The Adaptation of Lean Methodology in Swedish Cultures

- the innovation approaches to Lean Manufacturing

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Abstract

The Japanese automobile manufacturer invented Lean Production or Toyota Production System (TPS) which has been introduced and implemented in Swedish manufacturers for around 20 years (Dabhilkar, et al., 2005). Many studies discussed how it creates success in optimizing production process and quality. However, many researches show that the gap between culture become the main barrier in the process of realizing ‘true’ lean manufacturing. So, what problems has been brought out because of cultural difference in the process of implementing the lean method in Swedish industry and how to eliminate them?

The adaptation of lean method will have influences on the culture of a company. The purpose of this paper is to find out the problems which brought out by the cultural difference and a set of general approaches and principles which can be used for Swedish cultures to adapt and implement lean methodologies successfully and effectively.

Keywords: Lean, Lean implementation, Cultural dimensions
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1. Introduction

1.1 Background

Lean production directly descended from Toyota Production System (TPS), which itself resulted from Taiichi Ohno’s investigations and practical trials over three decades at Toyota (Hofstede G, 2012). Lean methodology is a major influence of innovation. Because lean manufacturing focuses on less wastage, less time spend (automation) and higher quality which triggered lots of innovation (Ohno, 1988). Nowadays the fact shows problems arising in adaptation of lean methodology in different cultural context. Lean manufacturing system was invented in Japan, wherever you found some company other than in Japan adapt lean manufacturing system. There are some modifications of lean manufacturing system. In real context, lean manufacturing system is based on less time, however, in European culture context, companies focus more on making a process much easier doable thus automation rather than lessening the time. So, that would be our case study.

According to Edgar, the culture within an organization is built on ‘artefacts’ (i.e. cultural expressions that you see and hear, such as clothing and language), the common values this paper refer to here explains how to work, act and solve problems (Schein & Edgar, 1992); the fundamental assumptions that are so deeply rooted that no one reflects on them (Bruzelius & H. Skarvard, 2000).

Based on the concept of lean manufacturing methodology, the implement of lean shall rest on the following values which interrelate with each other (K. Liker, 2004):

- Focus on customers
- Base decision on facts
- Focus on processes
- Improve continuously
- Let everybody be committed

1.2 Research Question and Aim

Lean Management is more a field about philosophy but it is often regarded as a change strategy which aimed at improving performance in the manufacturing process (Hofstede, 1984). As is born in Japan, its products, regulation and procedures are under Japanese culture. Therefore, the adaption of lean method in other cultural background would have influence on the company which implements the lean method (Abrahamson, 2014).
Based on the situation that more and more industry manufacturers have an inclination to implement lean manufacturing to enhance the production effectiveness and acquire competitive market share (Yang, et al., 2011), the research question is what problems has been brought out because of cultural difference in the process of implementing lean method in Swedish industry and how to eliminate them?

The paper aims at finding out a set of general approaches and principles for organizations from different cultures adapt and implement lean methodologies successfully and effectively; finding out the potential venture opportunities in introducing the new approaches.

The objectives of this paper are to analyze the current barrier of implementation of lean manufacturing in Swedish manufacture companies; summary of cultural influence of production techniques in Swedish industrial companies; procedures and techniques which come up in the paper can be used in Swedish cultures; measure the venture ideas.

1.3 Scopes and constrains

Whilst the cultural research will present in Europe area, cultural differences between European countries are considered obvious. Take the research into every single culture may prove difficult due to time constrain. Depending on the country origin of the companies used for data sampling, the project scope may be narrowed down.

1.4 Thesis Disposition

This paper consists of 6 chapters. The first chapter of the paper is the introduction part where explains the background, research question, aims and structure of this paper; then, the related literatures, definitions and theories are described in the second chapter. The second chapter introduce the methodology which was applied in the paper and how it worked. The fourth chapter is empirical study which contained two case studies of Swedish manufacturers about implementing lean method and the achievements. The fifth chapter is analysis and discussion of what have been illustrated in the former chapters. The sixth chapter is the conclusion of the whole paper and future research.
2. Literature review

2.1 Innovation

Innovation is defined as ‘translating an idea or invention into a good or service that creates value’ (Edquist & Charles, 2011). The term of innovation starts with novelty, which is one of the most important elements of innovation. The term of novelty can be referred as something new, such as a new idea, a new product or a new process. However, an innovation constitutes not only novelty but also changes. On the other words, an innovation sometimes is a new product or service that meets a customer’s needs. It must deliver values to customers and creating a new market that diffusing its uniqueness and values to broader customers (Drucker & Peter, 2014).

Nowadays people usually misunderstand about the concepts of innovation. Comparing the terms of novelty, invention and innovation, a novelty describes someone find something new, for example a car painted by fancy color. Invention describes the inventor invents something new and assuming it contains potential value through utility. A creation defines something new and valuable, for example a cartoon animation figure like “Kungfu panda”. An invention normally protected by patents, for example the foundation of modern 4G mobile network is called Code Division Multiple Access (CDMA) technology invented by Qualcomm in 1990’s when the mobile communication was not as popular as today. An Innovation gives explanations to something new that invented with the unique existing market. For example: McDonald’s unique business model, Volvo’s active braking system (Drucker & Peter, 2014).

The relationship between these terms can be illustrated as the following diagram (Drucker & Peter, 2014).

![Diagram](image-url)

Figure 1 Relationship among novelty, creation, invention and innovation
2.2 Lean Manufacturing

As is mentioned before, lean production directly descended from Toyota Production System (TPS), which itself resulted from Taiichi Ohno’s investigations and practical trials over three decades at Toyota (HofstedeG, 2012). Implementing lean is achieved through four main concepts: JIT (Just in Time), automation, flexible workforce, and capitalizing on worker suggestion (Ohno, 1988). Lean production keeps the concepts of TPS and expands the techniques to achieve the main goal of waste elimination, it includes also: preventive maintenance, product design, cellular manufacturing, training, cross-functional teams, and others. But Lean methods are not a solution by themselves; companies applying Lean seem to understand how to use it but have failed on disseminating its application across the corporation (RoosL.U., 1990).

Lean production is a production management method that can quickly adapt to the market according to the users’ changing demand through the cooperation of system structure, personnel organization, operation mode and the supply & demand of market (Abrahamson, 2014). Meanwhile, all the useless and redundant things are streamlined during the process which can achieve the best results of production in all the aspects including the marketing. Comparing to the traditional large-scale production methods, its characteristics are ‘multi-species’, ‘small batch’. (Womack & Jones, 2003)

Different kinds of industries have different characteristics, therefore different industries have their own preference and emphasis (Babson, 1995). Taking the process industry and discrete industries for examples, in the process industries, such as chemical, pharmaceutical and metal, their general preference for the lean production is equipment management, for example, TPM (Total Productive Maintenance). The industries need to apply a range of specific equipment to the production whose status have greatly effects on the quality of the product (Babson, 1995). However, in the discrete industries, such as machinery and electronics, production line arrangements and procedures are important factors which affecting production efficiency and quality, so the discrete industry focus on standardization, JIT (Just in Time), and zero inventory (Abrahamson, 2014).

2.3 Industrial innovation

When it comes to industrial innovation, the first term comes to the mind is industrial revolution. Dating back to the history of human industry, the three industrial revolutions had reshaped the world situation and caused great changes:

The first industrial revolution: the advent of the age of steam; the
large-scale introduction of the steam engine brought revolution into essence; during the process in which people learn to convert a large-scale thermal energy into mechanical energy.

The second industrial revolution: the coming of age of electricity, in essence, human beings learned to use electricity; during the process in which people learned to convert the mechanical energy into electrical energy.

The third industrial revolution: the advent of the information age; this is not the energy revolution, but the advent of the information age; during the process in which people can connect to the world easily.

Therefore, every time the outcome of industrial revolution is a substantial increase in productivity. The first and second time revolution brought new energy into coming; and the third-time revolution brought technology into coming and spreading, when the production ability develops to a certain extent, the demand for information generated the third revolution.

As it is demonstrated obviously from the three industrial revolutions, the substantial increase in productivity depends on two techniques: the increase of the production of raw materials and energy; the increase of production efficiency under certain circumstances. The first and second industrial revolution belong to the former and the third is part of the latter. According to this classification, what the people have been looking forward to in the fourth industrial revolution should be the further development of the popularity of new energy or automation technology.

According to Freeman, at present, there are three main innovation modes which are technology-driven innovation mode, demand-pull innovation mode and product innovation integrated mode. (Freeman, 2011)

1) Technology-driven innovation model

Technology-driven innovation mode means that the main innovation has new technology and innovations. It also applies its designs, productions, crafts and service and puts them into the market’s innovation modes. Scientific research is a process for people to explore the natural, understand the world and transform the world. Many activities don’t contain commercial attributes in advance. However, the results of innovation meet the needs of the market. In industrial practice, this kind of innovation mode takes a long time which is always more than 5 to 10 years. This is because from the experimental research, sample trial production, mass production and targeting market, there are many issues in technology, management and Funding. Companies need to have accumulated in the field of technical knowledge.
2) Demand-pull innovation mode

Technology-driven innovation mode means that the existences of market demand promote innovation to do technological research and apply the results (Bruzelius & H. Skarvard, 2000). Most enterprises are willing to use this kind of innovative mode because it has quick returns, shortening innovative time and innovation cycle and reduction of research and development spending. However, this innovative model can’t put lots of resources into basic scientific research. Lack of theoretical guidance and support restrict the further innovation.

3) Product innovation integrated mode

Product innovation integrated mode is a product innovation mode based on the possibility of the technical and market demand by combined effects of technology push and demand-pull. Technological innovation is a very complex process. It is difficult to determine whether a factor is push or pull factors of technological innovation. Most successful technology innovation is the result of the combination scientific technology and market demand. As the American Economist N. Rosenberg said, “Technological innovation activities decided by both technology and demand. Demand determines the reward of innovation. Innovative technology determines and the possibility of innovation and the cost of innovation.” (Yang, et al., 2011) According to the survey of Canadian scholars, the technical innovation pushed by technology takes up 18%. The technical innovation pulled by demand takes up 26%. The technical innovation affected by combined effects takes up 50% (Drucker & Peter, 2014). In the induced of market demand, products carried by the integrated mode of innovation not only can activate the development of a range of industries, but also can make the market prosperous (Freeman, 2011).

2.4 Cultural difference

The implementation of production management techniques, such as Lean or Total Quality Management is embedded in the social context of the nation. Some researchers have an idea that production techniques are “universal”, which means that cultural differences are not relevant when developing and applying these methods (Hofstede, 1984). However, some professionals believe that production techniques are influenced by the national cultures which is national specific and any organizational practice must be adapted to the social context in order to maximize its effectiveness resulting (HofstedeG, 2012).

The national specificity points out that difference across nations, such as, cultural, political, and/or economic factors, would obstruct the applicability of cross-national production managerial practices organizational applicability of
managerial practices. Therefore, the local cultural aspects must be taken into account when implementing the production management methodologies that invented from a completely different cultural environment (Hofstede, 1984). Moreover, simply apply common theoretical methods to different countries would not be possible if the initial intention of improving production performance is not the same.

Professor Geert Hofstede conducted a study on how values in the workplace are influenced by culture (Hofstede, 1984). His project was developed through collecting paper based answers by psychologists within a large multinational business enterprise among the employees of its subsidiaries in 67 countries including European countries and Japan (HofstedeG, 2012).

The comparison was made between employees in similar positions and fields, and the individuals were all employed by subsidiaries of the same multinational corporation, thus the national differences in the research could not be due to either occupation or employer but had to be due to nationality. Through answers on 32 value statements, Professor Hofstede has defined six value dimensions to each specific country (HofstedeG, 2012).

In this paper, in order to compare and analyze the adaptability of implementing the Japanese style production management methodologies in Sweden, five dimensions proposed by Hofstede are going to be used which are “Individualism” (IDV), “Power Distance” (PDI), “Uncertainty Avoidance” (UAI), “Masculinity” (MAS) and “Long term orientation” (LTO) (Hofstede, 1984).

2.4.1 Individualism (IDV)

“The fundamental issue addressed by this dimension is the degree of interdependence a society maintains among its members” (Hofstede, 1984). It illustrates the connection between the individual and the collective. This relationship is closely connected with social norms. Thus, individualism can have an effect on not only family members, however conjointly education, faith and politics. A given society’s norm for individualism versus collectivism can powerfully have an effect on the character of the connection between an individual and also the organization to which they belong (Hofstede, 2001).

Japan is a typical collective society. In Japan, people request large emotional dependence from members. In contrast, Sweden has individualistic societies, so people have broad responsibility for individual actions (Hofstede, 2001).
Furthermore, in Japan, market demand is larger than emotional dependence from members, thus some production methodologies like Lean Production, Total Quality Management and/or Total Productive Maintenance that invented by Japanese manufacturing companies. Goals and incentives are formulated and work is organized to support the central influence of social interaction on the operation of the production system (HofstedeG, 2012). In Lean production, “The term ‘team’ is difficult to define precisely in a lean production plant because it refers not only to the work team, the formal structural unit, but also to a notion of ‘team work’ that embodies the goal of a cooperative relationship among work teams, among departments, among functional specialties, and among organizational levels. (HofstedeG, 2012)” In contrast, Swedish workers have broad responsibility for individual actions and, each worker is by himself an independent entity, so all companies must address the idea of individualism in the workplace in order to remain efficient and competitive.

2.4.2 Power Distance (PDI)

This dimension reflects human inequality in the areas of prestige, wealth, and status in each culture (HofstedeG, 2012). It is about the extent to which workers may accept unequal power distribution. Power distance indicates the tendency of a society to accept and desire inequality, as well as how this society sees the opposition of dependence versus interdependence.

Hofstede (Hofstede, 1984) states that Japan is a borderline hierarchical society. Japanese are always conscious of their hierarchical position in any social setting and act accordingly. However, it is not as hierarchical as most of the other Asian cultures (Hofstede, 1984).

In high power distance societies, like France, power does not need as much legitimation as in low power distance societies, such as Israel and Denmark (Hofstede, 1984). Also, in low power distance cultures, there is a prevalence of talent conflict between the powerful and powerless, while in high power distance cultures this relationship has higher levels of internal harmony (Hofstede, 1984).

Sweden performs low power distance on this dimension. And the characteristics of Swedish style are: being independent, hierarchy for convenience only, equal rights, superiors accessible, coaching leader, management facilitates and empowers (Hofstede, 1984). Control is disliked and attitude towards managers are informal and on first name basis; communication between managers and employees is direct and participative.
In Lean production, high value of the Power Distance would have a negative influence. The reason is that it will be difficult to empower people to point out errors and difficult to work in teams where roles should be equal (Hofstede, 1984). Employees want to be motivated and expect more than only marching orders. Lean requires challenging goals, which if accepted could create the motivation and urgency needed for breakthrough improvement.

2.4.3 Masculinity versus Femininity

Masculinity refers to a series of personality and psychological characteristics with achievement orientation, task completion attention or behavior orientation. The study found that masculinity mainly includes four aspects: abandon femininity, does not contain any femininity; money-oriented, respected, full of sense of accomplishment; full of confidence, strength, braveness. Compared to Masculinity, femininity is a series of personality and psychological characteristics with warm, caring for others. Femininity is usually limited to the role of housework, family care and shows the opposite features towards masculinity (Hofstede, 1998).

Compared to femininity, masculinity society has a higher rating and reputation. Researches have shown that masculine societies are more in line with social needs than feminine societies. But in the feminine society, women and men are of equal status, the working environment tends to be less stressful and assertive (Hofstede, 1998).

The table below illustrates the traits of Masculinity and Femininity (Hofstede, 1998)
2.4.4 Long term orientation (LTO)

Professor Hofstede indicates Long-term orientation stands for the fostering of virtues oriented toward future rewards—in particular, perseverance and thrift. Its opposite pole, short term orientation, stands for the fostering of virtues related to the past and present—in particular, respect for tradition, preservation of “face,” and fulfilling social obligations (Hofstede, 2012).

This dimension describes how a society comparing its past in dealing with current and future challenges. A long term oriented society emphasizes on encouraging efforts in modern education in order to prepare for future challenges. On the other hand, a normative society, prefer to maintain time-honored traditions and norms while viewing societal change with suspicion (Hofstede, 2012).

2.4.5 Uncertainty Avoidance (UAI)

This dimension indicates how countries deal with the attribute of uncertainty, reflecting their inclination to accept or avoid it.

The paper expects cultures with high uncertainty rejection scores to

<table>
<thead>
<tr>
<th></th>
<th>Masculinity</th>
<th>Femininity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Norms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>money and things are important</td>
<td></td>
<td>quality of life and people are important</td>
</tr>
<tr>
<td>live in order to work</td>
<td></td>
<td>work in order to live</td>
</tr>
<tr>
<td>Politics and Economics</td>
<td>economic growth high priority</td>
<td>environment protection high priority</td>
</tr>
<tr>
<td>conflict solved through force</td>
<td></td>
<td>conflict solved through negotiation</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>only men can be priests</td>
<td></td>
<td>both men and women as priests</td>
</tr>
<tr>
<td>Work</td>
<td>larger gender wage gap</td>
<td>smaller gender wage gap</td>
</tr>
<tr>
<td>fewer women in management</td>
<td></td>
<td>more women in management</td>
</tr>
<tr>
<td>preference for higher pay</td>
<td></td>
<td>preference for fewer working hours</td>
</tr>
<tr>
<td>Family and School</td>
<td>traditional family structure</td>
<td>flexible family structure</td>
</tr>
<tr>
<td>girls cry, boys don’t; boys fight, girls don’t</td>
<td></td>
<td>both boys and girls cry; neither fight</td>
</tr>
<tr>
<td>failing is a disaster</td>
<td></td>
<td>failing a minor accident</td>
</tr>
</tbody>
</table>

Figure 2 Traits of Masculinity and Femininity (Hofstede, 2001)
reveal a preference for semi-permanent certainty of rules, work arrangements, and relationships moreover as a rejection of risk taking (Hofstede, 2001). On the opposite hand, a low uncertainty avoidance suggests a better tolerance for uncertainty and, therefore, an acceptance of additional informal actions like circumstantial negotiation for the settlement of disputes, and a disposition to take risks (Hofstede, 2012).

Japan is one of the most uncertainty avoiding countries on earth (Hofstede, 2012). This is usually due to Japan's constant threat from natural disasters such as earthquakes, tsunamis, and volcanic eruptions of typhoons. In this case, Japan learned to prepare for any uncertain situation. This is not only contingency planning and precautionary measures for sudden natural disasters, but also for other aspects of society. In other words, everything Japan do is for maximum predictability (Hofstede, 2012). While low uncertainty avoidance cultures in Sweden (Drucker & Peter, 2014).

The paper could say uncertainty avoidance would not have a negative correlation with Lean production where the greatest influence is expected from standardization and the use of well-proven technology. Sweden's low value for Uncertainty Avoidance can manifest itself in an unwillingness to fit in an overly standardized and controlled system. According to research results from Abrahamson that Japanese culture supports Lean principles by having a low Power Distance and a high Uncertainty Avoidance (Abrahamson, 2014). The results show that the paper could expect some implementation problems for Sweden due to the low value of Uncertainty avoidance. This could be by employees putting things into question that are not well explained. Employees would most likely not be prepared to follow strict rules without understanding the purpose.

Based on the cultural differences classified and discussed above, what is the relationship between the Hofstede's cultural dimensions and Lean Productions? Jeffrey Liker (K.Liker, 2004) has defined 14 Lean principles. A table of comparison has developed that providing a clear picture of how these two principles are connected. The assessment metrics are “weak”, “medium” and “strong” which describe the degree of correlation in between cultural dimensions and Lean principles.

The result shows that Individualism and Uncertainty Avoidance have the biggest impact on the principles of Lean production (Abrahamson, 2014).
<table>
<thead>
<tr>
<th>Lean 14 principles</th>
<th>PDI</th>
<th>UAI</th>
<th>IDV</th>
<th>MAS</th>
<th>LTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long term philosophy</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td>Strong</td>
</tr>
<tr>
<td>Create a continuous process flow to bring problems to the surface.</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td>Strong</td>
</tr>
<tr>
<td>Use “pull” systems to avoid overproduction.</td>
<td>Weak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level out the workload (work like the tortoise, not the hare).</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build a culture of stopping to fix problems, to get quality right the first time.</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized tasks and processes are the foundation for continuous improvement and employee engagement.</td>
<td>Strong</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use visual controls so no problems are hidden.</td>
<td>Weak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use only reliable, thoroughly tested technology that serves your people and process.</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.</td>
<td>Strong</td>
<td></td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop exceptional people and teams who follow your company’s philosophy.</td>
<td>Strong</td>
<td></td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respect your extended network of partners and suppliers by challenging them and helping them improve.</td>
<td>Weak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go and see for yourself to thoroughly understand the situation.</td>
<td>Medium</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.</td>
<td>Strong</td>
<td>Strong</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Become a learning organization through relentless reflection and continuous improvement.</td>
<td></td>
<td>Medium</td>
<td></td>
<td>Strong</td>
<td></td>
</tr>
<tr>
<td>Number of connections</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Number of impact Greater than &quot;Medium&quot;</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 3 The connection between cultural dimensions and Lean principles
2.5 Lean manufacturing in Sweden

2.5.1 The introducing of lean manufacturing towards Sweden

In the late 1980s, high inflation and high interest rate attacked Sweden and Swedish engineering industry was front with a server crisis resulting in low productivity growth. This dilemma put Swedish manufactures into a situation that they must take measures to increase competitive advantage, or they would decline and extinct in this crisis. Under the support of government research which targeted at work organizational changes and productivity improvements, the manufactures in Sweden realized that they must adopt lean manufacturing which can eliminate the negative impact of this crisis in manufacturing industries. After applying lean method for decades, in the mid of 1990s, the manufacturing industries had witnessed the steady growth in productivity (Dabhilkar, et al., 2005). For example, the world-renowned customer focus program of ABB company is a marvelous output in this background.

2.5.2 Problems occurring during the process of implementing lean method

In Dabhikar’s research, the main problem which the adoption of lean manufacturing brought about is changes of working systems which resulted from cultural difference (Dabhikar, et al., 2005). In the Japanese culture, the core of manufacturing industries is to deliver the goods on time no matter what it takes and they emphasis on cooperation with different positions and departments. However, in the Swedish culture, the number of employees reported sick had dramatically improved when carrying out lean method.

In other words, it can be viewed as a work organization change with a ‘white-collarization’ of blue-collar work (Dabhikar, et al., 2005). Based on this concept, Dabhikar conducted a survey in Swedish company to figure out whether lean method need to be implemented in this work conditions. The result shows that lean method should not be blamed for deteriorated working conditions. On the contrary, the lean strategy should be regard as valuable method and solution to enhance the production.

2.5.3 Current status of lean manufacturing in Sweden

In the end of the research, the author, Dabhikar, illustrated that Swedish manufacturers had to search for a cure to counter consumption of human resources which resulted from cultural difference and then strongly advised less prejudiced approaches than so far the industries have been witnessed (Dabhikar, et al., 2005).

All in all, the lean method could be regard as competitive alternative in the aspect
that the function of manufacturing is successively being degraded and outsourcing (off-shoring) seems to be the only way out. Unfortunately, there seems too few plants have intended to implement the lean manufacturing strategy thoroughly. (Yang, et al., 2011)
3. Methodology

3.1 Research approaches

The research is based on constructive research methods. The main idea is to solve a particular area of the problem. In order to do this, it provides a solution ((Models, charts, plans, organizational charts, etc.) which solves the problems and make theoretical contributions. Considering that the steps of this study context and proceed as follows:

• Find relevant real-world issues. Lean manufacturing application and adaptation has resulted in several research methods and challenges. The problem that this research tries to solve is introduced at the beginning.

• Make general and comprehensive understanding of the topic. This is done through not only the relevant topics in the lean production and literature review chapters, but also a set of empirical data within the local Swedish company. The data collection process will be introduced later.

• Build an innovative solution concept. This step is straightforward: build the solution that solves the above problems by developing a construct. The actual implementation of the build construct involves many problems (and sub problems). How to gain more theoretical and empirical understanding to make contributions to the construction of the previous steps become important methods. Therefore, the construction is supported by strong theoretical contributions and empirical data (Arghode, 2012).

• Demonstrate the feasibility of the solution. This step involves the implementation of a solution within the company. However, it may take several years to measure whether the successful implementation of lean manufacturing and how well about its benefits. Therefore, the implementation and verification of the solution isn't included in the scope of this paper.

• Demonstrate the theoretical connections and research contributions of the solution concept. This step involves the theoretical contribution of construction. As a constructive study, if the authors are not able to generate a new solution, the study will move forward without any meaning. In addition to constructs, it is possible to link to other theoretical contributions.

• Check the scope of the solution. The final step is to check the relevance of your internal solutions and other organizations. Because of intense competition and changing circumstances, the build should fit into other settings. This means that it can run in other companies and industries with similar characteristics.
The method of choice is based on qualitative research methods. The reason for choosing these methods is that they provide a richer explanation of a particular phenomenon which is exploring the factors behind the cooperative model in this case. (Weber, 2015)

3.2 Research paradigm

This paper adopts the research method of the interpretivist paradigm, which emphasizes that “understanding” is not only the understanding of the text, but the universality (Arghode, 2012). The core of the interpretivist paradigm is "understanding". Understanding is not an explanation of objective knowledge, but an expression of life experience, which involves human emotions, attitudes and experiences, grasping the meaning of life manifestations (Arghode, 2012). Contrary to positivist paradigm, the interpretivist paradigm does not rely on the observations of people lives, while emphasizing a holistic view and interrelated point of view. It assumes that all behaviors are significant; research does not just stay at the surface of the behavior, but it reveals the meaning behind the act, forming a consensus understanding. As for interpretivist paradigm pay more attention on describing and analyzing the research topic, interpretivist seems appropriate to this paper.

3.3 Data analysis

Data analysis methodology is to guide the data analyst for a complete data analysis, it is more data analysis ideas, it is also the data analysis of the early planning, guiding the work of late data analysis work, and data analysis law refers to the specific of the data analysis methods, such as our common comparative analysis, cross analysis, correlation analysis regression analysis. Data analysis methodology in a common PEST methodology, 5W2H, logic tree, 4P theory, user behavior analysis 5 for a more classic and practical theory. PEST theory refers to the economic, social, cultural, technical environment, it is generally used for the analysis of the macro-environment, mainly applicable to industry analysis; 5W2H refers to the beginning of 5W and 2H at the beginning of English Word to ask questions, to solve the problem in the question. 5W on behalf of why, when, where, what, who, 2H on behalf of how, how much, its use of a wide range of users can be used for behavioral analysis can also be used for professional analysis of business issues and so on. Logical tree, also known as the problem tree, deductive tree or decomposition tree, it is through a known problem as a trunk, and then consider the issue and what issues related to identify all the associated projects and then to solve it mainly applies to Analysis of business issues. 4P theory of product, price, channel, promotion of four factors, it is mainly
Data analysis methods include comparative analysis, group analysis, cross analysis, average analysis, etc., each method has its own characteristics and scope of application, in the actual operation of the process the author can according to their needs to choose the appropriate method.

This paper adopts questionnaire as qualitative research methods to collect data on national culture differences between Japan and Sweden in 5 dimensions and the questionnaire is answered by production manager which is considered to be objective and close to the actual situation.

3.4 Case study

The case study approach provides researchers with the tools to study complex phenomena in their research context. When used in a proper method, it will develop into sound scientific research and become a valuable methodological development theory, assessment tools and methods to develop relevant interventions. In the process, it is a key element to realize the design scheme and the realization of effective case study.

The studies of questionnaires, observations, and interviews are the basic methods of research by looking at financial statements. Case study as an important qualitative method in the management of research methods has important functions, and provides a lot of guidance and direction for theoretical research, practice. During the process, the case study provides an opportunity for the researcher to observe the problem, to study the case in depth, and to develop the model and management techniques as a source as much frequently as possible. Moreover, they also provide valuable instances for theoretical research (Weber, 2015).

This paper has demonstrated two cases. The first one is focused on the lean improvements in a freight train company and how it improves its effectiveness by adopting lean manufacturing. The culture difference and manufacturing procedures play an important role in the whole process. The second one is focused on the lean adaptation in a multinational company producing mechanical and electromechanical solutions for locks doors and windows and how they overcome cultural differences and apply to the local environment, during the process, questionnaire is used to collect data and information from their production line.
3.5 Limitation

Limitations are the situations that cannot be decided and controlled by the author which also could have an influence of the results and conclusion of the thesis (Weber, 2015). This thesis is limited by the time constrain and the data sampling may be narrowed down which influenced the process of data collection and analysis. In addition, it was hard to contact companies which are willing to be interviewed. Out of nearly 30 companies contacted, only one company in fact agreed to be interviewed and 7 companies agreed to complete our questionnaire. Therefore, the sample size is small but typical local industry engineering companies. The sample collected may not enough to be used to generalize all the circumstance and industries but can point out general status and problems existing in the Swedish industrial companies.

3.6 Delimitation

Delimitations are the situations that can be decided and controlled by the writer which can also play an essential role in results and conclusion of the thesis (Weber, 2015). In other words, delimitations are the boundaries set by the writer to make assumption and define the research scope, objective and perimeter. The literature is done based on this concept which is specifically related to the lean innovation and cultural difference according to the previous studies to emphasis on the impact of cultural difference towards production effectiveness and lean method application. The paper defines two major delimitations which are lean manufacturing and cultural difference and the objective is to find their relationship and to combine them in the European culture context.

3.7 Ethical Consideration

The paper takes ethical perspective into consideration. Among all of the important values in ethics, the most important one is that all the interviews and questionnaire in this thesis are conducted voluntarily. The interviews were willing to take their time and complete the questionnaire anonymously regarding our thesis topic. Only two companies which are the case studies in Chapter 4 agreed to share their ideas and opinions to the public Therefore, apart from this two, other companies and interviewees names are not disclosed for the sake of respect and promise. In this way, the anonymous interview can make them feel free and safe to speak out about their inner opinions about this thesis topic.

3.8 Sustainability Consideration

Besides ethical consideration, this paper also takes sustainability into consideration. In this thesis, the questionnaire sample and results are
recorded and transcribed using digital tools instead of traditional paper. Also, the paper submission and supervision are also done digitally.

Moreover, the paper provides a span view of what has been researched in the past and current in the aspect of cultural differences which brings challenges to the lean adaptation in European companies. This thesis can serve as the solid foundation and play an important role for the further and deeper investigation about the lean adaptation in different cultures.
4. Empirical study

4.1 Differences between Japanese cultures and Swedish culture

The chart below shows the national culture differences between Japan and Sweden in 5 dimensions which studied by Professor Geert Hofstede. A culture is meaningless unless it compares with others.

In Power Distance dimension, the degree of the member of the society with less power accepts the power to be distributed unequally. Japan in Power distance dimension rates number 54 which is a mid-high number in this dimension. This reflects that typical Japanese workers get used to follow the orders from their superiors other than question the orders. On the other hand, the Power distance in Sweden rates only 31 that means Sweden is a low power distance culture. Most of the Swedish organizations have flat hierarchies therefore the superior’s manager’s role is not so important as in Japanese organizations.

The Individualism chart compares the degree of expectations that individuals only take care of themselves and their families. The higher degree of the individualism the higher expectation of self-care. Japan is scored 46 in individualism dimension whereas Sweden is 71. It means Japan is much less individualistic than Sweden. Japanese workers are more group minded. The harmony of group is always above individual’s opinion. For example, the Japanese manager would like to seek for everyone’s opinion within the group before taking decisions.

Uncertainty avoidance express that people from different societies feel uncomfortable with uncertainty. The degree in this dimension shows the ability of the members in the societies deal with the unexpected results in the future. the uncertainty avoidance score for Sweden is moderate, but relatively weak if comparing to Japan (score 92). Swedes live and work comfortably in uncertain situations. That means Swedish people accept that things change and incorporate them easily into their work routines and so on; moreover, there are fewer rules and the work situations are less structured (Hofstede, 1984). In Japanese organizations, there are more detailed and specific rules, laws, policies, and regulations to cover almost any specific situations or circumstances in order to avoid uncertainties. The Japanese society is set to refuse ambiguity and emphasize structure and codes of behavior. In Japan, organizations usually put a lot of efforts on feasibility studies are conducted in dealing with any potential risk factors.

Masculinity focuses on how a society stresses achievement and the
higher degree of masculinity means the more the society emphasizes ambition, acquisition of wealth. The chart illustrates Japan has a very high level of masculinity, the Japanese men are educated from very young age to become a salaryman and serves as the only motivational factor in business, so the core of Japanese value is fortunes and power. Unlike Japanese, Swedish society emphasizing the equality, quality of life and leisure time.

Long term orientation describes how a society links its past in dealing with the present and the future challenges. Japan scored 88 which is a very high score in this dimension. It means that Japan is a long term oriented society. Japanese companies usually invest high rate in R&D even in economic crisis. Japanese company owners value steady growth of market shares more than quarterly profit. This is because that the Japanese companies understand the goal of the companies is not only to make profit every year to satisfy the present shareholders but sustainable development for generations. For example: Toyota, Matsushita. In the chart, Sweden scored 53 in this dimension, which is an intermediate score that provides unclear preferences. But it shows that the score is much lower than Japan. Therefore, Sweden is not as long term orientated as Japan.

![Figure 4 Comparison of national culture in 5 dimensions between Japan and Sweden](image_url)
4.2 A Case Study of a Swedish freight train cargo company

4.2.1 The overview of the company

Company A is an old freight train company with a long business history. The establishment could be tracked back to the year 1856. The Company A has its headquarters in Eskilstuna, sales and marketing in Borlänge, transport offices in Göteborg, Norrköping, Hofors, Skellefteå, Piteå, Boden, Karlsborg and Gällivare, and maintenance workshops in Eskilstuna and Boden. Company A is engaged in three major business areas that are rail-base freight transport, maintenance service, and wagon leasing. Main customers of the company are listed as follows:

- SSAB, wagon leasing customer for using in transport steel in different forms;
- OVAKO Steel AB, rail transport customer for transport of steel between Hofors and Hällefors;
- ICS (Inter Container Scandinavia) AB, rail transport customer for transport container between Eskilstuna and harbours in different cities;
- Production/Material Service Department of the railway authority, transport customer for transport railway’s track all over Sweden;
- Boliden Mineral AB, transport customer for transport ore in several routes

4.2.2 Findings -- Implementation of Lean in the freight train cargo company

The author has been assigned for a project in helping Company A to implement Lean improvement in the wagon maintenance function. The Company has problem with fluctuation in number of incoming wagon in their main maintenance workshop in Eskilstuna. The objective of the improvement is to investigate Company A’s wagon maintenance workshop in Eskilstuna, and suggest potential solutions for the problem that the Company is experiencing. The tasks are included performing investigation and providing suggested solutions of resource utilization, flow of tasks, logistics, and preventive maintenance planning of the workshop.

The concepts of Lean Manufacturing and logistics management have been used as basic methodologies in providing potential improvement suggestions. The main targets were set to eliminate the wastes during the wagon maintenance process, meanwhile increase efficiency of support logistics activities, developing practical preventive maintenance plan, and encourage cooperation between different functions within the Company.

4.2.3 The cultural influence when implementing Lean in the freight cargo company

By comparing the cultural dimensions described in the last chapter, the
cultural impacts behind the wastes and losses are shown in the matrix below:

<table>
<thead>
<tr>
<th></th>
<th>IDV</th>
<th>UAI</th>
<th>PDI</th>
<th>MAS</th>
<th>LTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long waiting time</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Idling losses</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margin loss</td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competence and</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>knowledge losses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunities</td>
<td></td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>loss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra time</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5 Connection of cultural dimension and actual problems

In the matrix, any of the losses supposed to be related to the 5 culture dimensions. However, the Lean production implementation plan is set to start from the standardized Lean framework which targeting at the problems without any cultural impacts. And the implementation under the standardized framework is done step by step.

Introduction to Lean   Value Stream Mapping   Define strategy   Stabilized the jobs   Stabilized the jobs

Figure 6 Steps of standardized framework

Introduce and implement 5s technique, Sort, set in Order, Shine, Standardize, and Sustain, in order to identify needed items and eliminate unnecessary tools and materials, assign address for each item,
keep workplace clean and organized, put standard in place and monitor, and sustain such procedure and condition.

On the other hand, some wastes and losses are strongly influenced by the cultural dimensions, like “long waiting time” is influenced by the Uncertainty Avoidance because the pre-diagnosis of the incoming freight wagon is done when they must have been parked inside the workshop. In this case, the solution is customized by considering the cultural impacts, thus the workshop could have maintenance staff to perform preliminary diagnosis of the incoming wagons before send in to working tracks which will help the foreman to have better view for assigning work to special track that can perform most of required maintenance works and minimize number of changes between different working tracks. Besides, this inspection result can also signal the maintenance staff to prepare essential materials and equipment before the wagons arrive in working tracks.

4.3 A case study in a Swedish Manufacturing Company

4.3.1 The overview of Swedish company B

Questionnaire which have been attached in the appendix was send out selectively to the industrial companies which were founded in the Nasdaq Stockholm and only 7 out of 20 feedbacks have been re-ceived. Among those feedbacks, one company has been chosen because its manufacturing process and method is much closer to this paper’s theme. Then, a skype interview was conducted with the production manager.

The company is a Sweden based multinational company producing mechanical and electromechanical solutions for locks doors and windows and has been the market leader for decades. In order to maintain the market leading place and better meet the customers’ the company has implemented lean production in their plant in Eskilstuna, Sweden.

4.3.2 Findings -- Implementation of Lean in Company B

The company B has adopted Lean manufacturing principles for over 10 years. The road of Lean implementation developed at company B is complicated but encouraging. Although there are several challenges and obstacles along with the implementation progress the company B successfully managed to overcome the difficulties. The Lean implementation is realized through several Kaizen projects. Like many other companies do, the implementation started under heavy pressure – very low efficiency is audited by professional auditing team.
During the implementation, in the first place, understanding lean principles is seen as the most important thing in order to construct a value stream map for all processes then figuring out the value added and non-value added activities.

The general manager of the plant has a rich practical experience in lean manufacturing from the aspects of management and implementation. He decided to improve the company thoroughly by using techniques introduced by lean principles. The general manager then discussed with top managers in order to identify their willingness and strength that could be contribute to the lean implementation. He provided a series of mental training to the key members in the improvement project and has designed a plan for the entire improvement project. Deploying lean principle was not as simple as it sounds. The general manager realized the simply deploy the lean techniques was not the only approach in helping the company to success but also the philosophy and culture in order to sustain the result. The general manager was the key factor to the final success for the lean implementation.

The result of culture study of Swedish company number 2 is presented in the form of summary of our interviews and answers to the questionnaires that developed to be categorized by different cultural dimensions. In the other words, each question has a specific purpose of data collection in terms of cultural dimensions incorporate with lean production methodologies.

The questionnaires are covered part of Lean principles and categorized by cultural influence. The questions were answered by production manager which is considered to be objective and close to the actual situation. The questionnaire results showed that the Company B which deployed many lean principles but not all of them.

Flexible operator and learning by doing – The survey results showed that the company B’s lean implementation focused on operators’ versatility and flexibility and cross-functionality as well as learning by doing, for example, through effective job rotation in place and training. In the manual assembly or semi-automated assembly stations, there are processes are designed to enable mutual aid and varying staffing levels in order to promote teamwork and matching of staffing level to current average demand.

Visualization – This is a common lean technique that requires less cultural influence. The company B has a common way of
communication and information sharing that supporting the daily production.

Continues improvement – The result of the interviews indicates the company B has a certain process for continues improvement. The supervisor and managers are well trained for immediate improvement.

Process and product standardization – The result of interviews and questionnaire showed that engineers and production managers understand the standardization (complexity reduction) benefit the entire value stream is required and have worked on the standardization for a long time. The more standardized product/process the less uncertainty cases arise from the routine process.

Respect for employees – Under Swedish culture of equality and well deployment of visualization management that promoting self-discipline. Employees feel less stressful when working.

Enhanced quality management process – The Company B has process control plan including a process Failure Mode Effective Analysis (FMEA) with potential failures and action plans in place to implement Poke Yokes. There are evidence of reviews and updates of the process control plan in response to customer complaints along with training and work instruction updates. A defect library is utilized to document quality issues which are to maintain expected quality level from customer's perspective.

Supportive leadership -- there are some growing leaders who thoroughly understand the work, live the philosophy, and teach it to others.

A learning organization is required – Although the Kaizen activities are greatly deployed in the production lines, activities belong to different person or department are isolated. The company B needs to build a learning organization which is not exist at the present. A learning organization for continues improvement can provide work environments that are open to creative thought, and embrace the concept that solutions to ongoing work-related problems (Bruzelius & H.Skarvard, 2000).

And how these characteristics related to the Hofstedes 5 cultural dimensions? The table below shows the relationship between Company B’s characteristics and lean principle and cultural dimensions.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Corresponding Lean principle</th>
<th>Cultural dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible operator and learning by doing</td>
<td>Multi skills</td>
<td>Individualism, Masculinity, Long term orientation</td>
</tr>
<tr>
<td>Visualization</td>
<td>Fix problems</td>
<td>Individualism; Uncertainty Avoidance</td>
</tr>
<tr>
<td>Supportive leadership</td>
<td>Lean leadership</td>
<td>Power Distance; Masculinity</td>
</tr>
<tr>
<td>Learning organization</td>
<td>Learning organization</td>
<td>Individualism, Long term orientation</td>
</tr>
<tr>
<td>Enhance quality management</td>
<td>Fix problems</td>
<td>Uncertainty Avoidance</td>
</tr>
<tr>
<td>Process and production standardization</td>
<td>Standardized</td>
<td>Uncertainty Avoidance</td>
</tr>
<tr>
<td>Continues improvement</td>
<td>Continues improvement</td>
<td>Long term orientation</td>
</tr>
<tr>
<td>Respect for employees</td>
<td>Lean leadership</td>
<td>Masculinity; Power Distance</td>
</tr>
</tbody>
</table>

Figure 7 Corresponding lean principle and culture difference dimension of the questionnaire
5 Discussion

The term of culture can be defined as how people relate to management and colleagues, collaborate with other inside and outside the team while they solve problems (Spencer-Oatey, 2004). In associate with lean principles, technically, 5S are the fundamental of lean production, and mentally, lean thinking is a shadow of national culture.

5.1 Why Japanese culture fit for Lean production?

As is known, the lean production system was innovated by Toyota because Toyota successfully implemented a series of down-to-earth production principles and techniques in Japan. However, until now, there are still arguments when companies implementing the lean. There are plenty of negative examples of implementing lean, especially in western countries. It is true that principles introduced by Toyota is generated from Japanese society and supposed to be perfectly fit for Japanese companies. So almost every manufacturing company in Japan has successfully transformed into Lean way. Why lean production system—a well-known advanced and robust production system only suit for Japan? The only answer is the culture. Japan has a perfect culture for lean production. An ideal cultural environment for implementing lean, must be:

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Required Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualism</td>
<td>Low</td>
</tr>
<tr>
<td>Masculinity</td>
<td>Very high</td>
</tr>
<tr>
<td>Power Distance</td>
<td>High</td>
</tr>
<tr>
<td>Uncertainty Avoidance</td>
<td>Very high</td>
</tr>
<tr>
<td>Long term orientation</td>
<td>High</td>
</tr>
</tbody>
</table>

Figure 8 Ideal cultural environment for implementing Lean

Professor Hofstede’s study indicates that Japanese cultural dimension has a very high level in masculinity, uncertainty avoidance and medium high level of power distance and relatively low level of individualism which constitute the fundamental cultural factors of successful lean implementation (Hofstede, 1984).
5.2 Lean and cultural dimensions in Sweden

5.2.1 Is Individualism (IDV) the obstacle for implementing Lean philosophy?

Before the start of practical study of company A and B, the author has a preliminary assumption which the both company are individualistic cultural environment just because the Swedish national culture. The facts that results of study in Company A verified my assumption. For instance, as long as the almost every operator gained the multi operational skills, the production supervisor is unable to allocate tasks freely according to the production demand because teamwork between some production operators is not always in harmonious situation. It is affected by the Sweden’s national culture relatively an individualistic country, managers and line workers are not skilled in teamwork and this is conflict to lean principle. The Japanese Toyota way shows that a collectivistic culture is ideal for implementing lean principle.

Sweden has an intermediate score in individualism but far lower than Japan from Hofstede’s research. In company A, in general, the Lean production continues improvement activities would be taken in individual or small groups rather than large group. As consequences, none of the effective activities or processes were sustained and the managers had to increase the investments on more advanced equipment in order to increase the efficiency but contributing a small portion of improvement.

Does it mean lean production can only be implemented in collective society? In company B, the teamwork is very common and efficiency in

Figure 9 Japanese level of cultural differences in 5 dimensions
between line workers. This is because they have been systematically trained and the teamwork is part of standardized process. Moreover, the support from the top management that influences the production team to learn to work with each other in the company’s environment. But is the individualism an obstacle to lean production? The pressure on members to conform to the group norms diminishes the freedom and independence of the individual (Dartey-Baah, 2013). Always working in teams can restrict freedom therefore creativity which is the core factor of lean principles. Swedish companies maintain even more advanced creativity than Japan while less collectivism. The US understands to be high individualistic country, in order to overcome the negative impacts from high individualism the US start using self-directed work teams in an attempt to strengthen the collective power in the organization and decrease the disadvantage caused by individualism (Wong & M, 2007).

5.2.2 What is an ideal organization structure for lean system to work – Power Distance

Most Sweden companies have flat non-hierarchical organization structure. The situation also applies to Company A and B; the managers do not operate like a superior but a facilitator. The workers feel get respected and self-disciplined. In company A, the line supervisor takes responsibilities to allocate the tasks to the line operators and the operators balance the workload based their own ideas and submit only a working hour report to the supervisor. We call it autonomous system. In company B, in standard assembly line the operators could move or rotate their positions to match the production demand without supervisor’s order.

In contrary, in a high power distance country, a centralized hierarchical reporting structure defers the information sharing and communication. The worker must always follow the superior’s instructions without any doubt or questioning. The point influences the principles of continues improvement and lean leadership and communication which requires a flat and decentralized organization structure. In the low power distance environment, the workers can obtain information transparently and freely. Communication among different functionalities becomes easy. The low power distance is a congenital advantage for lean implementation in Sweden.

5.2.3 Could Lean principles be implemented smoothly in a country which has low acquisition of wealth as well as low desire for material?

Sweden is a low masculine culture or feminine culture. Workers spend less focuses on achievement, acquisition of wealth, assertiveness and material rewards for success. It makes implementing 5S – the foundation of lean in the company A very difficult. The workers treat 5S as an extra work although a series training had been given and have been told 5S are
mandatory just because they want to maintain less work stress. The employees’ both mental efforts and workloads are in the low level. The Swedish feminine society gives the negative effects of lean.

By studying of Company B provides a positive impact from low masculinity. the low masculine can build a good team work environment. In the company B, many growing leaders who are thoroughly understand the work are open to teach others. It provides a great platform for knowledge sharing in high masculine society leads to a very aggressive and competitive environment people fight for life, wealth and power. No one wants to share information or intelligence to one another as fearing of loss opportunity then benefit. For this reason, Swedish society (fewer masculine) can be better suit for lean communication since it strives to create an atmosphere of consensus and compromise in order to achieve common goals.

5.2.4 Preventing from uncertainties is not always a weak point for Swedish companies.

According to Hofstede’s (Hofstede, 2012) research, it is assumed that company A and B were not good at dealing with unexpected incidents or emergencies before taking investigation. The company A -- a traditional Swedish company, as it is assumed, workers there believe in generalists and common sense. For instance, replacing a cast iron part takes 10 months to finish only because the part supplier located in the United States. They prefer technological solutions to process solutions against uncertainties.

The company B has overturned the authors’ assumption about uncertainty avoidance. The production lives with a series of process rules such as “late differentiation” – eliminating the uncertainties at the beginning, “Short Internal Management” – rapid reflection to uncertainties, “Failure Mode Effective Analysis” – evaluate uncertainties and prevent.

Japan is a high Uncertainty Avoidance society. In Japan, people get used to work with the written or unwritten internal rules and regulations as they seen rules are strict and cover every part of expected or unexpected situation. In Sweden, the Company usually at a loss when facing uncertainties due to insufficient rules about uncertainty avoidance. However, the situation can be improved if certain written rules regarding uncertainty avoidance are seen as routine job strictly.
5.2.5 Long Term Orientation (LTO) determines the success of the lean production

Long term orientation is essential for Lean philosophy. The implementation of Lean requires the long term orientation of management. The concept of lean such as Kaizen or continuous improvement is organized by long term orientation. (Womack & Jones, 2003) and (K.Liker, 2004) also indicate the long term perspective is important to a lean organization. There is a focus on continuous improvement and creating exceptional processes, leaders, teams and people, to ensure the long-term success of the company (K.Liker, 2004).

The Company A has implemented several lean techniques but the management only has a short term orientation -- they would like to see the optimization result in a short time rather than planning long term education and strategic investment. In return, almost all of the implementation results could not be sustained for a long time without the support from the management. In contrary, the company B keeps every good practice introduced by lean principle and sustained for over 10 years because of the management has a long term planning before the lean implementation. “This is no quick solution in the sense that there is an easy answer to organizational change, but by focusing on implementing strategies, the organization will achieve change competence in a longer perspective, and therefore be more fit to handle different kind of change due to underlying understanding of the psychological processes.” (Saksvik, 2009)

5.2 Standardization or Customization?

According to cultural impacts that influence the implementation of lean, there are two optional approaches which are standardized implementation and customized implementation. “There is there is no best way of implementing change, which would support customization. “(Hallencreutz, 2011)

Standardization including standardized process and products is advocated by lean principles. Standardized work facilitates the exposure of any potential problems and carrying out specific improvement activities in order to greatly reduce the time and financial costs. Customization provides the optimized solutions against different requirements from different kind of customers. In context, the staffs are not only the implementers but also internal customers in the lean implementation considering cultural impacts. The top management should take into account of internal customers’ acceptance according to national culture dimensions and interactions are necessary. Every single staff must be involved during customization. By
targeting the ultimate result -- increase the external customer’s value the internal process must be optimized through adopting a unique and tailor-made implementation approach that every employee can accept. In Sweden, the customized implementation plan is needed by considering big cultural difference between Japan and Sweden. The Swedish company without Lean background should create their own implementation plan which technically guided by lean principle and mentally guided by culture. Finally, standardization shall be taken into consideration as soon as the new processes are accepted by employees.

5.3 Further research

This paper studies the problems encountered in lean manufacturing in Sweden, and analyze then problems, then solutions. In further research, the adaption of lean method can expand to other cultures, even to the whole world. Abarhamson (Abrahamson, 2014) compares the relationship between lean factors in product quality and financial performance in Asia Pacific (Australia, New Zealand, Hong Kong, Korea and Taiwan), Europe (UK, Spain) and North America (US and US). One of the aims of this study was to test the "no culture" hypothesis that the relationship between quality improvement and performance was the same across regions and geographic regions (Abrahamson, 2014). The study found that the nine factors obtained from the three samples follow the same pattern. Thus, these nine factors are applicable to Europe, Asia and North America and show support for the "no culture" hypothesis. This study provides a reference and direction for the popularization and development of lean production. In the future, it may be possible to develop a strategy that will allow lean production to operate in almost every cultures.
6. Conclusion

Lean manufacturing and culture differences are both normal and simple concept, however, it can inspire many thoughts about them. Can they have impacts on each other and how can they interrelate? Based on these thoughts and questions, the innovation and goals of this paper come out. According to previous researches which have been mentioned in the paper before, lean method is a changing method to appeal to current market need which is individual and diverse, and there are many problems brought in when implementing lean method in Sweden. The paper emphasis on the problems which related to the culture difference and figure out some solution by practical investigation.

The adaption of lean manufacturing in Swedish seems to have a long way to go because of huge cultural difference between Swedish culture and Japanese culture according to previous researches and practical trials. However, this situation can be released by changing the way lean manufacturing works or changing the culture where lean method is implemented which is up to the management team of the certain company.

In conclusion, these findings present us that culture difference plays an important role in the process of adapting lean method in Sweden. Therefore, these issues should be considered when lean method is adopted in Sweden. This indicates similar issues can be raised in different countries and the best way to eliminate the cultural impact is to adjust both in order they can supplement each other.
Reference


Appendix

Questionnaire:

Lean production cultural adaptation questionnaire

Q1: Please choose one of options that describes the Production Line Operators Flexibility

- Operators have no willingness to help
- Operators are trained to operate several stations / machines within a cell / sector (U Line management, multi machine manning). Mutual aid is implemented and encouraged.
- Effective job rotation in place to maintain operator versatility and flexibility.
- Operators within or across a Sector or Cell move or rotate their positions to match the workload / demand without Supervisor or Leader directions

Q2: In the production lines, is there any growing leaders who thoroughly understand the work, live the philosophy, and teach it to others?

- YES
- NO

Q3: Is there any learning organization through relentless reflection and continuous improvement for production?

- YES
- NO

Q4: Please choose one of options that describes Production Line Problem solving – Short Interval Control (Rapid reflection for improvement)

- There is no certain way of reporting problems during the production process.
- The production and support function managers have been formally trained for Short Interval Control.
- A global product-process action plan is available and updated based on the Short Interval Control
The global production process action plan is build according to the Pareto Analysis of issues/ barriers identified in production.

Q5: Please choose one of options that describes Line Process control and Poka Yoke (Mistake proofing)
- Very limited understanding of Poka Yoke for process control.
- Production Engineers and Quality Engineers have a solid understanding of the definition of Poka Yoke, Jidoka and Zero Defect. Examples of Jidoka and Poka Yoke can be easily observed.
- The Plant has registered their examples of "New" Poka Yokes or Jidokas in the Poka Yoke Database. Documented capability improvement or Poka Yoke plan tied to customer issues or defects.
- Utilization of Poka Yoke & Jidoka covers 100% of Critical Parameters and 50% of Major Parameters as defined in the Process Control Plan. Poka Yoke & Jidoka effectiveness is assessed periodically and benchmarked with other entities through PY database.

Q6: Please choose one of options that describes Process and Product Standardization
- There is knowledge that concepts of standardization can be applied to components and parts, process technologies and machines and tools.
- There are examples where the concepts of process or product Standardization have been applied.
- Late Differentiation and Standardization of processes are in continuous improvement with evidence of measureable results.
- Only a few of standardization applied to process and products

Q7: Ideas contribution -- staff contribute their ideas for improvement
- There is a system or process to record employee ideas
- Supervisors & managers are empowered to immediately implement "quick hit" ideas.
- Final feedback is given within 1 week; average lead time to implement is <
30 days.

- There is no way for staff submitting their ideas

**Q8**: Mental effort load – Line Operators mental load such as Counting, Remembering

- 1
- 2
- 3
- 4
- 5

(1: very low; 2: very high)

**Q9**: Time load – Level of time load

- 1
- 2
- 3
- 4
- 5

(1: very low; 2: very high)

**Q10**: Weight of load – the weight of goods that need to be carried by operator without machine

- 1
- 2
- 3
- 4
- 5

(1: very low; 2: very high)

**Q11**: Operators Psychological stress load – How do they feel stressful when working?

- 1
- 2
- 3
- 4
5

(1: very low; 2: very high)