implementation. Since the phrase Lean was coined in 1988 (Krafsik, 1988), Lean as a concept has evolved over time. The result is confusion about what Lean is (Hines, Holweg, and Rich, 2004). Lean is described to have begun as a translation of the Toyota Production System. It would be logical to expect that a management concept as popular as Lean should have a clear and concise definition, but instead of a concise definition on Lean the Lean concept itself has become translated into different versions (Pettersen, 2009). The emphasis of the Lean concept has shifted from a technical production system focus to an all-encompassing organizational philosophy; these two views of Lean are called Toolbox Lean and Lean Philosophy, respectively (Langstrand, 2012). Pettersen (2009, p. 137) concludes that:

When embarking on a journey towards lean, it is important to acknowledge the different perspectives that the concept comprises. Raising the awareness of these differences may help make the message clearer and avoid conflicting opinions on which concept the organization is implementing.

Another reason for failure with Lean implementation could be a lack of understanding of the two basic principles in Lean. Emiliani (2006) argues that simple logical arguments would reveal that authentic "continuous improvement" is not possible without "respect for people" (ibid., p. 177). However, it seems to be common to misunderstand or neglect the importance of the "respect for people" principle, since this has been highlighted as an obstacle to Lean (Sohal and Eggleston, 1994; Bhasin and Burcher, 2006; Teresko, 2006; Liker and Hoseus, 2008; Osono et al., 2008; Pay, 2008; Ivarsson et al., 2013). In contrast, with the creators of Lean management, the Toyota people, the focus was on the "respect for people" principle.

A third reason for Lean implementation failure could be that managers don't provide the right kind of leadership. The manager's role in Lean is to be supportive and challenge the people they manage to develop (Liker and Meier, 2007). That means that managers' capacity to lead is central in Lean.

Mazzocato et al. (2012, p. 2) claim that research on Lean is still limited and that studies of Lean often lack explicitly stated and appropriate research designs, as well as appropriate statistical tests and outcome measures. They also argue that a predominance of studies report successful Lean interventions but so far little has been reported about failed attempts or barriers to application. Thus there is a need for further research to fill the knowledge gap about Lean as a functional approach in health care (Mazzocato et al., 2012).

The divided results from Lean implementation efforts show how important it is to research and identify factors that are barriers to successful implementation of Lean. Researching and comparing barriers in different businesses can reveal both common and business-specific barriers, thus contributing to knowledge that would be fruitful in future Lean implementations. This thesis aims to contribute with such knowledge about barriers to Lean implementation by collecting empirical findings from manufacturing and health care and structuring the perceived barriers and difficulties to Lean implementation.

1.2 Purpose and research questions

The purpose is to identify and structure perceived barriers and difficulties to Lean implementation. In this thesis the term 'Lean implementation' is defined as implementation processes guided by principles originating in the Toyota Production System.

1.2.1 The research questions

1. Which barriers to Lean implementation in manufacturing and health care are described in the literature and among managers and key personnel active in Lean implementation?
2. How do the views on Lean of the managers implementing Lean influence the implementation?
3. How is management of Lean described in the literature?

1.3 Structure outline

The first chapter gives an introduction and background to the thesis, as well as the thesis purpose and research questions. The second chapter provides an introduction to the Toyota Production System. The third chapter contains the thesis's theoretical framework. In the fourth chapter the methodology for the research is described. In chapter 5 a summary of the result of the three appended papers is presented. In chapter 6 the result of the thesis is discussed, and in chapter 7 conclusions of the thesis are presented. Chapter 8 presents the references in the thesis, followed by appendix with the appended three papers.

2 THE TOYOTA WAY

Since history can help to understand how the present was molded, this chapter gives a brief description of the history of the Toyota Way.

2.1 A brief history of Toyota and the Toyota Way

The Toyota founder's philosophy is argued to be the uniting force in Toyota globally (Osono et al., 2008, p. 121). The story begins in the late 1880s with Sakichi Toyoda (Liker, 2004, p. 16; Emiliani, 2006, p. 167). Sakichi was running a spinning and weaving business. However, Sakichi was not pleased with the work with spinning and weaving being so hard, so as a means to reduce the stress on the workers, including his mother, grandmother, and their friends, he invented the power-driven loom that he learned how to build with a steam engine as the power source, through trial and error and by actually getting his hands dirty in the process. The approach to go and learn from one's own direct own firsthand experience was later to be a fundamental part of the Toyota Way as the *genchi genbutsu* principle (Liker, 2004, p. 16). As Sakichi continued to improve his spinning and weaving machines with the company he started in 1926, Toyoda Automation Loom Works, he invented a device that automatically stopped the loom when a thread broke, an invention that later evolved into the *jidoka* principle (mistake proofing) in the Toyota Production System (TPS) (ibid., p. 16). In 1929 Sakichi sent his son, Kiichiro Toyoda, to England to negotiate with Pratt Brothers about the price for selling the patent rights for the mistake-proof loom. It ended with Pratt Brothers buying the patent for £100,000; that capital was used to start building what in 1937 was formally formed as Toyota Motor Company (Fujimoto, 1999; Liker, 2004; Holweg, 2007).

With the £100,000 from the patent selling, Kiichiro started the family's car business. Kiichiro built the Toyota Motor Company on his father's philosophy and management approach, including jidoka, genchi genbutsu and the conviction that managers must act on facts found by personally "getting dirty" to understand before making decisions. Kiichiro added his own contributions to the company philosophy. Examples of his contributions are the just-in-time principle and the kanban system, which he thought up after seeing how US supermarkets replaced products on shelves based on the customers' consumption (Liker, 2004; Holweg, 2007). After World War II the economic situation resulted in growing inventories of unsold cars and financial difficulties for Toyota Motor Company. In 1950 the economic and financial

problems led Kiichiro Toyoda to take responsibility for the situation and leave the company as a reaction to labor conflicts. Another consequence was a split into Toyota Motor Manufacturing and Toyota Motor Sales divisions. The first 10 percent cuts in wages for managers and workers were not enough to deal with the financial problem, and in the end the company had to break Kiichiro's policy of not laying off workers. After Kiichiro's retirement from the company, his cousin Eiji Toyoda became managing director of manufacturing. It was not unusual to go abroad to study manufacturing, and a delegation from Toyota had for example been to Europe and studied the airplane work at Focke-Wulf in Germany. What they saw inspired the later developed concept of takt time (derived from the German *Taktzeit*). Eiji Toyoda made a trip abroad to the United States in 1950 to study manufacturing methods (Holweg, 2007). The mass production approach that was used in the United States interested Eiji but was not seen as suitable for Japanese conditions without adjustment. Eiji wanted the Toyota production process to be equal to the productivity at Ford despite the differences between the market conditions in Japan and the United States. The man that Eiji Toyoda was given the mission to create TPS was Taiichi Ohno (Sugimori et al., 1977; Liker, 2004; Holweg, 2007; Osono et al., 2008). The custom to go abroad to learn and be inspired has had a great influence on Toyota. The fact is that Toyota Way has been influenced by several Western industrial management practices, such as:

- *Training Within Industry* (TWI) (Imai, 1997; Emiliani, 2006: Liker and Meier, 2007; Liker and Hoseus, 2008).

- *The Ford system* (Krafsic, 1988; Emiliani, 2006; Holweg, 2007).

- *The PDCA method* that they learned from W. Edward Deming (Liker and Franz, 2011).

These practices of Western origin were adapted to suit the Japanese context. Thus the Toyota Way is not an entirely Japanese creation, it is a hybrid (Holweg, 2007, p. 422). Although Emiliani (2006, p. 168) claims that there are no direct connections to the last 100 years of Western theoretical management thoughts, he means that this is a reflection of the lack of formal training among the key personnel at Toyota and the strong beliefs the Toyota managers had on the importance of being practical, able to really understand problems and

willing to challenge existing paradigms, attributes that were seen as far more important than theoretical analyses.

There are characteristics that are argued to have had an impact on the development of the Toyota Production System:

- The lack of natural resources in Japan (Sugimori et al., 1977; Edström et al., 1994; Liker, 2004).
- The Japanese collectivistic culture (Sugimori et al., 1977; Edström et al., 1994).
- A sense of equality and desire to improve among Japanese (Sugimori et al., 1977; Imai, 1997).
- Diligence and high levels of education resulting in high levels of ability (Sugimori et al., 1977, p. 553).
- The Japanese willingness to center their daily lives on work (Sugimori et al., 1977, p. 553).

Sugimori et al. (1977, p. 553) argue that these traits are reflected in the enterprises through lifetime employment, labor unions by company, little discrimination between blue-collar and white-collar workers, and the possibility for workers to be promoted to managerial positions. Another trait that is argued to be important to the development of Japanese company culture is the homogeneity among the Japanese population (Sugimori et al., 1977; Edström et al., 1994). An additional factor that is argued to be of importance behind the development of the Toyota Way is that the Toyota philosophy puts the people in the center, not machines, and that this represents a more human approach than generally found in industrial production (Osono et al., 2008).

2.1.1 The Toyota Way

A basic and important assumption at Toyota is that people are the source of the development of production (Liker, 2004; Osono et al., 2008; Rother, 2010), and People development has

been seen as a key success factor by Toyota leaders ever since the founding of the company (Liker and Hoseus, 2008). The assumption of the importance of people and their development has shaped the Toyota Way, leading to a system characterized by dualism. Liker and Hoseus (2008, p. 39) illustrate the Toyota DNA as two intertwined value streams: the product value stream and the people value stream.

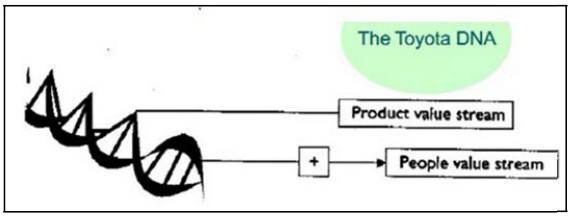

Figure 1. Toyota DNA (Liker and Hoseus 2008, p. 39).

The two value streams are developed via two systems of action, the product value stream through TPS and the people value stream through the Toyota Human System (THS). The purpose with TPS is to highlight and identify problems so they become visible and thereby may be countered. THS is a system that aims to develop people who are willing and able to take countermeasures against a problem that has been made visible via TPS. This dualism of the Toyota Way is also described by Osono et al. (2008), who assert that it is difficult for an industry observer to understand the reason behind the success Toyota has had. Only after six years of research at Toyota did they come to understand that the company's ability to combine the hard and the soft side that leads to the success and is the reason that permits Toyota to continue to outperform its competitors. The hard and the soft side are described as interdependent and equal important factors; Toyota's focus on humans as the center of production and consumption is the force that drives the continuing progress. The dualism of the Toyota Way is also clearly seen in the two dual pillars: Continuous Improvement (CI) and Respect for People (RfP), as illustrated in figure 1 below from a Toyota "Human Resources Development" document.[1]

[1] http://www.toyota.co.jp/en/environmental_rep/03/jyugyoin03.html

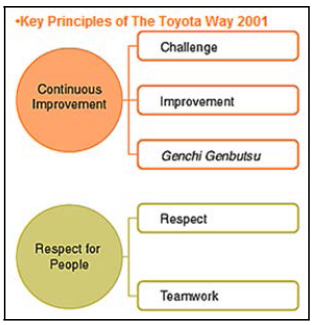

Figure 2. The Toyota Way 2001: human resources development.

To the dual pillars, five key principles are connected: challenge, improvement, genchi genbutsu, respect and teamwork. Challenge, improvement and genchi genbutsu are connected to the CI pillar and the key principles respect and teamwork are connected to the RfP pillar. A similar description in the shape of a Greek temple was used by Liker at the KTH campus in Södertälje in February 24, 2010, figure 3 below.

Figure 3. Slide used by J. K. Liker, in "Toyota culture: Developing a culture of continuous improvement," a lecture conducted on February 24, 2010, KTH/Lean Centrum, Campus Telge.

The difference between the illustration of the Toyota Way in the Toyota document above and Liker's Toyota Way temple, apart from the visual, is that Toyota uses the word *improvement* for the second key principle connected to the CI pillar, while Liker uses the word *kaizen*. However, the meaning is the same, since the Japanese word *kaizen* means "change for the better" and is often used to mean "improvement" (Imai, 1997).

Before Toyota Motor Corporation adopted the Toyota Way document in April 2001, Toyota's management philosophies, values and business methods had been implicit in their tradition,

but when codified and extended to all people in the organization the document was seen as providing guidelines that all employees should embrace and thereby contribute to the development of Toyota globally.[2].

[2] http://www.toyota.co.jp/enlenvironmental rep/031ivugyoin03.html

3 THEORETICAL FRAMEWORK AND PREVIOUS RESEARCH

This chapter begins with a description of Lean and the known barriers and factors behind resistance to change in organizations. Then a general description of leadership and management and the relation between the two is presented. The chapter ends with a description of leadership and management in relation to the Toyota Way and Lean.

3.1 Lean

Lean is an American term that originates from the International Motor Vehicle Program (IMVP) research project at Massachusetts Institute of Technology. The phrase Lean was created by Krafsic to differentiate buffered production, with its stocks and *just in case* mentality, from the Toyota production philosophy that focuses on flow and with a *just in time* philosophy (Krafcik, 1988). Womack and Jones (2003) argue that the word Lean symbolized a way of doing more with less. Initially the Lean concept was developed to improve car production.

The results from IMVP became known through the book *The Machine that Changed the World,* written by the three senior managers of the IMVP, James P. Womack, Daniel T. Jones and Daniel Roos (Womack et al., 1990). It was by means of that book that the term Lean was spread over the world. The book showed that Toyota was more effective than its competitors in the USA and Europe. Cusumano (1994) argued that at Toyota in the late 1980s the output per worker was two to three times higher than at US or European plants. Toyota is portrayed by other researchers and writers nowadays as a success story (Osono et al., 2008; Shook, 2009; Rother, 2010; Liker and Franz, 2011).

According to Emiliani (2006), one of the earliest descriptions of Toyota's management system in the USA was an article published in 1977 in *American Machinist* by Ashburn. Among business leaders in the USA the awareness of the Toyota Way, however, remained low until the 1980s. In the early writings the focus was on the operational aspects in the Toyota Production System designed to improve production efficiency by eliminating waste. There was no attention to the RfP principle or humanity aspects. Japanese human resources practices were usually described as a separate topic; generally descriptions of Japanese post–World War II management were written with either operations management or human

resources management in focus, but, with a few exceptions, not about the integration of both operations management and human resources management.

Emiliani (2006), in his historical overview of Lean in the USA, depicts the role the state of Connecticut has had in US industrial history as a source for manufacturing of high-quality goods and in the evolution of Lean in the USA. The common manufacturing and services production method in Connecticut was batch and queue. The earliest involvement in Lean in Connecticut is when Productivity Inc. was created in Greenwich, Connecticut, in 1979. The company was created to educate business leaders about Japanese industrial management practices, through activities such as publishing newsletters, distributing books, running national conferences and seminars, and organizing study tours. The first study tour to Japan in 1981 aimed to give US business executives the opportunity to learn how Japanese companies achieved their remarkable improvements in productivity and quality. A separate company, Productivity Press, was created in 1984. Productivity Press published and distributed English translations of Japanese books that described TPS and other Japanese management methods. Productivity Inc. and Productivity Press played a large role in bringing Lean to the USA.

In 1985, the US government funded the International Motor Vehicle Program (IMVP) study at Massachusetts Institute of Technology. The purpose of the study was to determine why Japanese automakers were so much more productive and produced better quality products at competitive prices compared to the US “Big Three” Detroit-based automakers.

3.1.1 Lean in health care

It is nowadays a common notion that Lean with its improvement focus is a concept that is relevant in more sectors than manufacturing, such as in the service sector (Radnor et al., 2006; Radnor et al., 2012) and in health care (de Souza, 2009; de Souza and Pidd, 2011; Mazzocato et al., 2012¸ Radnor et al., 2012). The relevance of Lean in health care delivery is argued to be the Lean concept's improvement approach through waste elimination, value adding for the customer and flow focus (Kim et al., 2006; Kollberg and Dahlgaard, 2007; de Souza, 2009; Joosten et al., 2009), and it is argued to be important to increase effectivity in health care as many countries are challenged by an increased demand for health care (Radnor and Walley, 2008; Mazzocato et al., 2012; Radnor et al., 2012). Therefore, avoiding waste and make effective use of the resources in health care has become an important issue. Health care in

Sweden is facing those kinds of challenges, and Lean is proposed as one approach that can be used for more effective use of resources in health care (Kollberg and Dahlgaard, 2007; Mazzocato et al., 2012).

Kollberg and Dahlgaard (2007) argue that it is important to see Lean as part of a larger management shift in order to plan for changes in mindsets and workplaces, and they advocate considering that local departments have different requirements to plan and predict their demands when adapting the Lean principles to health care. Radnor et al. (2012) and de Souza (2009) find that so far, a majority of Lean initiatives in health care is performed as small, enclosed projects that create 'pockets of best practice' rather than adopting an organizational or system-wide approach.

Joosten et al. (2009) argue that application of Lean to health care has often so far been limited by a tool focus, and a more integrated approach as a framework for Lean thinking, with both sociotechnical and operational aspects, is needed in the future. Their dualistic frame is shown in figure 4.

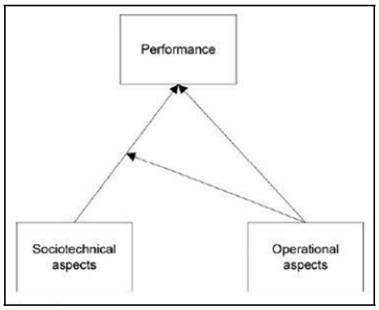

Figure 4. A conceptual framework of Lean thinking (Joosten et al., 2009, p. 344).

Lean health care is at an early stage of development and often Lean in health care focuses on the use of particular tools (Mazzocato et al., 2012, Radnor et al., 2012). Radnor et al. (2012) suggest that health-care organizations are at a stage equivalent to automotive manufacturing in the late 1980s and early 1990s. and they argue that Lean in health care needs to move from a tool focus to embrace Lean thinking more broadly across the wider health-care system. However, there are some initially reported positive effects from the application of Lean in health care:

- Reduction of patients' waiting times (Mazzocato et al., 2012; Radnor et al., 2012)
- Positive impact on quality (Kim et al., 2006; Radnor and Walley, 2008;Radnor et al., 2012)
- Reduction in cost (Radnor et al., 2012)
- Increased satisfaction among staff and patients (Radnor et al., 2012)
- Increased efficiency in patient flow (Kim et al., 2006; Radnor and Walley, 2008)
- Increased productivity (Radnor and Walley, 2008)

There are some challenges in adopting Lean in health care. Waring and Bishop (2010) argue that Lean has potential to improve health-care delivery, but the potential is not easily realized. A challenges they highlight is the importance of leadership; Kollberg and Dahlgaard (2007) conclude that it is important to design a measurement system that measure the initiatives taken, which they believe requires new thinking about the managing in health care.

Mazzocato et al. (2012) argue that Lean in health care is still at an early stage and that research on Lean is limited, with studies reporting successful Lean interventions predominating, while fewer studies report failed Lean attempts or barriers to its application in health care. Therefore, they advocate for further research about Lean as a functional approach in health care.

3.2 Barriers and resistance to change

Change efforts often fail to reach their goals (IBM, 2008; Kotter and Schlesinger, 2008). In a *Harvard Business Review* article from 1979, reprinted in 2008, Kotter and Schlesinger argue that there is nothing more difficult and doubtful of success than to initiate a new order of things. They argue that change initiatives often encounter resistance from humans and that managers, although generally aware of that, surprisingly rarely systematically search for sources of resistance before initiating change initiatives. In the article they identify four common reasons for human resistance to change:

- A desire not to lose something of value
- A misunderstanding of the change and its implications

- A belief that the change does not make sense for the organization
- A low tolerance for change

And they claim that it is important for managers to be aware of the four common reasons to resistance to change, because that gives them a chance at predictability (Kotter and Schlesinger, 2008). Kotter (1995) claims that one of the most important lessons about change is that change processes go through a series of different phases that usually require time to handle, and that critical mistakes in any of the phases can create a devastating impact on the change process. Kotter (1995) identifies eight errors that often are made in change efforts:

Error 1. Not enough of a sense of urgency is established, and that means that people in the organization are not motivated enough; without engagement from them the change effort goes nowhere. A reason can be that the organization has managers who are lacking leadership skills. Change requires leadership.

Error 2. There is not a powerful enough guiding coalition that develops a shared assessment of problems and opportunities, therefore not building necessary levels of trust and communication.

Error 3. No vision that is clear enough and easy to communicate is developed, with the aim of showing stakeholders the direction the organization has to move in. This is not a matter of numbers; it is about a picture of the desired future.

Error 4. Undercommunicating the vision is a common mistake. Without enough communication people's hearts and minds are not open to the vision and they don't participate with enough effort to make the vision come true.

Error 5. The obstacles to the new vision are not removed. Even if people understand the vision and are willing to make it come true, obstacles such as organizational structures, compensation or performance appraisal system, or bosses with demands that are inconsistent with the vision can spoil the efforts.

Error 6. Not creating short-term wins to help people keep the urgency level up and make people experience the wins, with positive effects on engagement and commitment. Without short-term wins, people can give up and even start to resist change.

Error 7. Organizations declare victory too soon. It take 5-10 years for a change process to become a part of an organization's culture. Before that has happened it can be catastrophic to declare a win.

Error 8. The organization does not secure the change by anchoring the changes in the organization's culture. A change is fulfilled only when it has became a new behavior that is rooted in shared values and social norms, a culture in the organization that is naturally expressed as the way we do things (ibid.).

Piderit (2000) argues that resistance to change is a widely studied subject but has limitations in both terminology and in practice; research on the concept is in need of a new approach, based on a new conceptualizing that sees individual responses to change as multidimensional attitudes. She suggests that one thing that is overlooked by researchers is that people might resist change out of potentially positive intentions. That possibility has been pointed out by Kotter and Schlesinger (2008), who argue that people might resist change when they do not understand the implications and believe that it might cost them much more than they will gain, and they argue that such situations often occur when there is a lack of trust between the person initiating the change and the employees. A second common reason people resist organizational change is when they assess the situation differently from their managers or the people initiating the change and see more costs than benefits resulting from the change, not only for themselves but for their company as well (ibid.). Piderit (2000) argues that if research on resistance to change in the future, via a multidimensional research approach, would become better to offer guidance on change, not only to change agents but to all employees involved in change processes and that would minimize stress effects to the individuals (ibid. p. 792).

3.3 Barriers to Lean

According to Mazzocato et al. (2012), there is a lack of knowledge about failed Lean attempts and barriers to application of Lean, since research is still limited. However, that statement can to some degree be questioned, because some reports on barriers to Lean have been published.

Sim and Rogers (2008) concluded that among Fortune 500 plants located in eastern USA, an aging and high seniority hourly workforce and lack of committed leadership were the primary barriers to Lean. They further argue that communication is essential for continuous improvement initiatives, maintenance and effectiveness. In a study of 68 UK manufacturing firms, Bhasin (2012) found that barriers to Lean are strongly connected to the size of an organization, and as every organization is unique cultural issues are of importance. For a successful Lean journey both financial and human commitments are essential (ibid., p. 421).

Research on Lean implementation in aerospace showed that when implementing Lean it is important to consider the plant's specifics rather than firm specifics, since circumstances can differ among plants belonging to the same firm. The research indicated that operation managers need to have both a strategic and a tactical role, and top managers' involvement is important, since they have the important role of presenting a coherent vision that clearly communicates how Lean is suited and related to their business strategy, if the Lean implementation shall be successful. It was proposed that a culture that supports autonomous working and learning through experimentation could speed up the implementation process (Crute et al., 2003).

Research on Lean manufacturing implementation in Malaysian automotive components manufacturing showed the importance of skilled people with their own experience with Lean as Lean teachers and coaches. It was further concluded that support and clear directions from top managers are important (Muslimen et al. 2011).

Radnor et al. (2006) identified eight barriers to Lean in public services:

- People, in terms of skepticism about change programs in general
- Lack of ownership in terms of current activities or proposed processes

- Poor selection of improvement team members
- Leadership failure
- Compartmentalization, or "silo" culture
- Weak link between improvement program and the organization's strategy
- Lack of resources
- Poor communication (pp. 70-71).

Based on literature and their own experiences de Souza and Pidd (2011) identify eight barriers to Lean, five barriers that are common to both manufacturing (M) and health care (H) and three that are unique to health care. The explored barriers were:

- Perception of Lean (H)
- Terminology (M&H)
- Personal and professional skills (H)
- Organizational momentum (M&H)
- Professional and functional silos (M&H)
- Hierarchy and management roles (H)
- Data collection and performance measurement (M&H)
- Resistance to change from skepticism (M&H).

Radnor et al. (2006) concludes that:

> *The most commonly-reported barriers to improvement across all case studies were those posed by* ***people*** *at all levels of the organisation. At the staff level, scepticism was expressed about change programmes, especially about them being the latest management fad, and a feeling that they would not be listened to and that nothing would change. In one case this scepticism boiled down to the attitude that 'it was all about money' and cost reductions. Although the results clearly show that headcount and cost reduction was not a primary objective for any case study* (p. 70).

3.3.1 Missing the respect for people principle as a barrier to Lean

In 1988 a seminar at Hartford Graduate Center was held with the aim to present kaizen to Connecticut business leaders, and managers from manufacturing businesses across the USA attended. At the seminar Imai among others spoke, and there were hands-on activities led by Iwata, Nakao and Takenaka from Shingijutsu Co., Ltd. Emiliani (2006) describe that from the very beginning, kaizen was presented to Connecticut business leaders as a means to improve

and grow a business, not as a way to reduce costs by cutting jobs, as doing so was said to violate the respect for people (RfP) principle. At the beginning of the seminar Imai presented a literal definition of kaizen as: "*change for the better*." When Iwata, Nakao and Takenaka later in the week gave presentations, they focused on introducing technical aspects, though they were fully aware of the meaning of kaizen and the human aspect (ibid., p. 171-173).

The omission by the Japanese of kaizen and detailed RfP principle descriptions had negative effects. Emiliani (2006) states that instead of a clear description, the Japanese through an interpreter told the US top managers that they should not lay people off as a consequence of productivity improvements achieved through kaizen, because doing so would undermine future efforts to improve. Maybe it is as Emiliani (2006) proposes, that the Japanese thought that expressing such a simple, real-world, cause-and-effect relationship would be sufficiently persuasive to avoid outcomes that would be inconsistent with the RfP principle. The reaction among the US top managers that didn't understand kaizen, however, was negative, as described by Emiliani (2006, p. 173): *most CEO's made statements to Iwata along the lines of: "I am the CEO, and you have never run a company. So do not tell me what I should do. I will do whatever I think is necessary."* According to Emiliani (2006) this reaction shows three important conditions:

- Top managers' traditional way of thinking about business, both the technical and the human aspects, is not suited for kaizen.
- The top managers did not quickly comprehend the importance of "respect for people."
- Many CEOs are accustomed to thinking in terms of simple short-term trade-offs and thinking that higher profits are possible to obtain by reducing labor costs.

As Emiliani (2006) points out, it is one thing to have short-term thinking and seek to gain higher profits by reducing labor costs, and quite another to have a kaizen thinking that views labor, the people, as a valuable resource for determining how to reduce costs and improve products and services and have a long-term perspective. The reaction also highlights how important it is to get the respect for people principle known, understood and practiced from the beginning. Unfortunately, kaizen is still widely misunderstood and misapplied by management practitioners, especially in the USA, where most managers continue to use kaizen as a way to cut jobs.

This misunderstanding among managers often resulting in conflicts and discrepancies between stated goals and what is done:

> *In most other cases, managers in Connecticut, and elsewhere, applied only one principle, "continuous improvement," resulting in an undesirable hybrid batch-and-queue/Lean management system that is rife with conflicts between top management's stated goals in relation to company policies, practices, performance measures, and computer information systems that help inform people's day-to-day activities* (Emiliani, 2006, p. 176).

However, not all US organizations that jump on the Lean train fail. Two organizations that are described to have succeed with their Lean implementation are Jacobs and Wiremold (Emiliani, 2006; Womack and Jones, 2003).

Since 1979 many US manufacturing and service organizations have tried implementing Lean. Two of the most successful outside of Toyota and its affiliated suppliers are the early Lean adopters Jacobs and Wiremold (Emiliani, 2006; Womack and Jones, 2003). These two companies succeeded because their top managers led the implementation through direct participation and consistent application of the two principles "continuous improvement" and "respect for people" (Emiliani, 2006, p. 176). Emiliani (2006) further argues that simple, logical arguments would reveal that authentic CI is not possible without RfP (ibid. 177). Despite the logical argument, it seems to be common to misunderstand or neglect the importance of the RfP principle. It has been highlighted as an obstacle to Lean by other writers too, both academics and nonacademics (Sohal and Eggleston, 1994; Bhasin and Burcher, 2006; Teresko, 2006; Liker and Hoseus, 2008; Osono et al., 2008; Pay, 2008; Ivarsson et al., 2013).

As a result of his historical research on Lean in the USA, Emiliani (2006) concluded that, from the beginning, most US managers and the business press focused on continuous improvement and the related operational methods used for improvements in productivity and quality, to reduce defects and lead times and for cost savings. But for the creators of Lean management, the Toyota people, the focus was on the RfP principle. This difference in the Japanese and US views was pointed out earlier by Karasek and Theorell (1990). They claim that the Toyota Way among the Japanese has historically been described as a dualistic system, but with different words, for example: *Just in time – Respect for human system* or *Just in time – Respect for worker system.* In the USA, however, both translation of the term and the

implementations of the approach have dropped the human part and only half of the concept remain, the technical tool part, just in time (Karasek and Theorell, 1990, p. 266). This reduces the Japanese dualistic system to a monism, and thus no longer a comprehensive system. Emiliani (2006) argues that the challenge for the future is to ensure that Lean management is taught as a comprehensive system of management that embodies both key principles, "continuous improvement" and "respect for people":

> *Top managers who practice Lean management must make greater efforts to ensure they understand the true meaning of kaizen – "change for the better" – and the "continuous improvement" and "respect for people" principles, in order to achieve favorable financial and non-financial outcomes that benefit all key stakeholders. The only way managers can learn and understand Lean management is through direct participation in kaizen and other process improvement activities. This will also lead to a better balance between thinking and doing* (p. 178).

That means that managers have an enormously important role to play in change processes, as for example implementing Lean, for better organizational performance and outcomes.

3.4 Change for increased organization performance

The lessons that can be drawn from change initiatives will probably be of increasing interest with increasing competition (Kotter, 1995). That is an estimate that is supported by an IBM (2008) report, which concluded that the normal situation in the future will be a situation of continuous change. This is particularly the case in Lean, since Lean means to strive for continuous improvement and that means continuous change. In the IBM (2008) study, 41 percent of change initiatives were considered successful. Successful change was not found to primarily depend on technology; instead, they concluded that success depends largely on people.

3.4.1 Organizational development

According to Eklund (2000a), all production is based on human activities and quality for the end user and therefore depends on the quality of the processes and activities that create and deliver the product or service. That means that human work behavior is central for organizational performance, and change aiming for increased performance requires change in human behavior at work (Robertson et al., 1993).

The purpose of the field of organizational development (OD) is to apply behavioral science principles and practices to organizations through a systematic process, with the aim to increase both individual and organizational effectiveness (French and Bell Jr., 1999, p. 1). Organizational development has a rich history of contributors from the field of behavioral science and from practitioners. Some of the contributors are well known, others not. Some of the contributors are: Robert Tannenbaum, who was a pioneer in team building; Chris Argyris, who was the first to use team building at the top management level; Douglas McGregor, the creator of theory X and theory Y, and writer of the now classic book, *The Human Side of Enterprise*; Herbert Shephard, who had a major impact on the development of OD and founded the first doctoral program to train OD specialists; Warren Bennis, described as one of the major figures associated with evolution of OD; and Peter Senge, who connected open system thinking to learning organizations. These contributors were influenced by persons such as Kurt Lewin, Abraham Maslow, Carl Rogers and Peter Drucker, among others. OD has been influenced by a number of theories, such as: systems theory, sociotechnical system theory and open system thinking. It is not clear who coined the term *organizational development,* but the term emerged as a way of distinguishing a different way of working with organizations and to highlight a whole organization (systemwide) development approach. (French and Bell Jr., 1999).

The contribution to development of OD from many fields has resulted in lack of a clear and single accepted definition of OD. Although OD still lacks a single and common accepted definition, French and Bell Jr. (1999) argue that there is a general agreement on the nature and major characters of OD (p. 24). A description of eight OD definitions, from older to more recent definitions, is to be found in French and Bell Jr. (1999):

1. OD is an effort that is:
    a. Planned
    b. Organization-wide
    c. Managed from the top
    d. Aiming to increase organization effectiveness and health
    e. Accomplished through planned interventions aimed at processes using behavioral science knowledge.

2. OD is a response to change that is a complex educational strategy with the aim to change beliefs, attitudes and values, as well as organizational structures, in order to better adapt to new technologies, markets, challenges and change itself.

3. OD is a planned and sustained effort to apply behavioral science for system improvement through self-analytic and reflexive methods.

4. OD is a process of planned change of an organization's culture. The aim is to change from a culture that avoids examination of social processes, especially such processes as decision making, planning and communication, to a culture that legitimizes and institutionalizes that kind of examination.

5. OD aims to
    a. enhance the congruence between organizational structure, strategy, culture and people,
    b. develop new and creative organizational solutions and
    c. develop self-renewing capacity in organizations.

6. OD is a set of theories based on behavioral science, values, strategies and techniques aimed at planned change of work settings in organizations to enhance individual development and improve organizational performance, by altering the on-the-job behavior among organization members.

7. OD is a systematic application of behavioral science knowledge to planned reinforcement and development of organizational strategies, structures and processes for better effectiveness.

8. OD is a planned process of change in organizational culture through the use of behavioral science technologies, theory and research (pp. 24-25).

The common base in the different definitions above is that OD is (a) uses behavioral science in planned organizational change, (b) aims at changing the total system or organization and (c) aims to develop individual improvement and organizational effectiveness (ibid., p. 25). The essence of organizational developmentis the insight that increasing effectivity depends on people and their on-the job behavior, and that people's on-the-job behavior is influenced by structures and rules. One model that has its background in OD is Porras and Robertson's Change Model. Porras and Robertson's (1992, p. 729) change model is shown in figure 5 with the basic categories, or four clusters, and the related specific key factors.

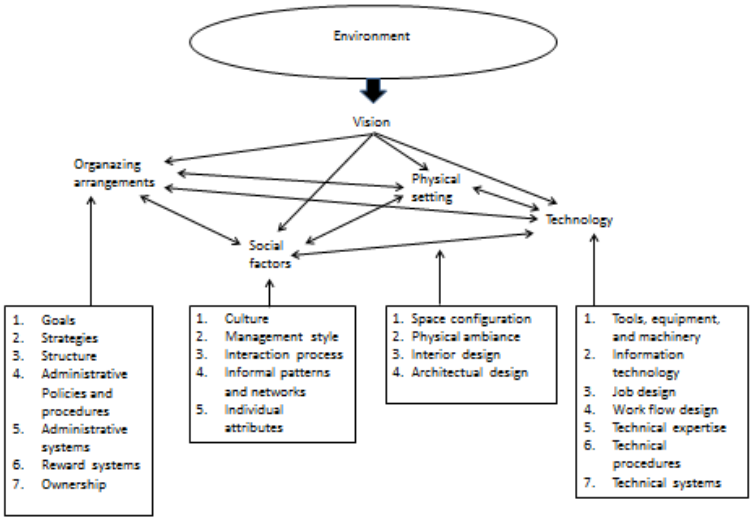

Figure 5. Change model. After Porras and Robertson (1992), p. 729. **[In the diagram, on the left correct the spelling to "Organizing" and "policies" (lowercase).]**

According to Porras and Robertson, these specific factors constitute a work setting that if changed will induce change in individual's on-the-job behavior.

Human factors/ergonomics (HFE) is a discipline that is concerned with the interaction of humans and other elements in working systems Dul and Neumann (2009).

3.5 Human factors and ergonomics

In 2000 the Council of International Ergonomics Association (IEA) approved a definition of HFE:

> *Ergonomics (or human factors) is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design in order to optimize human well-being and overall system performance.*
> *Practitioners of ergonomics, ergonomists, contribute to the planning, design and evaluation of tasks, jobs, products, organizations, environments and systems in order to make them compatible with the needs, abilities and limitations of people.*[3]

The Nordic Ergonomics Society (NES) uses nearly the same definition of ergonomics as IEA:

[3] http://www.iea.cc/01_what/What%20is%20Ergonomics.html

> *Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.*
> *An ergonomist is an individual whose knowledge and skills concern the analysis of human-system interaction and the design of the system in order to optimize human well-being and overall system performance.*[4]

HFE is seen to have the potential to increase organizational performance if working conditions are designed on the basis of human capacities and aspirations and they express it:

> *The focus of HFE is to jointly improve performance and well-being by designing the integrative whole better, and by integrating the human into the system better. This is done by fitting the environment to the human* (Dul et al., 2012., p. 3).

Dul and Neumann (2009) assert that HFE knowledge can support a company's business strategy to stay competitive, since ergonomics is concerned with the understanding of interactions between the humans and other elements in a working system. HFE has two goals: to optimize human well-being and the performance of the overall system (Dul and Neumann, 2009; Dul et al., 2012). By designing work environments to fit humans, two related system outcomes are possible to achieve: performance and well-being. Performance outcomes can be achieved in terms of productivity, efficiency, effectiveness, quality, innovativeness, flexibility, system safety and security, reliability and sustainability. Well-being is achieved in terms of health and safety, satisfaction, pleasure, learning and personal development (Dul et al., 2012), as illustrated in figure 6.

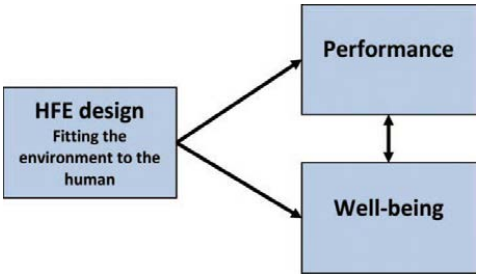

Figure 6. The effect of HFE design on performance and well-being (Dul et al., 2012, p. 380.

When HFE is overlooked in the design of a workplace system, the result can be a work environment that is a suboptimal system characterized by producing product defects, reduced efficiency, illness and dissatisfaction. Unfortunately HFE is still too unknown (Dul et al.,

[4] http://www.nordiskergonomi.org/index.php?option=com_content&view=article&id=53&Itemid=69

2012), and therefore HFE knowledge often is overlooked in organizational change efforts aiming to increase organizational performance. Managers are one of the identified professions or stakeholders that Dul et al. (2012) argue need HFE knowledge.

Eklund (2000a) points out that ergonomic research has been mainly focused on regular production work and that the research on change processes and the development of products, production and work processes is more limited. He finds that the sociotechnical approach has been aimed at work design but not on the change processes. Eklund (2000a) argues that this means that the sociotechnical approach could expand from a focus on methods used to analyze results to also include the processes that shape the results. Eklund (2000a) proposes a model based on the integration of total quality management (TQM) and ergonomics.

3.6 A proposed model for integrating TQM and ergonomics

Eklund (2000a) points to the similarities and differences between the disciplines of total quality management and ergonomics. He discusses developments concerning integrated approaches for applying ergonomics and quality jointly and proposes a framework for this.

The quality movement has developed from its roots in the field of statistics. TQM is largely based on the writings of Shewhart, Deming, Juran and Crosby. TQM is a topic that is viewed differently among different authors, companies and countries. The TQM philosophy is described as a mixture of normative assumptions, concepts, techniques and tools (Eklund, 2000b). However, despite the different views and mixtures of assumptions, the TQM philosophy is often expressed as consisting of the following cornerstones: customer orientation, leadership support, continuous improvement, participation, process orientation and decision making based on facts. TQM is closely linked to development of the Toyota Production System (Eklund, 2000a).

TQM emphasizes the importance of focusing on the processes that lead to end results. A process, in the TQM context, can be defined as a series of activities, performed or controlled by humans, with the aim to transform an input to a desired output. This is a similar view of productivity that is presented by the Asian Productivity Organization (APO):

> *In fact, productivity is really an "attitude of the mind". It is about people adding value to a work process by their skills, team spirit, efficiency, pride in work and customer orientation, aided by machines and systems* (APO, p. 4).

The APO definition above has its root in the definition of productivity from The European Productivity Agency (EPA) at a Rome conference, "The Concept of Productivity and Aims of the National Centres" in 1958:

> *Above all else, productivity is an attitude of mind. It is mentality of progress, of the constant improvement of that which exists. It is the certainty of being able to do better today than yesterday, and less well than tomorrow. It is the will to improve on the present situation, no matter how good it may seem, no matter how good it may really be. It is the constant adaptation of economic and social life to changing conditions, it is the continual effort to apply new techniques and new methods; it is the faith in human progress* (APO. p. 44).

Expressed above in the TQM philosophy and views on productivity expressed in the definitions by EPA and APO is the idea that if the processes are running well, the result will be high-quality products and output. As a consequence employees and their motivation and participation become very important, because the processes that lead to end results are processes that consist of human activities. The core of productivity is thereby humans interacting with other humans and with technology, within the frame of the organization and the environment. This core, the humans interacting with technology and organization, is the basis for an integrated approach Eklund (2000a) proposes, applying quality and ergonomics.

The Nordic Ergonomics Society defines ergonomics as the:

> *interdisciplinary field of science and application considering integrated knowledge of human requirements and needs in the interaction human-technology-environment in the design of technical components and work systems"* (Eklund 2000a, p. 464).

According to Eklund (2000a, p. 464), ergonomics is about work conditions that promote safety, health, well-being and efficiency, and thus focuses on the interactions among people, tasks, workplaces, environments, organizations at work and interfaces rather than on these components. Eklund (2000a) concludes that quality for the end customer is only achieved if there is quality in all processes and work activities leading to the delivery of the product or service. A conditional requirement is that the work activities are free of the risk of health impairments and accidents and that they promote well-being for the employees. An integrated ergonomics and quality approach focuses on the interactions that take place within the work activities and between humans, technology, the organization and the environment. The proposed framework is described as a supporting methodology to analyze these interactions (Eklund, 2000a).

The proposed model is composed of five generic elements: humans, technology, organization, environment and work activity. Also, both ergonomics and quality deal with design and change. The focus of design and change is on the interactions among humans, technology, organization and environment (Eklund, 2000a), as illustrated in figure 7.

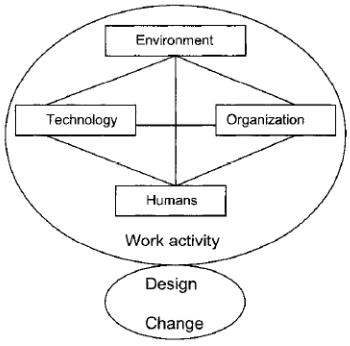

Figure 7. A model of generic elements for integration of ergonomics and quality and the interactions among humans, technology, organization and environment (Eklund, 2000a, p. 465).

Three things become very clear from the description above on Change for increased organization performance, no matter if it is about change in general or a more specific change as a Lean implementation:

- Change depends on people and their behavior.
- It is the interaction among humans, technology, organization and environment that is important.
- Managers have the most important role to lead the change.

So an important question is what the leadership looks like that managers require to support people and make change efforts in general, and specifically to make Lean implementation succeed.

3.7 Leadership and management not the same but complementary

Kotter (1990) points out that leadership is something that humans have been interested in for a long time. Leadership is also a topic that has been written a lot about (Bennis, 1959; Their,

1997; Yukl, 2010). Examples of early writers on leadership are Sun Tzu, Plato and Macchiavelli. The warrior philosopher Sun Tzu believed that Leadership is a matter of courage, trustworthiness, humaneness, strictness and intelligence, and his writings, *The Art of War*, influenced Japanese politics and business world (Cleary, 1988, p. 4). But despite all literature on leadership, it has been difficult to define and as a consequence a lot of the leadership literature is argued to be more manifestations of personal opinions than scientific conclusions (Their, 1997). In contrast to the long history of leadership, management is much younger, as it is a consequence of industrialization. With industrialization a need to be able to create order and structure complex organizations emerged, and that gave birth to the topic of management (Kotter, 1990).

Leadership and management were subjects that engaged researchers, and their research has produced a lot of different theories (Bennis, 1959; Horner, 1997; Yukl, 2010). Bennis (1959) identified twelve theories on leadership that researchers have proposed. Horner (1997), in a historical overview of leadership, identified and classified different theories.

The first category, *the great leader*, is based on the assumption that leaders are born with internal qualities that differentiate them from others. The thought was that if traits that distinguish leaders from others could be identified through examination of personality and physical and mental characteristics, people with leadership qualities could be assessed and then put in positions as leaders. However, despite much research on identifying the traits, no clear traits associated with great leadership were found. One flaw was that situational and environmental factors that play a role in a leader's effectiveness were ignored (Horner, 1997, p. 270).

The second category Horner found is *leader behavior*. The focus was now changing to leaders in the context of organizations and the leader behavior that contributes to effectiveness in organizations. Michigan and Ohio State leadership studies are well-documented examples of studies with a leader behavior focus that led to the identification of two primary and independent factors, consideration and initiation of structure. Research by others led to similar results. These findings led to a new leadership conception. Leadership was no longer seen as inborn qualities; instead, effective leadership methods could be taught, thus leadership could be learned. The research on leadership progressed and 1964 Blake, Shepard, and Mouton

developed their two-factor model of leadership based on what they labeled *"concern for people"* and *"concern for output."* According to Horner, these studies proposed that managers exhibit behaviors that fall into the two primary categories, "concern for people" and "concern for output," i.e., people or tasks. Depending on which type of concern was shown most frequently, a leader could be placed along each of the two continua. The outcome of this kind of research was primarily descriptive, helping to categorize leaders based on their behavior. Later the two factors in their two-factor model were complemented with a third factor, *flexibility* (Horner, 1997, pp. 270-271).

In the third category, the focus on leadership is described to be on the interaction among the leader's traits, leader behaviors and the situation in which the leader exists. These theories on leadership are based on the assumption that the effects of one variable on leadership influence other variables. This concept is described as a major insight at the time, as it opened up the possibility that leadership could be different in every situation. This was an important insight for the emergence of a more realistic view of leadership that considers the complexity and situational specificity of overall effectiveness, and it led to several different situations being identified and studied. Through further research, it was argued that certain leadership styles were more effective in certain situations; this initiated discussion and research on matching a leader with a situation that would be most conducive to that leader's style (Horner, 1997, pp. 272-273).

The conception of leadership as something that is related to a single individual and situation has been challenged. Instead of thinking that leaders are persons who lead other people as a workgroup or team, the leader is seen as someone who shall support others, as team members, to lead themselves. With this collectivistic view on leadership, a great leader is someone able to unleash the potential and abilities of others. Leadership is thus seen to be a potential that exists within each individual and not limited to formally appointed leaders (Horner, p. 275). The idea of leaders as the supporting force with the responsibility to unleash others' potential is expressed by Drucker (2007):

> *The manager is the dynamic, life-giving element in every business. Without his leadership "the resources of production" remain resources and never become production* (p. 3).

Future leadership is predicted to be much about motivational factors, generating motivation and participation among employees and organizational members (Horner, 1997; Nonaka et al., 2000).

Horner (1997) points to a future need for change in leadership research, since the models of leadership have so far been designed for, what she calls, the typical American worker, which is a high-school-educated white male, working in manufacturing. This "typical worker" is becoming less typical due to a number of factors, as the economy shifts from manufacturing to services, an aging workforce, a more ethnically diverse workforce, increased competition for highly educated and talented people. All of this leads to a growing challenge to keep people in the organization. She describes the worker of today and especially of tomorrow as having increased demands for meaningful and challenging work, as well as expectations for more responsibility and autonomy. Other important factors include that the nature of work has changed a lot during the past decade or two and that creativity and innovation are becoming more and more important to organizations. These changing and challenging factors, together with the increasing trend towards team-based work, highlight the importance for organizations to be able to make use of and continuously improve the employees' intellectual potential and talents, which is the manager's responsibility to accomplish with his or her leadership (Drucker, 2007, p. 3).

The future leader is going to need a different mindset and skill set from that of the majority of present leaders. These skills include the ability to create and maintain a team-based environment and get everyone in the organization involved in the activity. Thus, the mission for leadership is to enable the team to be optimally successful (Horner, 1997), a statement that is similar to one by Emiliani (2006, p. 16), who argues that the manager's duty is to provide a kind of leadership that helps people do a better job.

Kotter (1990) points out that *leadership* is a word that in everyday conversations is used in two very different ways. Sometimes the word leadership refers to the process that is mobilizing and directing, i.e., aligning people and their ideas. Sometimes leadership refers to people in formal leader positions, such as a manager in a company. This unspecific use of the word leadership has contributed a lot to the confusion about the topic, as it indicates that all people in formal leader positions provide leadership. According to Kotter, this is obviously

not true, since some of them are leading well, some poorly, and some do not lead at all. Kotter further argues that as most people today in formal leading positions are called managers it is easy to think that leadership and management are the same thing, or at least are closely related, but he believes they are not. Leadership is an ageless topic while management is a product born from the needs that emerged with the development of complex organizations, a result of industrialization (Kotter, 1990). The purpose of management was, and still is, to avoid chaos and bring order and consistency to key factors such as profitability and quality (ibid.). Management as a process has always been developed and refined, and will continue to be.

The distinction between leadership and management is important (Kotter, 1990; 2001), and several other writers have highlighted the differences between leadership and management. Bennis (1997) finds the distinction between leadership and management important and argues that leadership is about doing the right thing, whereas management is about doing things right. Both are important, but Bennis argues that most organizations in the industrialized world are underled and overmanaged, something he considers to be a consequence of a school system that produces good technicians and staff people but does not train people as leaders. He counters: "*The leader's goal is not mere explanation or clarification but the creation of meaning"* (p. 21).

Their (1997) describes management as production oriented and thus about administration, budget, laws and regulations, accounting and control systems. Leadership is depicted as being human oriented and thus about communication and information, psychology on individual and group levels, interaction and collaboration, motivation, norms, values and attitudes.

Kotter (2001) defines management as *coping with complexity.* The goal of management is stated to be to bring order and consistency to key dimensions, like the quality and profitability of products. Companies manage complexity via *planning and budgeting*, target setting and goals and the creation of structures. On the other hand, leadership is *coping with change,* aligning people by means of a vision, and communicating a desired future in a way that people can understand and commit to (Kotter, 2001). He argues that in a dynamic and ever-changing world leadership is vital for organizations to compete effectively and to survive, since as he points out that more change always demands more leadership.

Geller (2002) states that management can be understood as an activity that focuses on outcomes and that managers typically control consequences, dictate policies and rules, and hold people accountable. Leaders, on the other hand, go beyond consequence control in order to benefit colleagues' and coworkers' behaviors and attitudes through focusing on processes, setting expectations, and by directing, supporting, coaching or delegating (ibid.). Another difference between managers and leaders pointed out by Geller (2002) is that managers manage what is measured, whereas leaders facilitate intangibles.

Schein (2004) opines that management or administration is something that acts within a culture, while leadership, on the other hand, is something that creates and changes cultures. He argues that the only really important thing leaders do is work with and influence or change cultures, so the unique talent of leaders is their ability to understand and work with culture.

Kotter (1990) claims that few organizations are successful with both leadership and management. Among the few that are he points to such Japanese organizations as Sumitomo, Matsushita, Toyota, Nomura and Canon, and argues that their ability in both leadership and management is evident in their results as well as their ability to handle change. In contrast to those Japanese organizations most organizations are overmanaged and underled (Bennis, 1997 Kotter, 2001). The Japanese success is argued to be based on a collectivistic (group) mentality in contrast to the American and European leadership style, based on an individual, the strong leader at the top (Kotter, 1990).

3.8 Leadership for Lean

Osono et al. (2008) give a clear statement about the importance of having the two sides, the technical and the human, complementing each other; they write that after six years of research and more than 220 interviews at Toyota, they came to understand that it is how Toyota combines the hard and the soft sides and their focus on the human being as the center of production and consumption that have made Toyota successful.

Leaders at Toyota have since the beginning of their operations considered investment in people as the key to their success. The assumption at Toyota is said to have been that careful selection and development of people will continously improve processes and over time,

although time-consuming, lead to competitive strength. That has led the company to create a culture based on a company philosophy with principles guiding people's way of thinking and behaving (Liker and Hoseus, 2008). That indicates that at the core the Toyota Way is about people and culture. Rother (2010) argues that the most important factors behind Toyota's success are not production techniques or principles but the skill and actions of all the people working in the organization. He sees this, the issue of human behavior and the subject of managing people, as the primary differentiator between Toyota and other organizations. Perhaps the importance of people and people development is best spelled out in the Toyota document entitled "Human Resources Development" (Toyota, 2003):

> *Because people make our automobiles, nothing gets started until we train and educate our people.*

That highlights the importance Toyota put on development of people. Isao Kato, one of the initial master trainers at Toyota, states that it is not possible to separate people development from production development and succeed in the long run. He tells about a saying at Toyota: *"making things is about making people"* (quoted in Liker and Meier, 2007, p. xxiii). Kato continues:

> *If people want to succeed with Lean or TPS they have to emphasize people development and making leaders capable of delivering improvements* (ibid., p. xxiii).

The early Lean adopters Jacobs and Wiremold succeeded because their top managers understood the importance of people development and led the implementation through direct participation and consistent application of the two principles "continuous improvement" and "respect for people" (Emiliani, 2006, p. 176). Emiliani (2006) further argues that simple logical arguments would reveal that authentic CI is not possible without RfP (177). Despite this written and known simple logical argument, it seems to be all too common to misunderstand or neglect the importance of the "respect for people" principle when organizations try to implement Lean, with negative effects that lead to implementation failures (Sohal and Eggleston, 1994; Bhasin and Burcher, 2006; Emiliani, 2006; Teresko, 2006; Liker and Hoseus, 2008; Osono et al., 2008; Pay, 2008). Maybe this can be construed as a reflection of the statement shared by Bennis (1997) and Kotter (2001) that most organizations are overmanaged and underled. If balancing the two complementary systems, leadership and management, has been a success factor for Toyota, then it seems logical that organizations that have been inspired by Toyota and are trying to reach similar success

through Lean are going to fail if they lack leadership ability and are overmanaged. Research on barriers to Lean supports this, since leadership is found to be a common obstacle to Lean (Crute et al., 2003; Radnor et al., 2006; Sim and Rogers, 2008; de Souza and Pidd, 2011; Muslimen et al., 2011¸ Bhasin, 2012).

Research at Cardiff University Innovative Manufacturing Research Centre (CUIMRC) shows that leadership and leaders' commitments are important for Lean implementation and sustainability (Found and Harvey, 2007). Despite this, Lean literature mostly is about Lean tools and techniques, while literature on leadership so far has not focused on leadership for Lean. Lean thinking is something that has to go beyond departments and defense of "individual empires" to building a collaborative organization as a whole. They find that deploying Lean is not a matter of choosing a top-down or bottom-up approach, but rather requires both approaches (ibid.).

Flinchbaugh et al. (2008) argue that Lean leadership is about changing the way people see, think, talk, act and react and that there are five essential actions for Lean leaders:

- Teach by themselves and not delegate the teaching to external or internal training departments.
- Create tension but not stress. Stress arises from impossible or close to impossible conditions and when the vision of the future is unclear. Tension is created from a clear vision of the ideal state, a clear view of the current situation and skills and capabilities, supportive leadership, and resources to close the gap between the present and the vision.
- Create a culture of no blame and promote new thinking, actions and experimentation.
- Lead by participating or everyday action.
- Teach people to be able to teach others and evaluate their own performance.

3.9 Basic assumptions and cultural differences

There are significant differences between the American and the Japanese culture (Wagatsuma and Rosett, 1986; Edström et al., 1994; Dorfman et al., 1997; Heine et al., 2000). This cultural difference has been described as two extremes on opposite ends of a scale (Edström et al.,

1994). The American culture is characterized as individualistic, pushy and showing off, whereas the Japanese culture is characterized as collectivistic, unobtrusive and muted (ibid.). Group harmony is important for the Japanese, and the Japanese culture tends to encourage people to identify their shortcomings so they can improve themselves, whilst the American culture tends to encourage people to see themselves in a positive view (Heine et al., 2000). This cultural difference has been a source of misunderstanding, frustration and frictions, not least in business relations, in the contact between USA and Japan. One example given is the Japanese way of talking. The Japanese speak in two ways, *tatemae* and *honne* (Wagatsuma and Rosett, 1986; Edström et al., 1994; Heine et al., 2000). Tatemae is a formal way to speak, it is about form and expresses what is expected, while honne is expressing what is really thought or felt. Tatemae is important in relations, because formality and politeness is the Japanese way to try to avoid frictions, but in reality it is honne that is done to get results that count. This way to talk has been seen by Americans as falseness. The cultural difference between USA and Japan is argued to influence and give rise to differences in leadership and leader behavior (Wagatsuma and Rosett, 1986; Edström et al., 1994; Dorfman et al., 1997).

Imai (1997) argues that Japanese leaders are process oriented and acknowledge people as the cause of processes in production and improvements; therefore, Japanese managers focus on supporting and encourage their people. In contrast, the manager in the Western world focuses on results attained (ibid.). This means that Imai depicts the Japanese view as focusing on people and processes that create results, whereas Western managers focus on the end results. According to Liker and Hoseus (2008), leadership at Toyota is in many ways different, even in some aspects contrary to Western leadership tendencies. The Toyota leader focuses on processes, believing that *the right process will lead to the desired results* (ibid., p. 334). This means that at Toyota understanding of processes is seen as much more important than figures that represent results. Liker and Hoseus (2008, p. 334) list the differences between traditional Western leadership and Toyota leadership, shown in table 1.

TRADITIONAL WESTERN LEADER	TOYOTA LEADER
Expects quick results	Patient
Proud	Humble
Climbs ladder rapidly	Learns deeply and horizontally and gradually works way up ladder
Wants results at all costs	The right process will lead to the right results

Accomplish objectives through people	Develops people
Overcomes barriers	Takes time to deeply understand problem and root cause before acting
Manages by the numbers	Deeply understands the process

Table 1. Traditional Western leadership compared to Toyota leadership (Liker and Hoseus 2008.

According to Wagatsuma and Rosett (1986) there are clear differences in how senior officials behave when their organization is responsible for wrongdoing or accidents. Executives in Japan take responsibility and apology in public, even face-to-face with the victim in public, whereas American executives are more likely to deny responsibility when something goes wrong and seek to avoid personal contact with the victims. This difference in behavior is proposed to depend on the Japanese high value on group membership and harmonious relations, in contrast to the Americans' high value on individual autonomy (ibid.).

3.9.1 Previous research on culture and Lean

According to Liker and Hoseus (2008), there are some key points that companies embarking on Lean or a Toyota Way–inspired work model consider:

- Since leaders create culture, Toyota takes a long time perspective on the development of leaders. The leaders at Toyota are seen as carriers of the Toyota DNA and are expected to let the DNA become "visual" through their thoughts, words and actions.

- With higher leader positions, it follows that the distance to the value adding places, the *gemba*, increases, resulting in a decrease in power and the opportunity for direct influence on the value-adding work. Gemba can be defined as "the place where work takes place." The Toyota leader is expected to work hard to support the people that are the value adders, the workers in gemba. This leadership philosophy is the basis of what sometimes is referred to as the "Toyota servant leadership."

- At Toyota, leaders are expected to be thoughtful role models expressing the company philosophy and living the company's core values, such as spirit of challenge, kaizen (continuous improvement), respect for people, genchi genbutsu, and teamwork.

- Toyota develops their leaders from within the company by rotating them through different parts of the company. The people are expected to learn deeply at each step. Despite that, it is a slow, time-consuming way to develop leaders.

- When hiring outsiders Toyota has a rigorous procedure that guides the selection so they get people with an approach that is in line with the company philosophy and core values.

- It takes time to develop the understanding of and ability to manage the Toyota Production System (TPS), and it takes more time to understand and build skill in managing Toyota Human System (THS). Thus, to become an organization that works with both the hard side (TPS) and the soft side (THS) is a long-term process.

Based on five case studies Poksinska et al. (2013) concluded that the role of managers in the studied organizations changed from managing processes to managing people by motivating people, coaching them and developing people and teams. They further concluded that Lean leadership shows similarities to such leadership theories as transformational leadership, servant leadership and self-managed teams. They argue that it is important to create a supporting culture and system that guides behavior and thinking among the organization's members; the result will be that managerial push is replaced by employee pull, so the system will not be dependent on individual leaders (ibid.).

Emiliani and Emiliani (2013) argue that managers often lack motivation to learn Lean management, since it takes many years and top managers have difficulty recognizing their own management weaknesses. They further argue that managers must practice Lean leadership daily to learn and understand Lean management and be able to lead Lean transformations, They need to recognize and alter problems in thinking and acting among themselves as well as among others. That means that managers build culture through active daily participating practice, and thus become role models to others.

3.10 Critical views on Lean

Lean not only has proponents but also critics. Berggren (1993) made an early opposing statement about Lean as a universal concept as he mean is argued by Womack et al. (1990).

Berggren claims that Womack et al. (1990) has a fundamentalist view on Lean that not is connected to reality. Berggren depicts Lean as a double-edged philosophy, with both positive and negative consequences, and he believes that Lean is not the end of the development of production concepts as he feels Womack et al. (1990) suggest.

Landsbergis, Cahill, and Schnall (1999) argue that Lean creates intensified work pace and demands, so Lean work is a potential source of job stress and increased rates of musculoskeletal disorders and other health problems. In an overview of international and Swedish studies regarding Lean and work-related musculoskeletal disorders (WMSDs), Brännmark and Håkansson (2012) argue that when Lean is implemented there is a tendency to increased work pace, workload, stress and risk of WMSDs. They argue that the risk of WMSD increases if the Lean implementation is not accompanied by an ergonomic intervention with the aim of reducing repetitive work and monotony (ibid.). These statements are in line with a conclusion by de Treville and Antonakis (2006) who state there can be too much Lean, meaning too standardized work operations and decreased worker control, which will have negative effects on motivation. A situation that makes Lean mean.

Parker (2003) comes to a similar conclusion, finding that the Lean way of working can be damaging to people and result in higher levels of job stress and increased risk for cardiovascular disease. Nishiyama and Johnson (1997) also argue that Lean has negative effects on health and even can lead to *karoshi*, a word that means "death from overwork."

Carter et al. (2011) find a very different picture of Lean compared to Lean proponents' statements. They argue that Lean has negative effects on people's health, increases working hours and reduces morale among people, and state that in their survey only 1 percent of the staff was positive about Lean. They strongly argue that Lean has potentially disastrous consequences in the long run for public services (ibid.).

Given Lean proponents' suggestion that Lean motivates people and results in higher outcomes and competiveness, together with Lean opponents who argue that it results in limited and alienating working conditions, de Treville and Antonakis (2006) researched Lean production's impact on motivation. They concluded that Lean has a double-edged nature and to reach positive effects this double-edged nature is important knowledge to avoid

motivational and ethical traps (ibid.). An important issue that has been highlighted by opponents to Lean is that Lean, with its strong focus on standard operations, might lead to decreased worker autonomy and low levels of job control (Lewchuk and Robertson, 1997; Landsbergis, 1999; Parker, 2003; Metall, 2003), and that means a work situation that, according to the job-strain model, creates work-life stress (Karasek, 1979). In a long-term perspective, such a situation of job stress might be negative to productivity, product quality, costs and competitive strength, thereby endangering the survival of an organization that has its business in a world of competition.

Börnfelt (2006) states that in Lean production employees are expected to take an active part in improvement work, but he finds that Lean as it exists, being based on Fordism and characterized by monotonous, repetitive assembly line work with little control for the worker, becomes a contradiction. He argues that the low level of worker control is demotivating and thus contradicts the expectations that workers will take initiative and solve problems.

Mehri (2006) builds his critical view of TPS (and Lean) on his own experiences from his employment as a computer simulation engineer at a Japanese company (the company is not revealed) that is a supplier to Toyota, from April 1996 to June 1999. He argues from his experiences that there is a huge difference between how TPS is described and reality. He concludes that TPS as he experienced the concept in reality had negative effects on people, culture and performance.

Conti et al. (2006) claim that the character of Lean depends on management decisions, and job stress therefore heavily depends on management practices and policies. So according to them, the question Is Lean mean? is answered with the statement that Lean is not inherently stressful and negative to workers' well-being. They say the impact on worker health and well-being depends on how managers choose to design and operate Lean (ibid.). Maybe the important aspect is as proposed by Brännmark and Holden (2013), that Lean is implemented in a structured way that creates opportunities for active, continuous participation.

The critical views above show that there are critics to Lean as a concept as well as how Lean is implemented. The aspects pointed out by the opponents to Lean are important factors to highlight, since they otherwise become barriers to Lean implementation and sustainability.

The different opinions and conclusions among researchers about Lean and its effects on people and health indicate the need for more research on Lean. It is important to remember that Lean has evolved over time and that the Lean concept of today is not the end of the development of production concepts, as pointed out by Berggren (1993), and so it is important to continue to research Lean and its effects on people and productivity.

3.11 Summing up barriers and difficulties to change and Lean

When summing up the knowledge about barriers to change and Lean, it becomes clear that it is the soft side that is hard. In other words, in Lean implementation it is the respect for people (RfP) principle connected to the human value stream that organizations often fail with. Inadequate leadership is an important factor behind these failures. It is a bit surprising that although many barriers are known and have been so for a while, these factors such as the importance of people and their development and leadership support still turn out to be the problem.

As the purpose of this thesis is to identify perceived barriers and difficulties (i.e.. the experienced factors) to Lean implementation and then structuring these barriers, Porras and Robertson's change model, with its specific key factors related to four basic categories (1992, p. 729), was chosen as the reference model well suited for structuring the experienced barriers (see figure 5 above).

4 METHODOLOGY

In this chapter a description of the scientific approach, data collection and analysis methods, and quality of the study is presented.

4.1 Scientific approach

The scientific approach is fundamental, since it affects which problems the researcher addresses and thereby what method or methods are to be chosen. Research can be conducted with the aim of getting quantitative data, as in surveys and experiments, or qualitative data, as in a case study. Studies 1 and 2 for this thesis were performed as case studyies, study 3 was a literature study. As the purpose of this thesis was to identify and structure perceived barriers and difficulties to Lean implementation, the case study method was chosen for papers 1 and 2 based on Yin (2009) and Cohen and Manion (1994, p. 106). Yin (2009) describes the case study method as one suitable for explanations and descriptions of complex real-life interventions. Case studies can be used to illustrate certain topics in an evolution so they can be clarified. Cohen and Manion (1994, p. 106) state that a case study, by studying and analyzing an individual unit, typically establishes generalizations to wider populations. Paper 3 reports on a literature study done with the snowball method to find central literature on leadership in relation to Lean. According to Guldbrandsson et al. (2012) and Lewis (2012) the snowball method is suitable for identifying people that are influential on the public. The tool to find influential publications was the computer program *Publish or perish* (Harzing, 2007).

4.2 Data collection and analysis

This chapter describes the data collection and analysis for the three research questions.

4.2.1 Research question 1: Which barriers to Lean implementation in manufacturing and health care are described in the literature and among managers and key personnel active in Lean implementation?

The purpose was to compare similarities and differences in how the concept of Lean and barriers to Lean are described by key informants in manufacturing and health care. The data

was collected via semi-structured interviews that were recorded with a digital voice recorder; the recordings were then transcribed to text. Those interviewed were the division manager, the operations manager, the human resources (HR) strategist at the division, two business developers, the nursing managers at two emergency units and two Lean coordinators, in all nine interviews. The interview guide consisted of ten questions:

1. Have you had any Lean training?
2. How would you describe Lean?
3. Do you think all the people in your organization view Lean in the same way?
4. How is Lean implemented?
5. How is the implementation process going?
6. Do you see any barriers/challenges to succeeding with the Lean implementation?
7. Have you or your organization any vision of what it will look like when Lean is implemented?
8. Is there any health-related work connected to the Lean implementation?
9. What are you doing to promote wellness among the personnel?
10. Is Lean affecting the leadership?

The text was transcribed word for word, but interjections such as um and ah were omitted to make the transcribed text easier to read. The analysis consisted of two major steps. The first was to find obstacles from both industry and health care informants and compare them. This was done with the Constant Comparative Method (CCM) (Boeije, 2002). CCM was found to be a suitable method to identify and compare factors, in this case, factors that the informants from manufacturing industry and health care stated to be barriers to Lean implementation. The second major step was to analyze the barriers with a model for change (Robertson et al., 1993). The change model consists of four major interrelated subsystems: organizing arrangements, social factors, technology, and physical setting. Each of the four subsystems consists in turn of specific elements that are argued to strongly influence the work behavior of individual organization members. The change model was a functional model to link the factors that were found with CCM through the specific elements to one of the interrelated subsystems. This provided a clear picture of barriers and their nature, in terms of organizing arrangements and social factors.

4.2.2 Research question 2: How do the views on Lean of the managers implementing Lean influence the implementation?

The purpose was to address the question of how managers' views on Lean in terms of "toolbox Lean" or "Lean thinking" impact their view of the implementation process. The study strived for a contextual understanding of managers' interpretations of Lean and their resulting actions. Data was collected through individual semi-structured interviews with 20 managers and covered all hierarchical management levels in the company. The author of this thesis did the interviews with the people in production: the production unit manager, three production managers and 11 first-line managers. The top managers were interviewed by J. Renström. That means that for the author of this thesis it was the perspective and experiences among the managers in production that was the primary focus. But as it was seen as important to have the experiences from al hierarchical management levels it was decided to cooperate with Renström as his primary focus was on top managers. The seven questions that were used in all interviews were:

1. What is Lean for you? (any company definition)
2. Does Lean affect leadership (if so, how?)?
3. Do you have any vision of what it going to look like when Lean is implemented in the company?
4. Do you think that people in the company have the same view of the new Lean-based business system?
5. How is the implementation done?
6. How do you perceive the implementation—how is it working?
7. What problem/challenges do you estimate in the implementaion of Lean?

The company had at the time of research six product areas. All managers in one production unit participated. They were the production unit manager, three production managers and 11 first-line managers. Participating was also the president of the company, two product area vice presidents and two production unit managers, since they all had a leading role in the company's Lean implementation.

The authors transcribed their interviews and there after the analysis was done by both researchers (Halling and Jonas Renström) thru meetings and was conducted by comparing and clustering theme titles emerging from the transcribed material with the use of a big whiteboard and by supporting narrative arguments with verbatim extracts from transcripts to support the case, in a process influenced by interpretative phenomenological analysis (IPA). IPA is a qualitative research approach originating in psychology but

increasingly used in human, social and health sciences (Smith et al., 2009), which attempts to explore personal experience and is concerned with an individual's personal perception of an object or event. That means that IPA aims to give "voice" to or a picture of participants' experiences. Smith (2004) argues that IPA aims to explore participants' experiences and how they make sense of them. The first step in the IPA research process is to try to understand the participant's world and create a view that is as close to the participant's view as possible. It is important to remember that the picture is a construction by the participant and researcher and not an objective picture. When a participant's view is constructed, a second step positions that view in a wider context (Larkin et al., 2006). IPA should perhaps be seen more as a perspective or stance from which to approach the analysis of the qualitative data then a distinct method in research.

The results were finally structured into three themes: (1) the managers' view on Lean, (2) the managers' view on the implementation process, and (3) the relationship between the definition of Lean production and its implementation. Furthermore, the analysis resulted in the structuring of the five hierarchical levels into three management levels: top managers, middle managers and shop-floor managers.

4.2.3 What is the role of leadership and management in Lean as described in the literature?

The purpose was to explore the role of leadership and management in Lean as described in the literature. The work began with a literature search in the databases ISI Web of Science, Scopus and Google Scholar by the author of this thesis. The search terms were *leadership*, *leadership* AND *management*, *leadership* AND *lean*, and *management*. The large number of articles was discussed with J. Renström and resulted in a decision to search for central and influential writers, leading to a decision to follow the snowball approach for the study. One description of a snowball sampling is that a core group of participant is sampled, they are asked to identify other eligible participants and this second generation of participants is contacted and asked to identify the next generation in a snowball- rolling fashion (Cohen and Manion, 1994). The snowball method is a method suitable to identify people with influence on the public (Guldbrandsson et al., 2012; Lewis, 2012). In this study influential, i.e. central, persons were identified through their publications. To find central, influential writers the author of this thesis searched with the citation analysis tool *Publish or Perish*, with the aim to find the

most cited papers that were seen to be relevant according to the research question. This search resulted in 12 articles and 6 books that thru discussion between Halling and Renström were seen as central for this study. Through these articles and books, other literature was, by the two researcher, Halling and Renström, in cooperation identified as relevant for the study; the search for articles ended with a search for articles published the last couple of years. This was found to be a functional process to find relevant literature to fulfill the purpose of study 3. See paper 3 for a more detailed description of the process.

4.3 The studied organizations

Two organizations were studied in this thesis. One organization is part of a globally established Swedish manufacturing company, and the other is a health-care organization from which two emergency units belonging to the same county were selected. Both the manufacturer and the health-care organization are located in central Sweden. Both the manufacturer and the emergency departments had been using big globally established consultant firms (not the same one) to obtain basic Lean knowledge. In health care the teaching was directed to nurses and some managers; at the manufacturer the consulting firms directed the training to the managers in production. In both cases the training was about 5S and daily steering using visualization boards, with the aim of building continuous improvement through group kaizen activities. That meant that all the respondents in this study received basic Lean knowledge from consultants.

4.3.1 The manufacturer

The studied manufacturer is part of a globally established Swedish manufacturing company. The company is divided into several independent strategic product areas, which in turn contain several production units. The company's Lean journey was initiated by the company's president due to a perceived need for improvements to delivery precision, quality, utilization of competence and resources, and profitability. Initially an international consulting agency was hired to train a number of designated change agents within the company. As Lean was seen as a set of tools for increased profitability to be gained by higher productivity, shorter lead times, and higher and more stable quality, focus for the transformations was on production, leaving out support functions.

4.3.2 The health-care organization

At the time of the research the health-care organization consisted of five main divisions, and

the study took place in one of the divisions in two emergency units. The health-care organization's Lean journey was initiated by the top managers with the aim of increasing the organization's efficiency, thereby leading to better availability for care to the patients, increasing control over the production of care and reducing the cost. It was further argued that Lean should be seen as a part of the organization's strategy and part of the political agenda and connected to a project called the "sustainable way" (*hållbar väg* in Swedish). The overarching goal for the "sustainable way" was to increase efficiency, reduce patients' time in the care chain, increase patient safety and increase participation among employees. After around two years the organization saw a need for more Lean knowledge and employed "lean coordinators," one to each of the organization's five divisions. The two Lean coordinators participating in this study had both been working with Lean in a Swedish telecom company.

4.4 Quality of the study

In this chapter the quality of the study is addressed in terms of validity, reliability and external validity.

4.4.1 Validity

Validity is a very important criterion of research; it essentially is about the question whether the measuring really reflects what is measured (Bryman, 2008; Yin, 2009). Measuring validity is important in qualitative research and in social science (Bryman, 2008). According to Yin (2009), validity can be improved by use of multiple sources. When researching an organization the use of multiple sources can mean interviewing as many people as possible with regard to their relevance for the research goal.

Based on Yin (2009), the participation of all the appointed key informants in the semi-structured interviews at two researched organizations strengthens the validity of the results reported in paper 1. The validity is further strengthened by comparing the results from the study with results from other research on barriers to Lean implementation. There were a number of barriers to Lean in common, and that strengthens the validity.

The second study at the manufacturer, reported in paper 2, was conducted with managers in higher hierarchical levels with the same questions as used in the first study, reported in paper 1. The results from the two studies, covering all management levels at the manufacturing

company, were then compared. When the result of the second study was compared with the existing literature on Lean it was found that many of the barriers and experiences from Lean implementation were similar, which is argued to strengthen the validity of the results.

The third study, a literature study, showed that using search terms such as leadership and management give a very high number of hits in databases and on the Internet. So the topic of leadership/management has been researched and written about a lot. Using the computer program *Publish or Perish* as an instrument to find central publications based on citation frequency worked well. The same was true for the topic of Lean and Lean leadership. Taken together, I believe the results reported in the three papers are of strong validity.

4.4.2 Reliability

Reliability is about the question whether the results of a study are repeatable and an issue that is important in qualitative research together with the issue of stability of results (Bryman, 2008). The result reported in the three papers and the results from other researchers' findings regarding barriers to Lean are similar, and thus the reliability is argued to be strong. Replicability is closely connected to reliability (Bryman, 2008). In case studies it is important to conduct and describe the research done so that the research process can be repeated by others (Yin, 2009). Sometimes results from a study make the researcher want other researchers to replicate a study. That might happen if the result is controversial or contradicts other results. To make it possible to replicate a study it is important that researchers describe the research process in detail. Despite the generally "low status" of replication compared to originality in the academic world, replicability is valued in social research (Bryman, 2008). The informants and interview questions in studies 1 and 2 are described in papers 1 and 2. The literature research reported in paper 3 is also described so the process can be repeated by others. Thus, I argue that the three studies fulfill the possibility of replicability.

4.4.3 External validity

External validity is about whether a result from a study can be generalized to contexts other than the studied one (Bryman, 2008). When the results on perceived barriers and difficulties to Lean implementation in manufacturing and health care are compared to findings in the literature on difficulties in organizational change in general and Lean implementations there are many similarities. Therefore, the findings in this thesis about barriers appear to be relevant

to both organizational change in general and especially in Lean implementation, regardless of what kind of business the organization is in. The problem often is related to the human side, i.e. the soft side, and as all organizations consist of humans, the findings in this thesis are relevant for all kinds of organizations that want to make better use of their resources, regardless of what business they are in. That means that external validity in the thesis is strong.

5 SUMMARY OF THE RESULTS FROM THE APPENDED PAPERS

This chapter presents summaries of paper 1, paper 2 and paper 3.

5.1 Summary of paper 1

In the first study, the research question was: Which barriers to Lean implementation in manufacturing and health care are described in the literature and among managers and key personnel active in Lean implementation? The data was collected via semi-structured interviews with key informants active in the implementation process at a manufacturing industry and an health-care organizations. The results showed that in both organizations the view of Lean changed from a toolbox to a human behavior view. Eight barriers were described as experienced in both organizations:

1. Consultants with limited Lean knowledge
2. Leadership
3. Time
4. No vision
5. No common view of Lean
6. Organizational silos
7. Insufficient communication
8. Reactive culture

There were three barriers found to be unique to the manufacturing industry or health care, respectively. In the manufacturing industry the unique barriers were: (1) *Lack of support functions*, (2) *Operators lack Lean knowledge* and (3) *Lack of work standards and the black book* (the black book is a black notebook that the individual operator use for notes that he keep for himself). In health care the unique barriers were: (1) *Insufficient cooperation with external organizations, (*2) *No follow-up and evaluation* and (3) *Rules not followed.* When analyzed with Porras and Robertson's (1992) change model, nine of the barriers were found to be elements of social factors and five elements of organizational arrangements. No declared barriers were related to the other two clusters in the model: physical settings or technology. Despite the different business, similar barriers related to organizational arrangements and social factors were described as experienced in both manufacturing industry and health care.

Practical implications from the findings include that large organizations intending to develop their organizations based on Lean should consider organizational arrangements and social factors in order to limit barriers to Lean implementation. Most research on Lean has been about successful Lean implementations, whereas this study focuses on how Lean is viewed and what barriers key personnel in manufacturing industry and health care have experienced in regard to implementation. By comparison of the experienced barriers to Lean in industry and health care, barriers that are common, "archetypical" or unique for industry and health care were identified, thus contributing to knowledge about barriers to Lean implementation.

5.2 Summary of paper 2

In the second study the research question was: How do the views on Lean of the managers implementing Lean influence the implementation? Data was collected through individual semi-structured interviews with 20 managers and covered all hierarchical management levels in the manufacturing company. The study shows that the participating managers' view of Lean had evolved from a "toolbox" view towards more of a "Lean thinking" view, due to the learning taking place in the organization during the implementation. The study also shows that fragmented development of an organization, such as production units developing individually without the support they need from middle management or HR due to variations in knowledge about Lean, may impede Lean development efforts. From the study a conclusion is that even if Lean initially may be perceived as a "toolbox" where the tools in themselves are regarded as Lean, the definition may during an implementation evolve into a definition that also encompasses the design and management of the work. So to claim that a "toolbox" approach to Lean implementation will result in a projectlike implementation may be initially correct, but may prove to be incorrect over time due to organizational learning. Lean implementation initiated as a project directed at production units within an organization might thus over time evolve into a process of continuous improvement and prove a viable starting point, provided that sufficient time is given for adaptation and learning. As the definition of Lean develops, new and unforeseen deviations or needs may be identified, as happened in this case with an increased need for leadership, people development and dialogue. These developments in turn affect the managers' views on the implementation process and the perceived needs in regard to Lean development. The impression or even fantasy that Lean can be implemented as a project in selected parts of an organization is

clearly challenged by the results. Developing an organization towards a Lean way of working is clearly an evolutionary process, underlining "people development."

5.3 Summary of paper 3

In the third study the research question was: How is management of Lean described in the literature? The study was a literature study with a snowball method design. The study shows that management and leadership are two different but complementary systems of action, both of which are needed in organizations that strive for continuous improvement, elimination of waste and optimal performance. Management is described as being about organizing, structures, budgeting, work standards and routines, with the aim to create order, stability and predictability. Leadership, on the other hand, is about the alignment and development of people within an organization by communication and anchoring of visions, in order to establish a context where people are willing and able to contribute to the company efforts in reaching set targets and visions. The understanding of the complimentary aspects of these two concepts in relation to a Lean business operation can be said to be vital for sustainability and development. The duality of leadership and management is reflected in the duality and complementary aspects of Toyotas two foundational principles, continuous improvement and respect for people. The presence of these two principles is perhaps what ensures that Toyota maintains a functional balance between management and leadership abilities within its operations. These two main principles are connected to two value flows. The *Continuous improvement* principle is connected to the *production value flow,* while the RfP principle is connected to the *human value flow*. These two value flows have to be systematically supported and developed via a production system and a human system, which clearly reflects a need for both management and leadership.

6 DISCUSSION

In this chapter the results and the research methods will be discussed, as well as the thesis limitations and contribution.

6.1 Which barriers to Lean implementation in manufacturing and health care are described in the literature and among managers and key personnel active in Lean implementation?

In both industry and health care the informants described eight barriers that were experienced in both organizations: (1) consultants with limited Lean knowledge, (2) inadequate leadership, (3) lack of time, (4) no vision, (5) no common view of Lean, (6) organizational silos, (7) insufficient communication and (8) reactive culture.

There were three barriers found to be unique to the manufacturing industry and to health care, respectively. In the manufacturing industry the described unique barriers were: (1) lack of support functions, (2) operators lack Lean knowledge, (3) lack of work standards and the black book. In health care the described unique barriers were: (1) insufficient cooperation with external organizations, (2) no follow-up and evaluation, (3) rules were not followed.

Firstly, it is strikingly clear that despite the two organizations belonging to very different businesses, eight out of fourteen of the described barriers are the same. Further, I believe even the unique factors are consequences of the common barriers, since these factors relate to the old workplace culture and context not having been changed to support the creation of a Lean culture.

The lack of support functions in manufacturing was a consequence of the early decision to give priority to productive parts of the organization and leave support functions, particularly HR, out of the Lean implementation process. This was a mistake, as it led to a situation that according to the "creator" of TPS Taichii Ohno results in failure, because applying TPS only at the production floor will not work (Emiliani, 2006). At the manufacturer that mistake resulted in the support functions' incapacity to support the Lean implementation, and HR

even became an obstacle to Lean implementation. I maintain that this shows the importance of seeing Lean as a system that must include all parts of an organization.

Operators lacking Lean knowledge was something that was seen as important to attend to. The production managers at the manufacturer stated that now that they themselves understood what Lean was about, they believed the next step was to ensure that all operators also got Lean knowledge. At the time of the interviews most operators lacked that knowledge, and the managers said that if the operators never got that knowledge Lean would never work. This statement is a reflection of the managers' insight that all operators have to understand and behave according to Lean principles.

The lack of work standards was a barrier that had to be corrected by implementing work standards at the manufacturer. The managers in manufacturing felt that this was a big challenge, as it was opposite to the black book culture that had a long history in the company. The black book is a black notebook that the individual operator use for his notes, This notes is useful tip and experiences and are not shared with other operators, as it seen as a way to better payment. I argue that this highlights the importance of creating a new reward system that rewards the on-the-job behavior that is the goal with the Lean implementation.

Of the barriers unique to health care, insufficient cooperation with external organizations was seen as a a slow process with negative effects on the patient flow. I propose that by putting the customer/patient in the center and creating a standard way of working with external organizations this could be changed from "insufficient cooperation with external organizations" to beneficial cooperation with external organizations from the customers/patients' view, based on their needs.

The culture of no follow-up and evaluation was a problem in health care that has to be changed when implementing Lean. Continuous improvement requires following up and evaluating. Without changing this cultural issue there will be no chance to succeed with continuous improvement. Changing a culture is a leadership mission. Therefore, I believe this problem is a consequence of inadequate leadership, one of the eight common obstacles. A solution is to start to lead with a leadership that is suited for Lean.

Rules and agreements were not followed in the health care cases, and the informants expressed the opinion that there should be some sort of "punishment" when managers ignored organizational rules or procedures, because it was a source of organizational tension and made it more difficult for different parts of the organization to cooperate. This situation must be changed if the health-care organization is to become one organization and not be composed of competing organizational parts that are unable to work with the customer/patients to fulfill their needs. I believe the situation described is a sign of weak and inadequate leadership. To be able to succeed with Lean, the leadership in the health-care organization has to be changed.

Many of the common barriers described in the two researched organizations in this thesis are known barriers to Lean, including inadequate leadership (Radnor et al., 2006; Sim and Rogers, 2008; de Souza and Pidd, 2011; Muslimen et al., 2011), no vision (Crute et al., 2003), no common view of Lean (Crute et al., 2003; de Souza and Pidd, 2011), organizational silos (Radnor et al., 2006; de Souza and Pidd, 2011) and insufficient communication (Crute et al., 2003; Radnor et al., 2006; Sim and Rogers, 2008). I propose that we recognize these as archetypical barriers to Lean implementation.

Both the manufacturing industry and the health-care organization had been using big international consultant firms, but not the same ones, to get basic Lean knowledge. Both industry and health-care informants expressed the opinion that Consultants with limited Lean knowledge had been a barrier to successful Lean implementation. Muslimen et al. (2011) point out that engaging people with a lack of their own experiences with Lean as Lean teachers and coaches is a barrier to successful Lean implementation. I agree with Muslimen and his colleagues and found this was what happened in the industry and health care, according to the informants' descriptions. Therefore an organization that "jumps on the Lean train" and intends to use consultants to help them start moving has to be careful when selecting the consultants, so they get support from people with enough knowledge and preferably their own experiences with Lean implementation.

6.2 How do the views on Lean of the managers implementing Lean influence the implementation?

The manufacturer's Lean journey was initiated by the company's president in response to perceived needs for improvements in delivery precision, quality, utilization of competence

and resources, and profitability. The view of Lean was then a toolbox view, meaning that Lean was seen as a set of tools for increased profitability to be gained by higher productivity, shorter lead times and higher and more stable quality. The focus for the transformations was on production, leaving out support functions. This resulted in a negative view of HR among shop-floor managers due to HR's lack of Lean knowledge. This shows the importance of involving support functions from the beginning if they are to be able to support the Lean implementation. Since the HR department has a vital function in people development as described by Liker and Hoseus (2010), this organizational fragmentation resulting in conflicting priorities most likely affects the implementation negatively. It might be a solution to have HR people working on the shop floor supporting the shop-floor managers from the beginning of a Lean implementation process. At the same time the HR people can learn about Lean from consultants and about the circumstances and needs at the shop-floor level and can create connections to the people on the shop floor. This could be a way to build trust and respect between HR and production, which probably would help HR support the Lean implementation process and future continuous improvement.

Initially an international consulting agency was hired to train a number of designated change agents within the company. Middle managers were excluded as the consultants; later the change agents worked with the people in production, thus bypassing the middle managers. By delegating "ownership" to external experts, instead of letting them teach and coach the organization's managers at different hierarchical levels, the organization lost a training opportunity for the line managers. In the end that could in the worst case mean that when the consultants leave so does the Lean knowledge and supportability;to make matters worse, that unfavorable result is something the organization has paid for.

From a beginning toolbox view of Lean the view was altered to more of a Lean philosophy view, due to learning during the implementation. The view that evolved placed more focus on people and behavior, with changed priorities regarding what needed to be done to succeed with the Lean implementation. This move from the predicted to reality is a perspective given by Mintzberg and Waters (1985) on strategy implementation and emergent strategy. Emergent strategy means "learning what works." They suggest that intentions and priorities may change in the process of implementation as the organization learns, uncovers needs and/or discovers what works. Hence, Lean implementation or development in an organization may start out

with one specific focus that alters over time as the organization gains competence and understanding regarding its own needs, as was the case in the researched organization. This case showed that the view on Lean as a toolbox or as a philosophy influences the implementation process.

6.3 How is management of Lean described in the literature?

In papers 1 and 2 leadership emerged as an important topic in Lean implementation; that finding was the basis for paper 3. The purpose of paper 3 was to explore the role of management in a Lean enterprise system as described in the literature. The study was executed as a literature study with input from the databases ISI Web of Science, Scopus, Google Scholar and Publish or Perish. Findings show that leadership and management are two different but complementary concepts that can be seen as reflected in the duality and complementarity of Toyota's two foundational principles, continuous improvement and respect for people. With management as an action system connected to the CI principle and leadership connected to the RfP principle. It is important to differentiate between the two concepts in order to understand and meet organizational needs during Lean implementations, where both management and leadership have relevant but different and complementary functions in the implementation and change process to create a Lean culture. Management is about organizing for stability, whereas leadership is about leading change. This means that management is acting within a culture while leadership is about changing the culture: both are needed.

Implications of the study point to a need for a distinction between management and leadership and for greater understanding regarding the difference between management and leadership in relation to Lean. Further, there is a need to train managers in leadership, something which may be a reflection of the education system. That organizations are stated to be overmanaged and underled indicates that the ability to work with organizational culture and to influence behavior may be lacking, which may be one potential reason for the fact that companies tend to address Lean as a toolbox rather than an enterprise system, covering all of its operations and entailing cultural and behavioral standards. A basic and important assumption at Toyota is that people are the source for the development of production (Liker, 2004; Osono et al., 2008; Rother, 2012), and people development has been seen as a key success factor by Toyota leaders ever since the founding of the company (Liker and Hoseus, 2008). The assumption of

the importance of people and their development has shaped the Toyota Way, leading to a system characterized by dualism. So to succeed with Lean, it can be argued that organizations intending to implement Lean should make assumptions similar to Toyota's. To change the current way of working to Lean, or the Toyota Way–inspired way of working, people's on-the-job behavior must change, since increased performance requires changes in human behavior at work (Robertson et al., 1993). That show the importance of leadership, because leadership is about changing culture, i.e. behavior. Paper 3 contributes to an understanding of the complimentary aspects of management and leadership needed for successful Lean implementations and Lean sustainability, as well as the relation of management and leadership to the two basic principles in Lean and the Toyota Way.

6.4 General discussion

When comparing the history of the Toyota Way and Lean there are various key points as described in chapter 2 and culture differences as described in section 3.7 above that I argue are of importance. The Toyota Way was created in a collectivistic culture and built on a family business with roots back in the 1880s, developed by people in their daily work, whereas Lean was developed by researchers in an individualistic culture who were studying the Toyota Way, and via a book in 1990 that started the Lean wave. These differences are summarized in table 2.

Toyota Way	1880s	Collectivistic culture	practice	work experiences
Lean	1990	Individualistic culture	research	theory

Table 2. Differences between the development of the Toyota Way and Lean

The main difference between the Toyota Way and most Lean failures is that the Toyota Way is clearly stated as being a dualistic system consisting of two main principles (sometimes called pillars): one is the Respect for People (RfP) principle and the other is the Continuous Improvement (CI) principle. Toyota systematically develops their people (the people value stream) so they can take part in the development of production and reach continuous improvement (the product value stream). Toyota's ability to balance the two sides is seen as the source to the Toyota's success (Osono et al., 2008). Lean, on the other hand, is described as often being seen as a toolbox when organizations try to implement Lean. That means that the product value stream (the CI principle) is in focus but the people value stream (the RfP principle) is neglected, resulting in implementation failures, something that both academics

and nonacademics have highlighted (Sohal and Eggleston, 1994; Bhasin and Burcher, 2006; Teresko, 2006; Liker and Hoseus, 2008; Osono et al., 2008; Pay, 2008; Ivarsson et al., 2013). Emiliani (2006) states that it is logical that if the RfP principle is missing, Lean will not work, because it is the RfP principle that enables continuous improvement. Real Lean, as the Toyota Way, has to be a dualistic system, otherwise the result will be false Lean, which will not work (Emiliani and Stec, 2005).

Lean history shows us that the problem with the all-too-often "missed" RfP principle started in 1988 when US top managers choose to neglect the importance of the principle and its application. In my view, this was a sign of different cultures: The US top managers were focusing on results, whereas the Japanese managers focused on processes with people as the process drivers, a cultural difference that has been described by Imai (1997). Of course, leader behavior and organization's arrangements differ in organizations focusing on people and processes versus in organizations focusing on outcome and numbers.

One possible consequence of missing or neglecting the important RfP principle is already known—the negative health impact Lean can have, as pointed out by several authors (Nishiyama and Johnson, 1997; Landsbergis et al., 1999; Parker, 2003; Carter et al., 2011; Brännmark and Håkansson, 2012) and on motivation (Börnfelt, 2006; Treville and Antonakis, 2006).

So why are organizations that are inspired by the Toyota success still trying to implement Lean from a toolbox view when it is, according to research and Toyota documents, predicted to fail? I think there are three reasons behind that situation:

- Consultant firms that apparently have limited Lean knowledge and a toolbox view seem to be contracted by organizations all too often to help them implement Lean, as was the situation in the two cases described in this thesis. This means that such consultant firms are largely responsible for Lean implementation failures and should be avoided. On the other hand, perhaps the consultants did know about Lean dualism, but the company's toolbox view prevented understanding. Thus, a company's managers must be prepared to change their understanding of Lean even if it challenges their knowledge and paradigms.

- Researchers have been successful at identifying problems and barriers in Lean implementation, but not at all as successful at spreading the knowledge outside the academic world. I think that this is a sign that researchers need other media and ways to communicate their findings to the nonacademic world that has neither access nor time to search in databases and/or scientific journals. In addition, for Swedes and many others the information is often written in a foreign language.

- Much of the management and Lean literature has been written by people from the West, mostly the USA, and that literature has then been read by managers, consultants, students and others interested in Lean, thus often resulting in a limited view of Lean, i.e. a toolbox view. I believe a more scientific approach towards Lean must be adopted, which I propose means going to the primary source, in this case Toyota, to learn about what they have done and do.

Leadership research history (see section 3.5) shows that a lot of research has been done on leadership (Bennis, 1959; Their, 1997; Yukl, 2010), resulting in a number of descriptions of what leadership is (Bennis, 1959; Horner, 1997). Despite all the research on leadership, the studies are often more manifestations of personal opinions than scientific conclusions (Their, 1997). However, an important distinction that has emerged is that leadership and management are described as two complementary systems of actions. Leadership is, in short, described as being about people and motivation, and management is about structure and organizing (Bennis, 1997; Their,1997; Kotter, 2001; Geller, 2002; Schein, 2004). Bennis (1997) argues that most organizations are overmanaged but underled, and Kotter (1990) contributes that among the few organizations that are successful with both leadership and management is Toyota. As Toyota Way and real Lean are dualistic systems, one must apply a dualistic action system for managers in organizations implementing Lean. The managers in organizations have an important task that is straightforwardly expressed by Drucker (2007, p. 3):

> *The manager is the dynamic, life-giving element in every business. Without his leadership "the resources of production" remain resources and never become production.*

That makes the manager a critical factor to succeed with Lean, as argued by Kato:

> *If people want to succeed with Lean or TPS they have to emphasize people development and making leaders capable of delivering improvements* (quoted in Liker and Meier, 2007, p. xxiii).

Based on that I propose that:

- The distinction between the two complementary systems of action, leadership and management, is important to make more known. If known could help highlight the importance of people and people development, thus helping organizations to succeed to implement and sustain real Lean in the future.

- Research on leadership, and especially on Lean leadership, in the future should be conducted in close cooperation with people working in organizations. Piderit (2000) asserts that leadership research in the future needs a more multidimensional approach to better offer guidance in future change initiatives. I believe this is relevant for Lean implementation and that cooperation in research with people working in organizations would be a way to achieve that multidimensional approach. An argument for such a proposal is provided by Emiliani (2006), who explains that Toyota has been influenced by Western management practice but not by the last 100 years of Western management theorizing.

As people are depicted as the core of the Toyota Way and in "real" Lean, and opponents to Lean have pointed to the risk of negative impact on people's health from Lean (Lewchuk and Robertson, 1997; Landsbergis et al., 1999; Metall, 2003; Parker, 2003; de Treville and Antonakis, 2006; Carter et al., 2011; Brännmark and Håkansson, 2012), I argue that health and health promotion are logically essential. Health promotion can be seen as continuous improvement on an organization's human value stream. As a consequence, health and health promotion knowledge become an important topic for managers. Dul and Neumann (2009) support such a statement, arguing that human factors/ergonomics (HFE) knowledge can support a company's business strategy to stay competitive, since ergonomics is concerned with the understanding of interactions between the humans and other elements in a working system. HFE is described as having two goals: to optimize human well-being and to optimize the performance of the overall system (Dul and Neumann, 2009; Dul et al., 2012). By designing work environments to fit humans, two related system outcomes may be achieved: performance and well-being. Performance outcomes can be achieved in terms of productivity, efficiency, effectiveness, quality, innovativeness, flexibility, system safety and security,

reliability and sustainability. Well-being can be achieved in terms of health and safety, satisfaction, pleasure, learning and personal development.
Thus, HFE knowledge has the potential to help organizations that embark on Lean as it puts people in the center, the core to succeed with real Lean. This argument is supported by Eklund (2000a), who concludes that quality for the end customer is only achieved if there is quality in all processes and work activities leading to the delivery of the product or service. He further states that a conditional requirement for enabling this is that the work activities are free from the risk of health impairments and accidents and that they promote well-being for the employees.

I further argue that organizational development (OD) supports such a proposal and could provide managers and organizations that aim for Lean with needed knowledge. People's on-the-job behavior is influenced by structures, rules and managers behavior, so managers can learn from OD's (a) use of behavioral science in planned organizational change, (b) focus on changing the total system or organization and (c) goal of improving individuals and developing organizations' effectiveness. Based on that I argue for:

- The importance of promulgating health and well-being as important factors for productivity and quality.
- An integration of knowledge of Lean with knowledge from fields such as health promotion, organizational development and human factors/ergonomics in future Lean implementation efforts.

As Lean continues to be implemented in fields outside manufacturing, such as health care, more organizations are interested in Lean. That makes it more important than ever before to learn from mistakes and about known barriers, to prevent unnecessary future waste in efforts and money. I end this discussion with a statement from Taiichi Ohno, who is largely credited with creating Toyota's management system:

> *Companies make a big mistake in implementing the Toyota production system thinking that it is just a production method. The Toyota production method won't work unless it is used as an overall management system. The Toyota production system is not something that can be used only on the production floors. The belief that it is only a production method is fundamentally wrong . . . those who decide to implement the Toyota production system must be fully committed. If you try to adopt only the "good parts," you'll fail* (Emiliani, 2005, p. 383, citing Shinohara 1988).

6.5 The barriers in brief

In the two researched organizations there were descriptions of 14 barriers, of which eight were common to both manufacturing and health care and three were unique, as shown in table 3.

Main Barriers in Manufacturing	Main Barriers at the Emergency Depts.
1 Consultants with limited Lean knowledge	1 Consultants with limited Lean knowledge
2 Inadequate leadership	2 Inadequate leadership
3 Lack of time	3 Lack of time
4 No vision	4 No vision
5 No common view of Lean	5 No common view of Lean
6 Organizational silos	6 Organizational silos
7 Insufficient communication	7 Insufficient communication
8 Reactive culture	8 Reactive culture
9 Lack of support functions	9 Insufficient cooperation with external organizations
10 Operators lack Lean knowledge	10 No follow-up and evaluation
11 Lack of work standards and the black book	11 Rules not followed

Table 3. The barriers described in manufacturing and health care

6.6 Method discussion

The purpose of this thesis was to identify and structure perceived barriers to and difficulties with Lean implementation. The first study (paper 1) consisted of two case studies. Yin (2009) states that case study is a method suitable for explanations and descriptions of complex real-life interventions, and that case studies can be used to illustrate certain topics in an evolution so they can be clarified. Cohen and Manion (1994, p. 106) explain that a case study, by studying and analyzing an individual unit, typically establishes generalizations to wider populations. Based on that, the case study was selected as research method in the first and second studies in the thesis. With a different purpose or a different perspective other research methods could have been selected. For example, if the purpose had been to research how many barriers had been experienced to Lean implementation a survey would have been a favorable research method, according to Yin (2009). The case study method seemed to

function well in the first two studies (papers 1 and 2), matching the purpose of identifying and categorizing barriers.

Paper 1 documented two case studies at two different organizations, manufacturing and health care. The aim was to research what barriers key personnel had experienced in the Lean implementation process and compare the results from the two organizations. The data was collected through semi-structured interviews that were recorded with a digital voice recorder, and the recordings were then transcribed to text. I believe the semi-structured interviews worked well, since the interviews were not limited by "closed questions." Instead, it was more of a story told by the informants, with the interview questions as a guideline for sticking to the topics as the story was told.

Analysis of the interviews was done with the constant comparative method (CCM), and Porras and Robertson's (1992) change model. The analysis started with transforming the recorded interviews to text which was printed out in A4 sheets and then the barriers and difficulties mentioned by the participants were cut out with scissors. These pieces of paper were thereafter arranged and rearranged in different clusters during the analysis process, ending with the 14 barriers. Using scissors and cutting out the individual answers from the transcription of the interviews and clustering and comparing them worked especially well. I recommend the procedure, which made the CCM process of clustering controlled and easy reversible if necessary.

Using Porras and Robertson's change model to cluster barriers was found to work well and helped to give an overall picture of the nature of the barriers. With other perspectives or purposes other models for analysis could have been chosen. For example, the three-dimensional model consisting of content, context and process could have been used as a framework for analysis (Pettigrew and Whipp, 1993, p. 26). If instead of barriers, the interactions among human-organization-technology-environment were in focus, the model proposed by Eklund (2000a) composed of five generic elements—humans, technology, organization, environment and work activity—might have been a good alternative for the analysis.

The second study (paper 2) aimed to gain a deeper understanding of the barriers and difficulties experienced among managers on different hierarchical levels. Thru cooperation with this thesis author, that was primary focusing at the production level and J. Renström, who primary was focusing on top management this was possible. This cooperation is argued to have been fruitful not as least because of the discussions that meant sharing each other's perspectives and thus creating perspectives and ideas that otherwise might not had been. Semi-structured interviews with the managers were the method selected. The interviews were recorded with a digital voice recorder and transcribed to text. The semi-structured interviews are argued to have worked well to get the informants' stories. From the transcriptions, both researchers together identified barriers and difficulties and wrote them on a whiteboard with a notation indicating which manager had mentioned it. The analyzing process continued with clustering the individual barriers and difficulties in clusters and in three management levels, once we could see on the whiteboard that there were differences between the top managers, middle managers and shop-floor managers in their views on barriers and difficulties. The use of a whiteboard as a visualization tool when working together was found to work very well and helped the two researchers focus on the same thing, made the discussions in the clustering process focused and helped to reach a common view of the results. It may be important when using a whiteboard as a visualization board that the whiteboard has to be big enough. The methods used worked well to construct the participants' experiences but one must remember that it is a construction made by informants and researchers and not an objective picture. My experience from this IPA-influenced analysis process is in line with Larkin et al. (2006) who express the opinon that IPA may be more of a perspective or a stance then a distinct method in research.

The third study (paper 3) was a literature study with the purpose to explore the role of leadership and management in Lean as described in the literature. After it was found that leadership is a topic with a lot of articles and books written about it, I decided to search for influential people or central writings on the topic. This study was done according to the snowball method. According to Guldbrandsson et al. (2012) and Lewis (2012), the snowball method is a method suitable to identify people that are influential on the public. and VanderStoep and Johnson (2008) explain that the snowball method starts with sampling a core group of participants that identify other eligible participants, and this second generation of participants identifies the next generation in a snowball-rolling fashion. In this study

influential and central persons were identified through their publications. The influential core publications were found via the citation analysis computer program *Publish or Perish*. We recommend using *Publish or Perish* as an instrument to find central publications based on citation frequency, since it worked well for us in study 3. The snowball research approach was found to function well in the third study (paper 3). The result, the dualism of Lean leadership, can even be said to be a result that depended on the snowball research approach.

6.7 Limitations in the study

A limitation in the study is that only people responsible for the Lean implementations participated. This means that, for example, operators in the manufacturing company and nurses in the emergency units might have given a different description.

7 CONCLUSION

This chapter gives a description of the conclusions and contributions of the thesis and proposals for further research.

The purpose of this thesis was to identify and structure perceived barriers and difficulties to Lean implementation. The results showed that the perceived barriers to Lean in the researched manufacturing and health-care organizations were mostly the same and could be categorized as organizing and social factors. The implementation process itself can change people's toolbox view to a Lean philosophy view. Managers has a most important role, as they must provide structure and order as well as supporting and coaching people. These dual tasks can be fulfilled through the complementary action systems of management and leadership, which are connected to the Lean principles CI and RfP. This dualism is important to obtain "real Lean."

7.1 Contribution

This thesis provides knowledge about barriers and difficulties to Lean implementation. The findings can be helpful for all kinds of organizations that are aiming to implement Lean.

7.2 Further research

Some suggestion for future research:

- Study implementations of Lean in which known barriers are dealt with from the beginning.
- Study the implementation of Lean comparing white-collar workers' view of the process with blue-collar workers' view.
- Study the implementation of Lean and compare men's and women's views of Lean, the implementation process and its effects.
- Study the effects and outcome if health and health promotion are regarded as important knowledge for managers in Lean.
- Study how a Lean management tool built on health promotion knowledge could look and its effect on Lean implementation, sustainability, productivity and wellness.

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