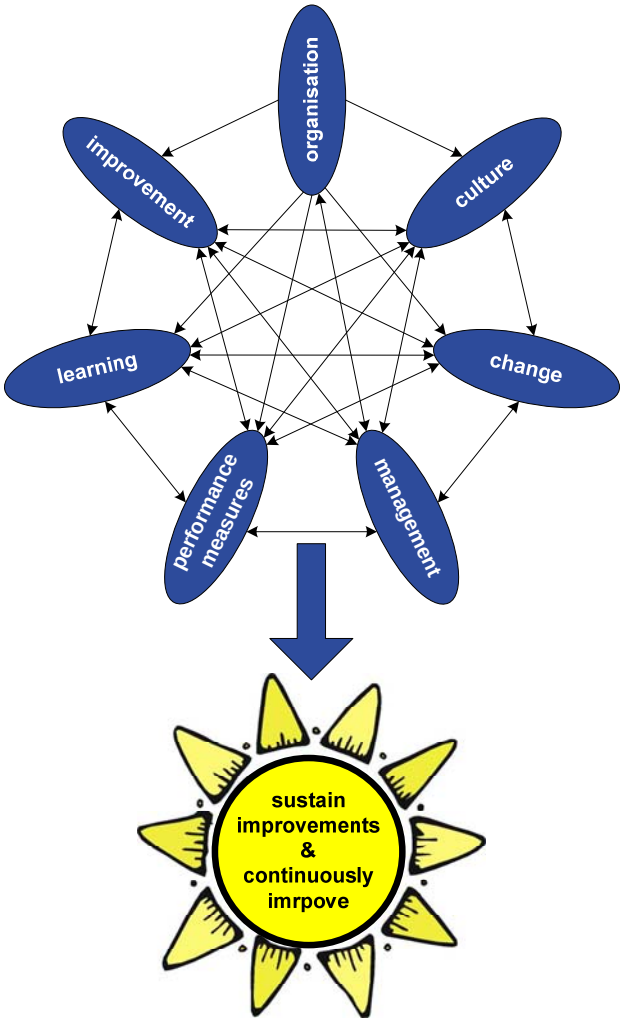
How can Danish companies create sustainable and continuous improvements?



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Preface for the public version

Danish managers and Danish company names are anonymous in the public version of our master thesis. As substitution, Danish companies have been categorised into three types of companies according to how they manage lean activities. Three fictive names are used throughout the master thesis. Each fictive name includes several Danish companies:

- Adico Medical – centralised lean approach
- Danecto – centralised and decentralised approach
- Zentec – decentralised approach

Abstract

Japanese companies show a superior ability to create continuous improvements by using lean principles. On the contrary, Danish companies find it challenging to sustain improvements and create continuous improvements when they engage in lean. Thus, the aim of this master thesis is to identify how Danish companies can sustain improvements and continuously keep improving after the initial lean transformation.

In order to clarify this, Danish and Japanese companies' approach to continuous improvements and getting them sustained are examined through both primary and secondary sources. This includes 22 company visits, among them four days education at Toyota in Japan.

The findings identify a set of parameters, which companies must align with lean in order to sustain improvements and continuously improve. Aside from lean principles, they include organisational structure, culture, management, change management, performance measurement, knowledge management, and improvement execution. These parameters are interrelated and influence companies' long-term results with lean.

Part of the outcome of the master thesis is a model, which unites and integrates these parameters. The model provides guidance to sustain improvements and continuously improve. The model is appropriate for all types of companies.

In general, Danish companies focus too much on a limited part of lean such as value steam mapping and 5S. In addition to the skills Danish companies already master, they must work with jidoka, standardisation, leadership, gemba, knowledge sharing, sensei, and after action review. This will enable them to continue their lean journey and in the future reach the same high level as experienced in Japan.

Preface

This master thesis, "How can Danish companies create sustainable and continuous improvements?", is completed at the Department of Manufacturing Engineering and Management at the Technical University of Denmark. The master thesis has been carried out from primo September 2006 to primo February 2007. In September 2006, we conducted an analysis of Danish companies' experiences and challenges with sustaining lean improvements and continuously improving. During the following four months, research of Japanese companies was carried out at Professor Kimura Lab at University of Tokyo.

The master thesis is accomplished with guidance from our Japanese sensei, Professor Kimura at University of Tokyo, and our supervisor at the Technical University of Denmark, Associate Professor Peter Jacobsen.

Acknowledgement

First of all, we would like to express our deepest appreciation to our sensei at the University of Tokyo, Professor Kimura. You did a fantastic job in arranging Japanese company visits and we appreciate that you always took time off to join us at our visits. Without your effort and great network we would never have gathered as much valuable empirical input from Japanese companies.

We would also like to thanks our supervisor, Associate Professor Peter Jacobsen, for continuous guidance throughout the process. Furthermore, we owe Head of Department of Manufacturing Engineering and Management, Professor Leo Alting, many thanks for making our stay in Japan possible.

Furthermore, we would like to express our appreciation to the Danish companies, Vola, Post Danmark, Danfoss, Novo Nordisk, Radiometer, Vestas, Velux, Junckers, Coloplast, Valcon, NNE, Implement, Logistikgruppen, and Danish Technological Institute for interviews and insight information about lean in Denmark.

Also, many appreciations go to the Japanese companies, Toyota, Toyoda Gosei, Icheie Industries, Otics, NEC, Kawasaki, Denso, and Hitachi. We deeply appreciate that you opened your doors to us and spent incredible resources in order to give us unique insights and knowledge about lean in Japan.

Finally, we would like to thank Toyota in Brussels for inviting us in February. This will enable us to add new perspectives to our master thesis between the hand in date of this master thesis and our final exam.

Tokyo, January 30th 2007

Janni Nielsen	Rasmus Bukkehave Madsen

Table of Content

Part I: Introduction

Part II: Theory

Part III: Findings in Denmark and Japan

Part IV: Structure

Part V: Culture

Part VI: Processes

Part VII: Recommendation

Part VIII: Conclusion

Part IX: Bibliographies

Part X: Glossary

Introduction

This part presents a motivation for the master thesis followed by the objective, scope, and methodology. Finally, the structure of the master thesis is illustrated.

1 Motivation

A recent survey conducted by Center for Ledelse (Centre of Management) concludes that cost reduction is one of the main reasons why companies introduce lean [Center for Ledelse, 2]. Additional expected benefits are reduced process time, faster delivery, increased customer satisfaction, simplified structures, and improved quality. All benefits, which increases a company's competitiveness in the globalising market. Lean may, thus, create an alternative to outsourcing activities based on costs while reducing some of the negative impacts such as long delivery time and business complexity.

Danish companies find it challenging to achieve the improvements expected prior to lean initiation. According to the previously mentioned survey, companies find it most challenging to sustain lean improvements and motivate employees. Time consuming every-day operation, culture change, continuous progress, and resistance toward change are furthermore found challenging.

Very limited literature is written about the interrelation among these challenges and how they impact companies' ability to sustain improvements and continuously improve. Thus, the motivation behind this master thesis is to analyse how companies can facilitate this in regard to lean.

Toyota and other Japanese companies have extensive experience with lean and a deep knowledge about how all elements in the company are aligned with lean. Japanese companies constitute an ideal target of investigation in order to acquire knowledge, which can be transferred to Danish companies.

It is necessary to investigate both Danish and Japanese companies in order to acquire knowledge about suitable lean approaches and to asses how lean can be adjusted to Danish circumstances. This also creates an opportunity to understand how national cultures impact operations.

2 Objective

Danish companies experience difficulties in sustaining lean improvements. Furthermore, after initial improvements are carried out they find it challenging to make continuous improvements a natural part of their business.

In order to improve a company's ability to sustain improvements and continuously create improvements, the entire company must be aligned with lean. Figure 2-1

illustrates three perspectives a company can impact in order to improve their ability to create sustainable and continuous improvements [Bakka and Fivelsdal, 1999: 23].

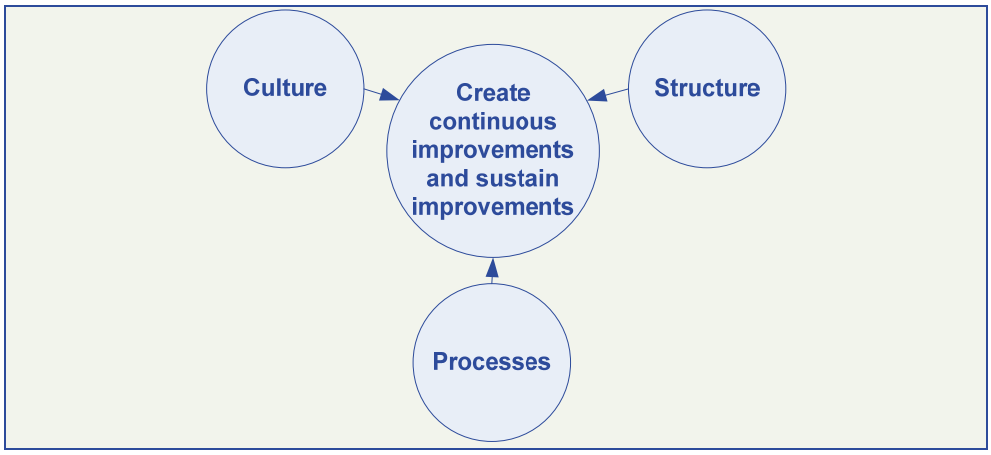


Figure 2-1: Analytical framework

The three perspectives constitute a holistic approach to improve current challenges. Thus, the main objective of the master thesis is:

> How can companies working with lean align their structure, culture, and processes in order to create continuous improvements and sustain improvements?

3 Scope and focus

Figure 3-1 illustrates that the scope of the master thesis is limited to in-house company lean activities. Toyota and other Japanese companies have already introduced lean throughout their supply chain. However, it will be clear throughout the master thesis that Danish companies have much work to do in aligning their internal structures, cultures, and processes with lean. To extend their lean approach to the entire supply chain before they gain adequate internal experience will be a big mistake.

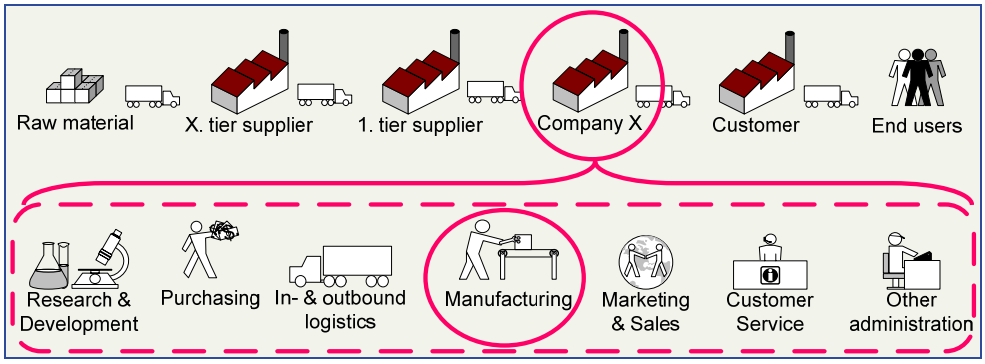


Figure 3-1: Scope of master thesis

Figure 3-1 furthermore illustrates that the thesis' scope is primarily within the manufacturing department. However, many other activities are affected by

manufacturing and findings can be directly or indirectly applied to other activities in the company, illustrated by the dotted line.

The scope is not limited to a certain industry or company size. Rather, a broad scope is chosen in order to make generic recommendations. It is important to investigate companies with lean experience in order to include their lessons learned in the recommendations.

Relevant parameters within the analytical framework presented in Figure 2-1 is illustrated in Figure 3-2. They are interrelated and constitute the focus areas used throughout the master thesis.

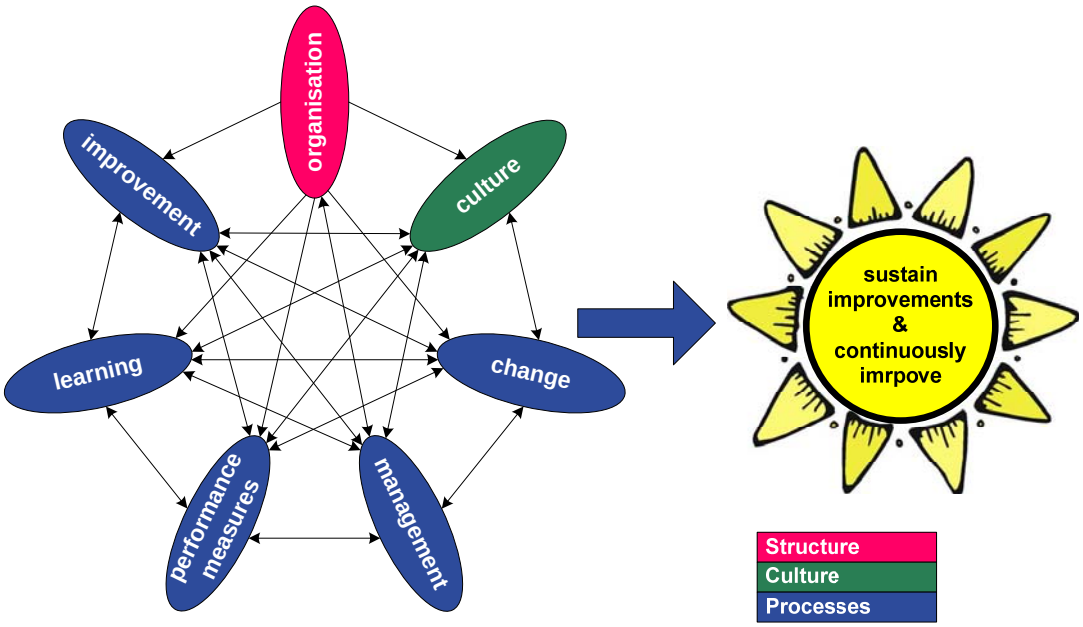


Figure 3-2: Seven important parameters to support sustainable and continuous improvements

4 Research methodology

The research methodology is illustrated in Figure 4-1. Both Danish and Japanese companies are part of the research as they have knowledge relevant for the objective. Danish companies have experience about the initial challenges and knowledge about Danish work environment and practices. Japanese companies have extensive lean knowledge and show an ability to continuously improve.

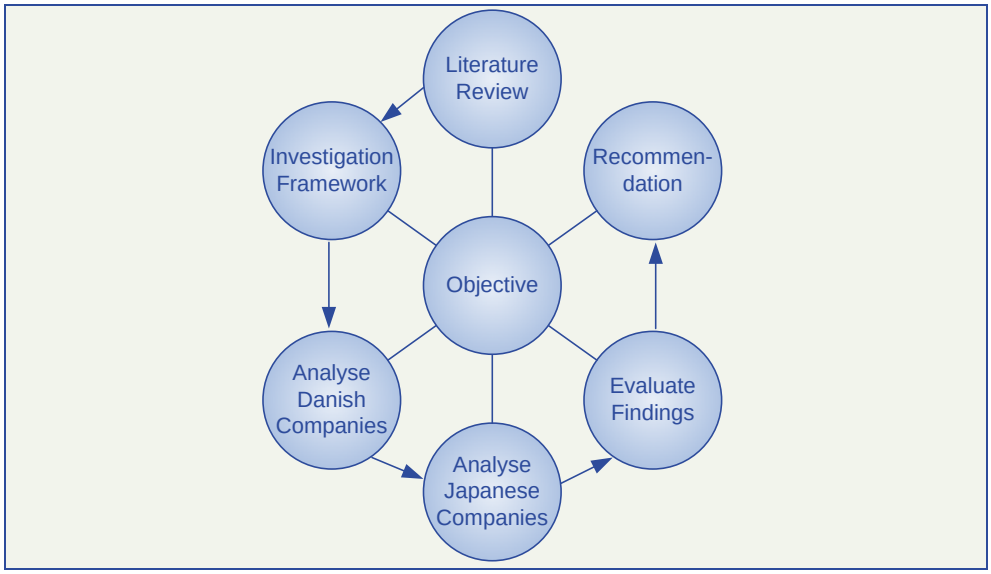


Figure 4-1: Methodology

5 Literature review and data gathering

Both primary and secondary sources are used to investigate how companies can sustain lean improvements and continuously create further improvements. Primary sources are in form of interviews with nine Danish manufacturing companies, five Danish lean consultant agencies, and eight Japanese manufacturing companies. Theoretical knowledge is mainly acquired through secondary sources in form of a broad spectrum of books and articles about lean and other relevant management aspects.

6 Structure

The structure of the thesis is illustrated below.

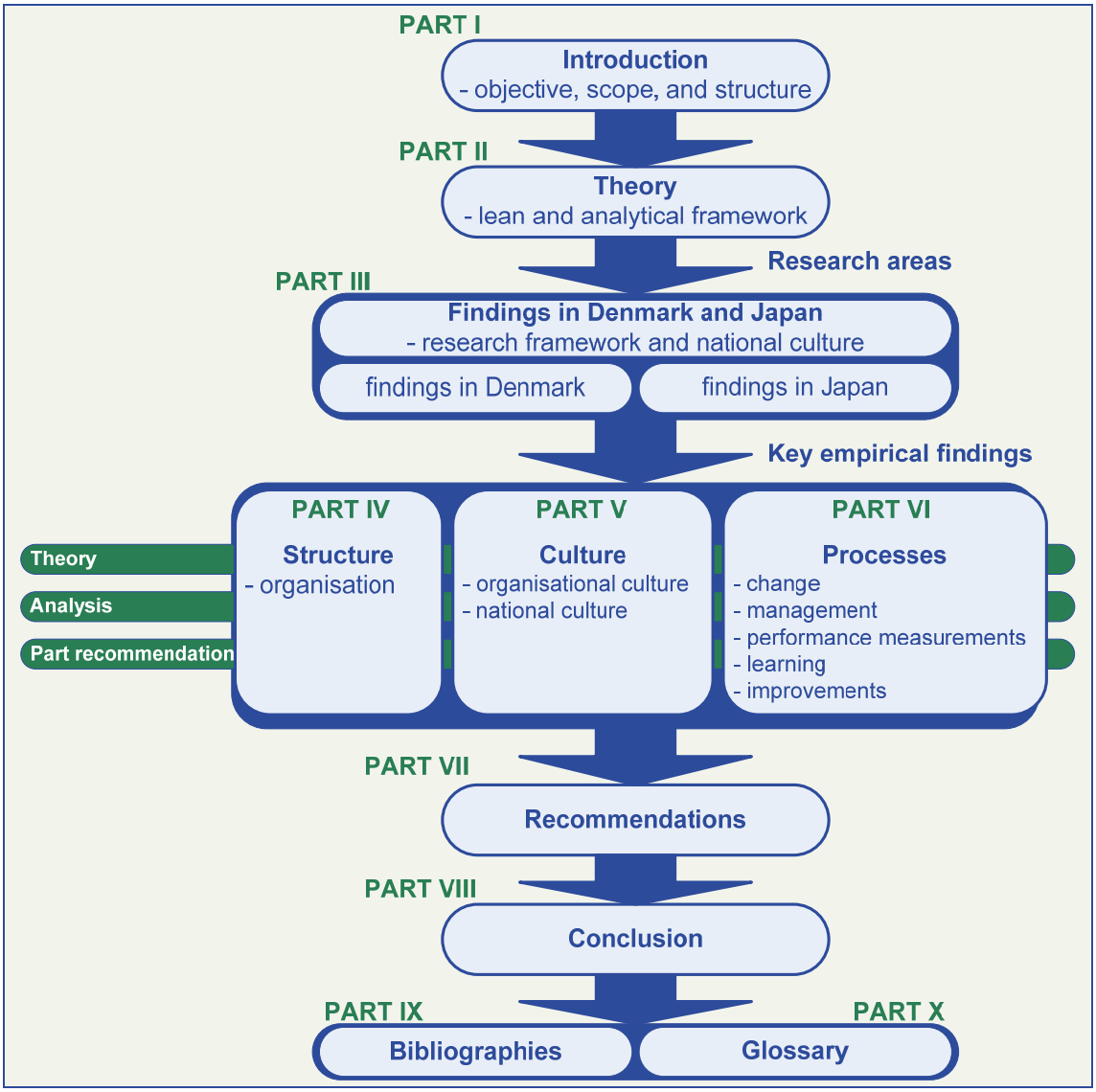


Figure 6-1: Structure of master thesis

Reading guidance

Various lean terms and Japanese words used throughout the master thesis are explained in the glossary [Part X].

The terms "Japanese companies" and "Danish companies" refer to the companies interviewed in Japan and Denmark. They must not be considered as all Danish and Japanese companies.

When we refer to e.g. Mr. Miura (Toyota) it means that it is a statement from one of the company visits. The statements are elaborated in Appendix 2 and 3.

Theory

This part presents main lean theories followed by a critique. Furthermore, the theory behind the analytical framework is presented and critiqued before our definition of lean is presented. Theory about each paradigm included in the paper is presented separately under each paradigm in part IV, V, and VI.

7 Lean theory

7.1 Introduction

Many books and articles are written about lean. This master thesis is addressed to people with basic lean knowledge. Thus, lean tools will not be described but key concepts can be looked up in the glossary [Part X].

The enormous lean focus in the business world has made the concept blurry. As a result, many people find it difficult to understand what lean actually is. Thus, the fundamental theories about lean will briefly be summarised and compared in order to end up with our perception of lean.

7.2 Toyota Production System

7.2.1 Toyota Production System by Taiichi Ohno

Toyota Production System (TPS) is the foundation for the current lean concept and was created in the 1950's. The honour of creating the Toyota Production System has mainly been dedicated Taiichi Ohno.

Toyota Production System is characterised by its ability to produce high variations of models in low quantities at low costs [Ohno, 1988]. This is a radical difference from the traditional mass production philosophy.

The purpose of developing a new production system at Toyota was to shorten the time line from orders are received to cash are received [Figure 7-1], improve quality, and reduce costs. *"All considerations and improvement ideas, when boiled down, must be tied to cost reduction"* [Ohno, 1988: 53].

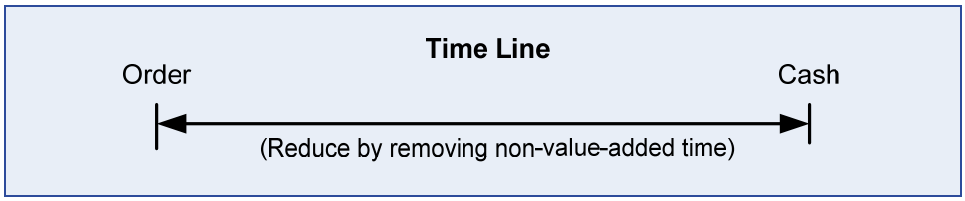


Figure 7-1: Reduce timeline for order received to cash received [Ohno, 1988: ix]

Toyota's objective can be reached through eliminating *muda (*waste). Taiichi Ohno distinguishes between waste, current necessary *non-value added activities*, and *value added activities*. Ohno (1988) has identified seven types of waste.

Seven types of waste
- Waste of overproduction - Waste of time on hand (waiting) - Waste of transportation - Waste of processing itself - Waste of stock on hand (inventory) - Waste of movement - Waste of making defective products

Figure 7-2: Seven types of waste

Ohno created a temple with two pillars, *just-in-time* and *jidoka* in order to eliminate waste [Figure 7-3].

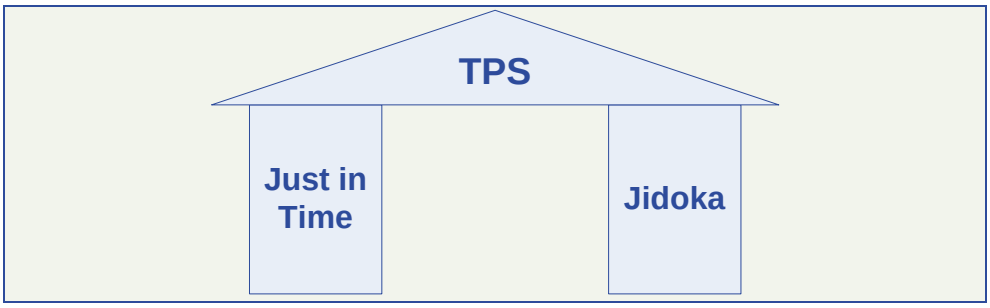


Figure 7-3: TPS temple [Ohno, 1988]

Just-in-Time is based on producing only what is needed, when it is needed, and in the exact amount needed. To make this possible, Ohno [1988] focuses on tools such as *takt time*, continuous flow, quick changeover *(SMED)*, and *kanban*.

Jidoka, also called *autonomation*, means *"build in quality"* in each process and make problems visible [Ohno, 1988]. Ohno based TPS on learning from previous errors by using *andon* systems and automatic stops. The focus is on error proofing and finding root causes by using tools such as *five whys*. *"To tell the truth, the Toyota Production system has been built on the practice and evolution of this scientific approach (five whys, red)"* [Ohno, 1988: 17].

In addition to *autonomation*, TPS relies on old well-known equipment and limited high-tech machines. It is important that employees control the machines and not the other way around [Ohno, 1988].

> *"First, work and equipment improvement should be considered. Work improvement alone should contribute half or one-third of total cost reduction. Next, autonomation, or equipment improvement, should be considered. I repeat that we should be careful not to reverse work improvement and equipment improvement. If equipment improvement is done first, costs only go up – not down"* [Ohno, 1988: 67]

The elimination of waste through the two supporting pillars can only happen if the basic foundation in the TPS temple is solid. Thus, Ohno developed *levelling* (*Heijunka*), stable and standardised processes, and visual management. *Levelling* is necessary to create flow, *kanban*, and *takt time*. Standardisation and standard work sheets are considered the foundation for stable and reliable processes and create the basis for continuous improvements.

TPS only works when employees have appropriate skills. Opposite mass production philosophies, TPS is based on teamwork and involvement instead of individual craftsmanship. To strengthen the flexibility in TPS, employees receive cross function training and are involved to a high extent.

7.2.2 Toyota Production System – in the year 2006

Today, Toyota Production System is still based on the fundamental concepts Taiichi Ohno developed more than 50 years ago. However, Mr. Miura (Toyota) emphasises that *"TPS is not an accumulation of tools"* it is a way of thinking. He states that it should be considered as the *"Thinking Production System"* [Appendix p. 88]. In addition, Toyota recently published five explicit basic assumptions that help explain Toyota's way of thinking and acting [Figure 7-4]. Two of the concepts are illustrated in Figure 7-5.

Figure 7-4: Toyota's 5 explicit business assumptions - Source: Toyota Kaikan Exhibition Hall

Figure 7-5: Examples of the five TPS concepts in year 2006 [Toyota Exhibition Hall]

Fujio Cho, President of Toyota Motor Company, explains what is unique about Toyota's remarkable success:

> "The key to the Toyota Way and what makes Toyota stand out is not any of the individual elements (…) But what is important is having all the elements together as a system. It must be practiced every day in a very consistent manner – not in spurts" [Liker, 2004: xv]

7.3 Five principles in Lean Thinking

James P. Womack and Daniel T. Jones [2003] define lean in a two-string perspective. The first perspective is cost reduction achieved by elimination of waste. Secondly, they emphasise company growth opportunities as a result of more reliable products, shorter lead-times, and faster customised product launches. It increases sales rather than simply destroy jobs in the name of efficiency.

> "Lean thinking is lean because it provides a way to do more and more with less and less – less human effort, less equipment, less time, and less space – while coming closer to providing customers with exactly what they want" [Womack and Jones, 2003: 15]

Womack and Jones' five generic lean principles are used as guidelines or as exact steps for lean implementation by many companies.

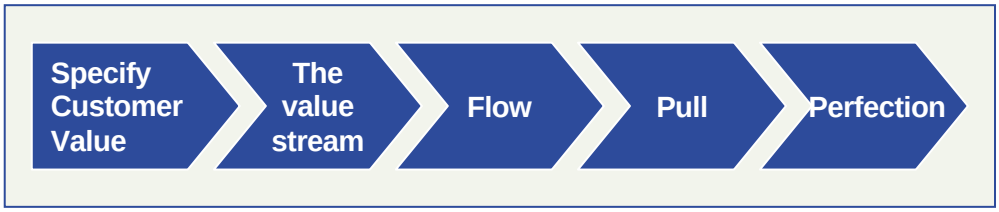


Figure 7-6: Five principles

First, specification of a product or service's value must be determined based on the ultimate customer requirements. All activities that create value for the customer must be identified. Activities that do not create value in each product or product family's value stream most be eliminated. The value creating activities should, hereafter, be reorganised in a smooth flow. Waste, such as waiting time, inventory, and transportation between processes will be eliminated as a result of flow. The forth principle is pull. Products should not be produced before demands from customers (internal and external) downstream occur and, hence, pull products from upstream processes when needed. The endless pursuing of perfection is the final principle. It covers a combination of continuous *kaikaku* and *kaizen* activities. The first four principles are interrelated and must be pursued continuously.

Womack and Jones emphasise two fundamental elements which facilitates continuous improvements. The first element is transparency, so all employees have an opportunity to see where waste can be eliminated. The second element is instant and highly positive feedback for employees making improvements.

7.4 Four Principles in The Toyota Way

Jeffery K. Liker [2004] states that astonishing few companies have grasped the fundamental essence of lean.

> "(…) most attempts to implement lean have been fairly superficial. The reason is that most companies have focused too heavily on tools such as 5S and just-in-time, without understanding lean as an entire system that must permeate an organisation's culture." [Liker, 2004: 7]

Liker's interpretation of Toyota's successful manufacturing approach is structured into 14 principles within four main categories (4P model) [Figure 7-7].

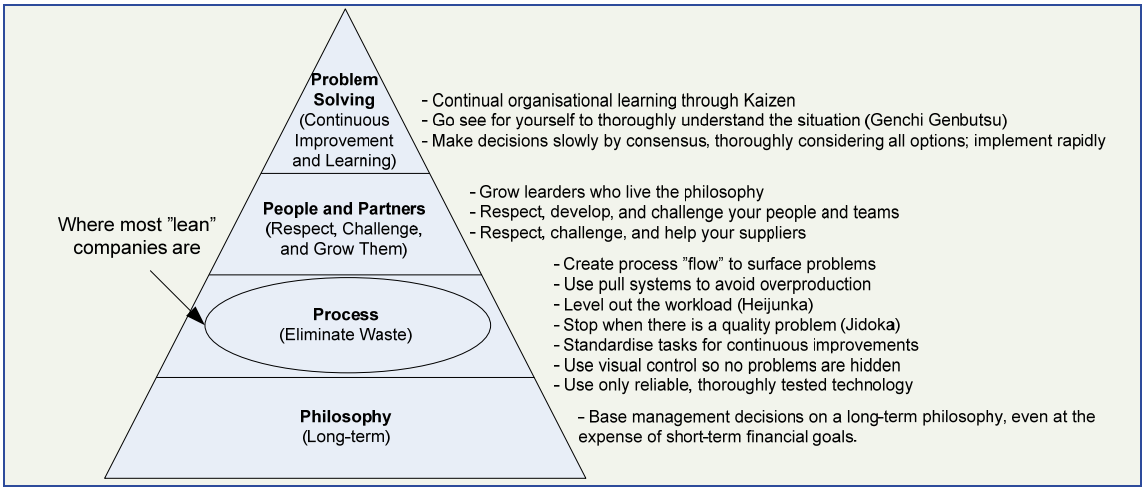


Figure 7-7: 4P model (14 principles)

The 4P model is a holistic interpretation of Toyota's business approach. The common known tools and techniques to eliminate waste are described in the part "Process". In addition to process optimisation, Liker emphasises Toyota's focus on three other parameters. First, the "Philosophy" of reaching decisions based on a long-term perspective even at the expense of short-term financial goals. Next "People and Partners" highlights the importance of respecting, challenging, and developing employees as well as business partners. The last parameter describes Toyota's approach to "Problem Solving" and continuous organisational learning through *kaizen*.

Liker mentions that most companies only work with their processes and do not gain full benefits of lean. He states that:

> *"Without adopting the other 3P's, they will do little more than dabble because the improvements they make will not have the heart and intelligence behind them to make them sustainable throughout the company" [Liker, 2004: 13].*

Liker stresses that a company must become a *"lean, learning organisation"* in order to be successful in the long term [Liker, 2004: xvii].

Toyota's General Manager for OMCD (central lean department) Mr. Miura hosted our visit at Toyota. He was also interviewed by Jeffery Liker and he finds the book "The Toyota Way" a 90% accurate description of Toyota (Appendix p. 89).

7.5 Lean practices

Womack and Jones, Liker, and Ohno have developed frameworks while others such as Shingo, Deming, and Imai et al. have taken a more practical approach and developed practices within a more specific area. Practices such as *TPM*, *SMED*, *TQM*, *kaizen*, *kanban*, and *PDCA* can be applied independently and do not address lean issues in a broader perspective. Consequently, these practical approaches will not be described further.

8 Critical review of lean theories

Many companies worldwide have worked with lean for many years. However, *"What's curious is that few manufacturers have managed to imitate Toyota successfully – even though the company has been extraordinarily open about its practices"* [Spear and Bowen, 1999]. This raises a simple but interesting question; why?

The three frameworks presented above all have similarities and differences in regards to their scope and approach to lean. However, it is interesting to evaluate the theories based on how implementable they are, what the short- and long-term results are, and how sustainable they are.

The five principles in "Lean Thinking" is a simple and tangible approach easily adopted by companies who introduce lean. The first four principles are similar to the *JIT* pillar in the TPS temple. However, they do not directly link to *jidoka*, the second pillar in the TPS temple. Mr. Miura (Toyota) states that Toyota finds *jidoka* equally important as *JIT*. *Jidoka* is essential to stabilise processes, sustain improvements, and it continuously creates the foundation for further improvements when abnormalities occur. Because the five principles are generic you could naturally argue that *jidoka* is embedded in them in order to facilitate flow and create continuous improvements. However, it is troublesome that it is not directly emphasised.

Many examples are provided where companies achieve large cost reductions in the short run when applying the first four principles of "Lean Thinking". The fifth principle, *perfection*, is included in order to ensure the long-term continuous improvements. However, the description in "Lean Thinking" is not very specific and difficult for companies to apply. The long-term results with the five principles are, hence, doubtable because no techniques for actually sustaining improvements and making continuous improvements by aligning the organisation, management, and culture are included in the generic principles. In order to ensure long-term benefits with the five principles they should be supported by management theories within culture, organisation, and management.

In "Toyota Production System" [Ohno, 1988] and "The Toyota Way" [Liker, 2004], various lean tools and techniques are presented in order to achieve cost reductions. However, it is emphasised that they are not the key to long-term success. Instead, a holistic approach with management commitment, a culture supporting continuous improvements, and continuous development of employees must be in place and continuously reinforced in order to become a *lean, learning organisation* [Liker, 2004]. "Toyota Production System" [Ohno, 1988] and "The Toyota Way" [Liker, 2004] emphasise, that only when a holistic approach is in place, sustainable and continuous improvements will truly follow.

Toyota has not published any concrete ways of working with these parameters. Liker [2004], on the contrary, suggests 14 principles, which can guide a company to become lean. It may be difficult for a company to know how to apply them, "*it is frequently hard to retain the list of things to do or not do, much less integrate them into one's work*" [Gallagher, 2005]. However, the broad 4P categorisation and Liker's ability to integrate various well-known management theories about elements such as culture change, motivation, and management can help guide a company. It is still somewhat abstract, and no clear order of action is provided.

No clear documentation for short- and long-term results with Liker's approach has been published. However, it seems obvious that the long-term results would be improved if the entire organisation is aligned with lean. The drawback, however, is that it is a much more complex task.

9 Theory of structure, culture, and processes

Bakka and Fivelsdal's [1999] framework of structure, culture, and processes is illustrated in Figure 2-1. It presents a holistic analytical approach to understand organisations and what influence problems or changes. As it illustrates a problem or change from three analytical perspectives it results in a more comprehensive analysis than if one perspective is merely analysed.

However, the three perspectives are not clearly separated and it is not always clear where organisational elements must be placed. For example, management can be analysed from all three perspectives. Furthermore, culture can be regarded as a factor, which incorporates both structure and processes.

Despite the critiques, it still seems like an appropriate analytical tool, which incorporates three vital elements for analysing organisations.

10 Our Definition of lean

Lean has evolved during the last 50 years and many lean definitions and lean approaches exist today. Some with high significance to the lean domain are described and discussed in the previous sections. Based upon these, we will present our lean

definition, which will be used throughout the paper. Furthermore, we will present the parameters we find essential to support lean, which create the basis for sustainable and continuous improvements in the long-term.

First of all, we do *not* consider lean as merely tools and techniques. Spear and Bowen (1999) describe that specific tools and techniques should be considered as *"(…) temporary responses to specific problems that will serve until a better approach is found or conditions change"* [Spear and Bowen, 1999: 104]. We find that relevant tools, techniques, and application of lean in an organisation must be adjusted to the specific circumstances. Hence, we do not perceive lean manufacturing as fixed or that there exist one best way to apply it. Rather, we perceive lean as a philosophy and a way of thinking and solving problems.

Ohno describes that *"all considerations and improvement ideas, when boiled down, must be tied to cost reduction"* [Ohno, 1988: 53]. In addition to this perspective, Womack and Jones [2003] emphasise that lean creates company growth opportunities. We find that both cost reduction and growth opportunities are essential elements in lean. Additionally, we find that lean creates a means to improve customer value. Finally, we would like to emphasise the importance in applying lean with a deep consideration and respect for employees.

We define lean as follows:

> *"Lean is a means of improving customer value while reducing costs through waste elimination and continuous improvements. This must be achieved through respect for employees and an improved work environment."*

In order to create good long-term results with lean, it must be embedded in all parts of the company. Hence, we find it vital to take a holistic approach when applying lean. Bakka and Fivelsdal [1999] describe that a holistic approach composed of structure, culture, and processes [Figure 2-1] increase the speed within which a company can realise the desired results. We find the three perspectives suitable because they cover all elements in an organisation, while reinforcing each other whenever one of the perspectives is changed. The three perspectives are divided up into seven parameters which we find important to create sustainable and continuous improvements [Figure 10-1]. The seven parameters will be used as an analytical approach throughout the paper.

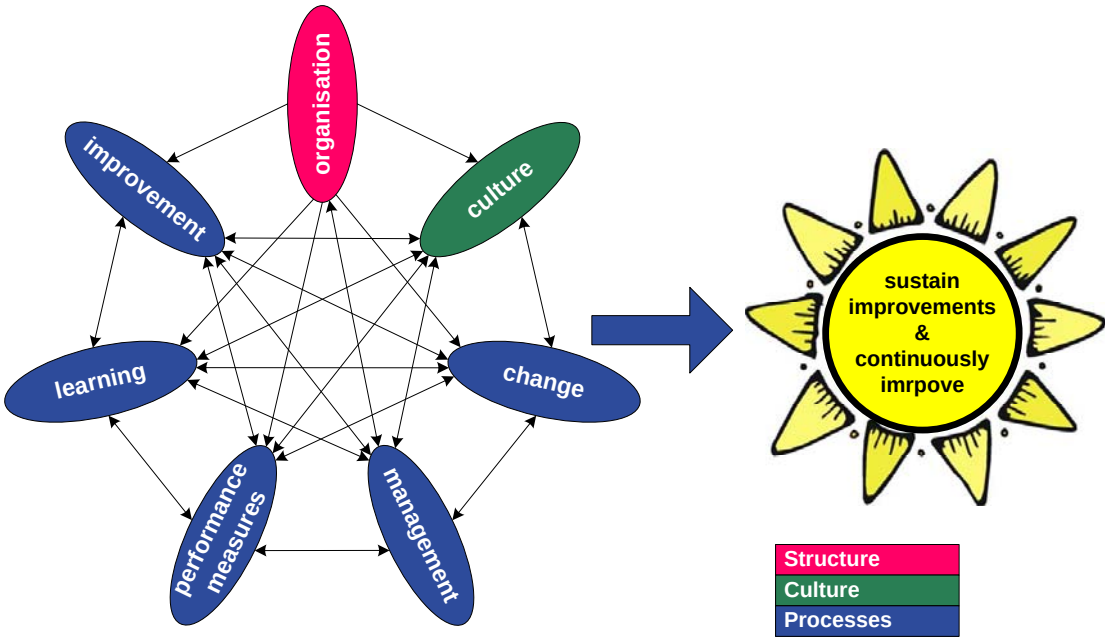


Figure 10-1: Seven important parameters to support sustainable and continuous improvements

Findings in Denmark and Japan

First, the research framework of empirical data gathering is described. This is followed by a theoretical national culture presentation of Denmark and Japan. This creates a cultural understanding, which is essential throughout the thesis. Finally, the findings in Danish and Japanese companies are summaries.

11 Research framework

11.1 Research design

This section briefly clarifies the preliminary considerations for choosing the applied research design [Figure 11-1] [Kotler and Keller, 2000: 104-112].

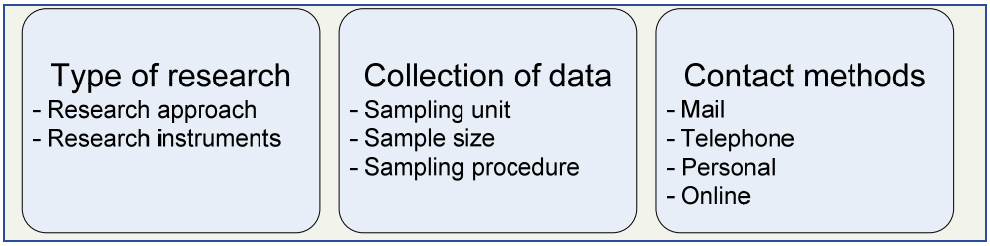


Figure 11-1: Method to research design

11.1.1 Type of research

Empirical research can be collected through various methods such as questionnaires, focus group, pooling, interviews etc. [French, 1979]. In order to identify companies' challenges, success stories, and approach to lean, "*open end interviews*" is an obvious choice. This creates an opportunity to freely dick deep into company specific circumstances, which creates a holistic picture of each company.

11.1.2 Collection of data

It is not possible to base the empirical research on a representative sample size due to the time-consuming research process. Still, limited carefully chosen companies give a good picture of Danish and Japanese companies' approach to lean, their success stories, and their challenges.

11.1.3 Contact methods

Several methods can be used to carry out an interview, illustrated in Table 11-1.

	Advantage	Disadvantage
Mail	Trustworthy	Slow process Not a holistic picture Impersonal
Phone	Fast to collect data	Only for short interviews
Personal	Comprehensive	Time consuming
Online / e-mail	Many correspondents	Easy viewed as spam

Table 11-1: Methods for interviews

A *personal interview* is chosen in order to give the most comprehensive data. Furthermore, it enhances the opportunity to add new perspectives, generate ideas, and get certain issues explained in details. Phone calls and e-mails are used to clarify vagueness.

11.2 Question framework

A meticulous developed question framework covers all relevant topics and ensures data gathered can be used in the analysis. The question framework is divided up into seven categories according to Figure 10-1. Each category is based on a theoretical perspective and illustrated in Figure 11-2 and in appendix p. 2-8.

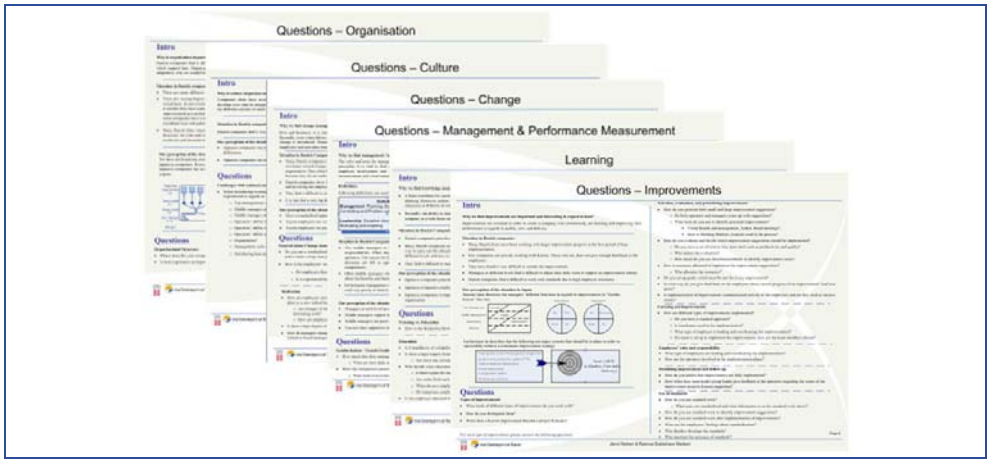


Figure 11-2: Question framework

A brochure introducing the project and the main focus areas were sent to all companies before the interviews were conducted in order to prepare them (Appendix p. 9-10).

Figure 11-3: Brochure about research project

11.3 Companies participating in the research

Background

A large amount of Danish and Japanese production companies are visited in order to get knowledge about many different lean approaches. Only companies with solid lean experience are targeted for the analysis.

Furthermore, Danish consultancies are interviewed in order to add perspectives from another angel as they have extensive experience and a higher theoretical level than most companies.

Companies included in Denmark
The following Danish companies and consultancies participate in the research.

Danish companies	Business area	Location	Danish consultancies
Coloplast	Medico		Implement
Danfoss	Thermostats		Logistikgruppen
Junckers	Wooden floors		NNE
Novo Nordisk	Pharmaceutical		Valcon
Post Danmark	Post		Danish Technological Institute
Radiometer	Pharmaceutical		
Velux	Windows		
Vestas	Windmills		
Vola	Water taps		

Figure 11-4: Danish companies included in the project

The interviews at the Danish companies lasted between two hours and one day. They were primarily hosted by lean managers placed in central lean departments. Often a plant visit was included in the visit.

Companies included in Japan
Due to Professor Kimura large network and recognition in the Japanese business world he arranged visits to the following Japanese companies.

Japanese companies	Business area
Toyota Motor Corporation	Car industry
Otics	Engine and machinery parts
Toyoda Gosei	Car interior, functional parts
Ichiei Industry	Safety systems
NEC personal product	PC and printers
Kawasaki	Motorcycles
Denso	Electronic component to car industry
Hitachi	Electronic

Table 11-2: Japanese companies included in the project

The interviews at the Japanese companies varied from four hours to four days and always included a plant visit. Four days were spent at Toyota where different general managers taught us about lean and three lean consultants answered our questions and showed us a Toyota assembly plant. Top managers and highly skilled lean employees always hosted our visits.

11.3.1 Critical review of methodology

An interview allow for many misunderstandings and uncertainties. To reduce them interviews were taped when allowed (only Danish companies). The wide scope of the master thesis and the interviews time variation limits the depth and details in all of the focus areas. Furthermore, interviews are time consuming and it is difficult to combine data for comparison. Furthermore, the environment and question technique influence the answers [Alvesson, 1999].

Conducting Japanese research as a part of a Danish research project implies a high degree of uncertainty due to language and lack of cultural understanding. In Japan it is furthermore difficult to ask open-end questions, why questions have to be structured differently.

An interview gives the researcher an opportunity to interpret the question to some extent and the real meaning might be changed slightly. Like Mr. Miura (Toyota) explains it: *"I can only express myself in English 80% correct and you might only understand 80% correct. It means only 64% is actually going to be true"*.

12 National culture

12.1 Introduction

The Japanese culture is often blamed to be the reason why Japanese companies are successful in continuously improving and sustaining improvements.

This section describes the main characteristics of the two cultures and their differences in a theoretical cultural analysis. An awareness of cultural differences is essential in order to understand what challenges Danish companies face and why Japanese companies are successful with lean.

12.2 Theory

Both a Westernised and a Japanese view on natural culture are presented in this section in order to characterise the Danish and Japanese culture.

Westernised view

Geert Hofstede's quantitative classification of attitudes, beliefs, and behaviours is categorised into four dimensions. Each dimension provides a numerical score between 0 and 100 [Hofstede, 1991]. Later, Hofstede included a fifth dimension (*long-tem orientation*) to his framework, which is only applied to countries with Confucian background.

Power distance
Power distance focuses on the degree of equality between people in a country or organisation. It shows how less powerful members accept and expect the power to be distributed unequal.
Individualism
Individualism is the degree to which individuals are integrated into groups. Are everyone expected to look after him/herself or family or are there societies where people take care of each other and have a big loyalty for the society?
Masculinity / femininity
He classifies societies according to feminine or masculine characteristics. Masculine is the assertive pole while feminine is the modest pole. In the feminine societies men and women have the same values but in masculine societies there is a gap between men and women's values.
Uncertainty avoidance
Uncertainty avoidance deals with a society's tolerance for uncertainty and indicates if its members feel either comfortable or uncomfortable in unstructured situations. Uncertainty avoiding cultures will always try to minimize the amount of uncertainty with a big set of strict rules, laws and controls.
Long-term orientation
Long-term results are expected as a result of today's hard work. In low long-term orientation changes can happen faster as long-term traditions and commitment are valued less.

Table 12-1: Hofestede's five dimensions

Fons Trompenaars has identified five relationship orientations that address how people in different cultures interrelate in the work place [Trompenaars et al., 1993]. These polar dimensions are:

Trompenaar's 5 dimensions	Question asked
Universalism vs. Particularism	What is more important – rules / relationships?
Individualism vs. Collectivism	Do we function in a group or as an individual?
Specific vs. Diffuse	How far do we get involved?
Neutral vs. Affective	Do we display our emotions?
Achievement vs. Ascription	Do we have to prove ourselves to receive status?

Table 12-2: Trompenaar's five dimensions

Because of many similarities with Hofstede only a few of Trompenaars dimensions will be used to explain Japanese and Danish culture.

Japanese view

Even though Benecit [1946] wrote her book during Second World War, her points about Japanese culture are in accordance with Hofstede and Trompenaars findings. Her key points about Japanese culture can be summarised as below [Benecit 1946].

- Laws and rules dominate - Robot like discipline and concern for small details
- Concern about what other people thinks and do – loss of face
- Loyalty and network ex. Hachi in Box 12-1.
- Hierarchy
- Family or village shows responsibility

Box 12-1: Hachi – the loyal dog

Hachi is a famous dog in Tokyo. Every morning Hachi accompanied his master to the station and around the time the master came home, Hachi went to the station to meet him. Even after the master passed away, Hachi kept looking for his master every day. Today, Hachi is a great symbol of loyalty in Japan and every Japanese child learns about this story. He is immortalised as a statue at Shibuya Station in Tokyo.

12.3 Denmark

Hofstede's surveys about Danish culture give the following results [http://www.geert-hofstede.com].

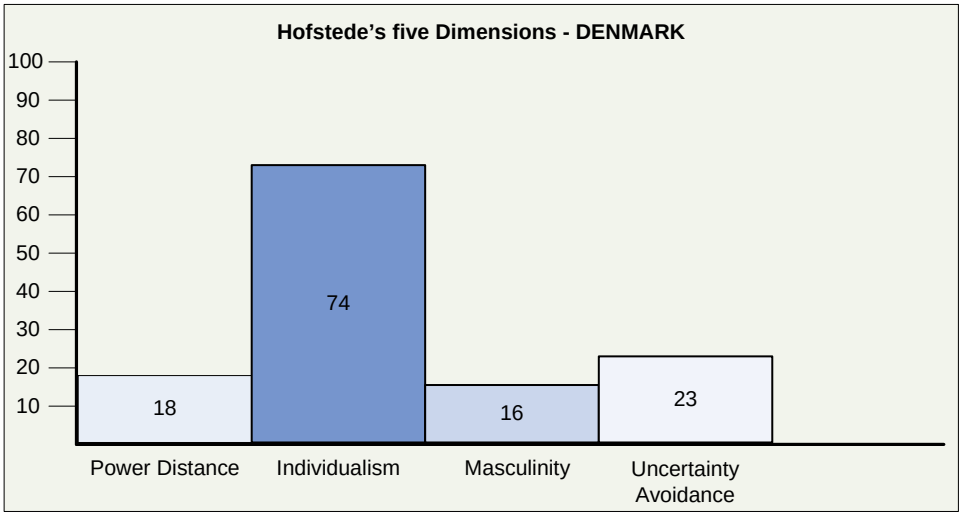


Figure 12-1: Hofstede's five dimensions - Denmark

The *power distance index* in Denmark is extremely low. Characteristics for such cultures are low income differences, collaboration, inter-dependence and decentralisation. Furthermore, it is characterised by dialogue and agreements between managers and employees.

Denmark ranks among the first ten *individual* countries, which indicates that relationships between individuals are loose and people value personal achievements and privacy higher.

The masculinity index in Denmark is among the lowest in the world, which indicates that Danes value safety and family values. In a working environment, conflicts are generally not solved by strikes but by compromises and negotiations.

Denmark has low *uncertainty avoidance*, which indicates a culture willing to try new approaches and a high degree of innovation. Competences overrule authority and protests are widely accepted. Few rules exist and employees are used to self-regulation.

According to Trompenaar's theories, Denmark is a *universalism* country that believes in laws more than relationships and what is good or true applies to every situation. Denmark further has an *achievement* culture where position and influence is acheived through expertise. To some extent emotions are shown openly in Denmark, which is described as an *affective* culture. Danish often show immediate reactions both verbally and non-verbally.

12.4 Japan

Hofstede's surveys about Japanese culture give the following results [http://www.geert-hofstede.com].

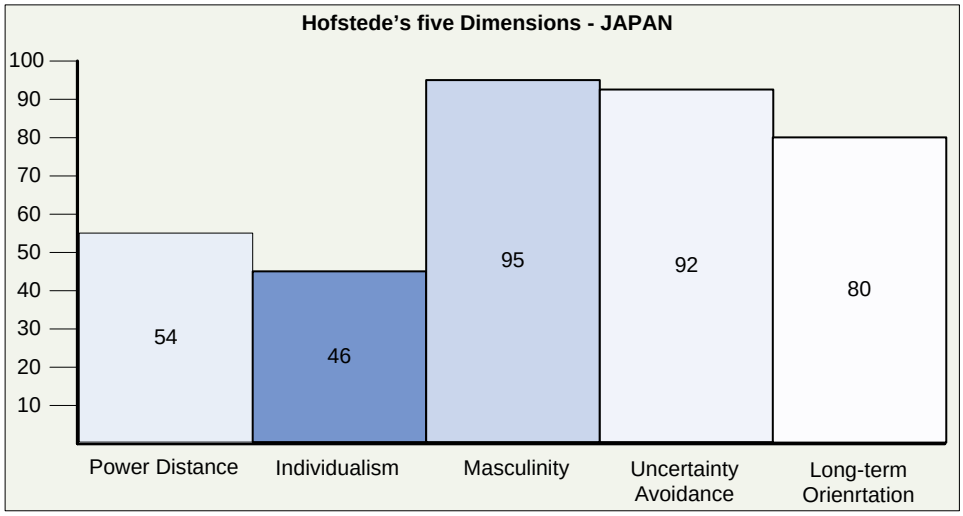


Figure 12-2: Hofstede's five dimensions - Japan

Japan has a relatively high *power distance*. It indicates that Japan is likely to follow a caste system, which makes it difficult to move upward. Less powerful members expect the power to be distributed unequal and there is a great respect for authorities.

Japans highest score on *masculinity* shows that men and women's values are different. Japanese men are goal oriented while Japanese women are more concerned about family values. In addition, the *uncertainty avoidance index* is high indicating that Japanese have low tolerance for uncertainties. In order to reduce uncertainties, strict rules, laws, and policies are important. Everything has to be controlled and structured in order to eliminate the unexpected.

The relative low *individualism index* indicates that Japan is collectivistic orientated. Close long-term commitment to a group and family are important in Japanese culture. Loyalty often overrules the regulations in the society and everyone is expected to take responsibility for their group/family. The high *long-term orientation* supports that Japan has strong work ethics where perseverance is valued.

According to Trompenaar's dimensions, Japan is a typical *particularist* society where circumstances and relationships influence the judgement of what is good and true. Japan is further an *ascription* culture that believes people are born into influence and connections are important. Japan is a very *neutral* culture and Japanese believe they should be in control of their emotions.

12.4.1 Confucianism

Confucianism became a common philosophy in ancient Japan as well as in China, Korea and Vietnam. With its roots set deep in Japanese culture, Confucianism continuous to pervade the consciousness of many Japanese while shaping the Japanese moral system and general way of living.

Confucian beliefs and values in contemporary Japanese society highlight a plethora of social concerns, respect for family, elders, authority, loyalty, and honesty. Following five relationships are the basis of Confucianism [Yao, 2000].

• Father and son (父子)
• Ruler and subject (君臣)
• Husband and wife (夫婦)
• Elder and younger brother (兄弟)
• Between friends (朋友)

Table 12-3: Confucian principle

It is not only relationships, which is important in Japanese culture. Also, factors based on Confucianism such as attitude toward time, persistence, protection of ones "face", respect for tradition, and reciprocation of gifts and favours play an influencing role.

> "According to the Confucian hierarchy of values, gender, age and the status of the speaker are more important than the message delivered (…) The Japanese would rather agree with their manager than cause him to lose face by disagreeing with him" [Clausen, 2006: 59]

12.5 Critical review

National culture theories are always generalising and easy to criticise. Ruth Benedict's description of Japanese culture, which is well accepted by Japanese, shows many similarities to Hofstede and Trompenaar's theories. This justifies the use of Hofstede and Tromenaar's dimensions to explain Japanese culture even though the theories are developed from a westernised view. Living in Japan for four months further gives the impression that the dimensions are consistent with our experiences in Japan.

13 Findings in Denmark

The findings in Denmark are briefly summarised below. Descriptions of each interview appear in appendix p. 11- 86. Two fictive cases based on the findings are created in order to introduce findings in Denmark.

Case: Adico Medicals centralised journey to lean

Adico is one of the largest Danish medico companies with 13,000 employees worldwide. The employees are placed in manufacturing plants within ten countries.

Top management decided to introduce lean in 2003. *"We had to be more efficient in order to compete against competitors in low-wage countries and lean was an interesting concept which targeted our goals"* CEO Simon Hansen.

Adico, who traditionally worked with a top-down approach, established a large central lean office responsible of introducing lean throughout the global organisation in an efficient and fast way. The same approach was used in all factories worldwide.

The central lean office prioritises lean projects based on business cases. They make a tight schedule for three months lean projects at local factories, which are carried out by internal consultant in cooperation with local managers and limited operator involvement. After the projects, local managers are responsible of sustaining improvements and continuously improving processes by involving operators without further support from the lean office. Adico often experiences a high degree of resistance from operators when a project is carried out. "*It was frustrating to see all these unfamiliar faces work in my department without knowing too much about what was going on*" operator Karin Madsen, "*we got some introduction to lean but never got to use the principles in practice*" operator Nis Bjerre.

After working with lean for three years Adico finds it difficult to sustain improvements and continuously improve operations even though they have clear targets and performance measures. The main reason according to global lean manager Claus Jensen is that middle managers find it difficult to adjust their management style to the new roles and responsibilities.

Furthermore, employees are difficult to motivate. *"People find our daily board meetings interesting, but it is difficult to get them engaged and give suggestions for improvements"* Group Manager Ib Skotte.

Case: Zentec's decentralised journey to lean

Zentec is a Danish company who produces specialised mechanical components in eight production facilities and employs 7,500 people globally.

Zentec introduced lean in 2002 after a consultancy recommended lean as a strategic concept to prepare them for future challenges. "*Lean was an obvious choice as it fits our company culture very well (…) the goal was not a cost reduction but to improve flexibility and employee involvement"* CEO Jørgen Rex.

Zentec has proud traditions and known for a company culture with high focus on employee satisfaction. Employees are involved in decision-making and many decisions are placed locally. Therefore, it was natural for Zentec to follow a decentralised approach to lean. Zentec has only a small central lean office, "*It is up to each factory director to reach their lean targets set by head-office, but we help inspire them and create a network within Zentec where they can learn from others experiences*" manager Knud Jessen, central lean office.

Zentec has divided all employees into teams of eight with different responsibilities. Everyone is educated in lean principles and tools according to their responsibility in the team. "*If a lean project has impact for our team, one of us will always join the lean project group*" Operator Tom Hansen. Zentec does not experience much resistance toward lean initiatives simply a normal scepticism.

Mostly, middle mangers run the lean

projects, which are considered as part of their daily job tasks. *"I also have my daily job tasks, so often the projects takes long time to carry out (….) It is difficult to keep group members motivated"* said department manager Thomas Overgaard and continuous *"when projects are implemented they are relatively easy to sustain".*

Zentec finds it difficult to use lean at their overseas sites. "*Lean is a long process and we are not even close at reaching our targets at our overseas plants*" SCM manager Bo Koch.

13.1 Structure

13.1.1 Organisational structure

Lean has influenced the organisational structure in every company. Many different approaches are used depending on the company's size, scale of globalisation, and culture. Not two organisational structures are identical.

All companies have established centralised lean departments and either decentralised lean departments or local change agents. The size, roles, and responsibilities differ in all situations. However, they can be grouped together in regards to some common characteristics as illustrated in the figure below.

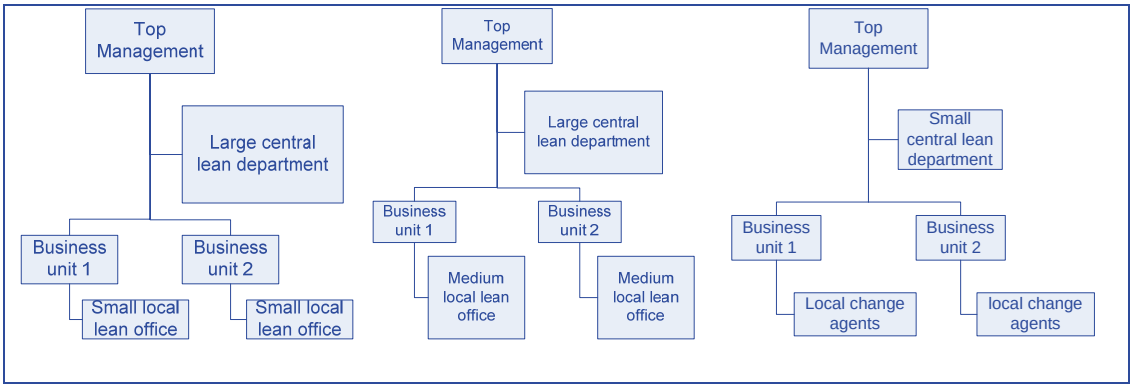


Figure 13-1: Three different ways of organising lean

All approaches have benefits and drawbacks. In general, a loss of ownership is experienced when lean is implemented by large central departments and limited local involvement such as at Adico Medical. Sustainable and continuous improvements are difficult to achieve as a result. However, good coordination, expert knowledge, and experience are achieved. Furthermore, a large central lean department assures the lean approach is standardised at all factories.

Local ownership increases when a decentralised approach is used. Zentec, who use the third model, express employees are fairly good at suggesting improvements. Another company, who also use a decentralised approach, expresses that local factories find it difficult to allocate enough resources to roll-out lean on their own. A consultant furthermore expresses that a company must not rely too much on a decentralised approach because *"you risk getting ten different lean cultures if ten different fabrics implement lean with ten different approaches"*.

Danecto, who used the second approach, has a large central lean department and much focus on local involvement either by local change agents or local departments.

However, they face difficulties in sustaining improvements and continuously improving.

Zentec have placed their central lean department low in the hierarchy. According to a consultant *"Lean is often delegated to low organisational levels, which result in slower roll-outs"*. Zentec face mixed results.

Few companies have changed the functional organisational structure after lean was introduced. Only one company changed to a matrix organisation with functions and value streams as the dimensions.

Adico Medical plans to close or remarkably reduce the central lean office after few years. At that point in time, they expect lean to be embedded locally in the organisation.

Consultants emphasise that there is not one organisational structure, which fits lean the best. It depends on the organisational culture.

Organising in Teams
Most companies and consultancies have positive experiences with organising operators in teams. However, operators, team leaders, and first line managers find it challenging to learn new roles and responsibilities. Furthermore, it is time consuming to implement teams properly.

Zentec gives each employee responsibility for a certain activity such as *TPM, 5S, kaizen* etc.

Use of external consultants
The degree to which companies use external consultants varies much. Many emphasise they would never have achieved as much without hiring consultants. Others say they intentionally use consultants limited as they fear local ownership would be reduced. Furthermore, they fear that consultants leave with the knowledge. Many companies limit the use of consultants to particular challenges such as education or *TPM*. Some have positive experiences with a *sensei*.

13.2 Culture

Several of the Danish companies experience various challenges when they use same lean approach in different countries. A manager even states, there are *"huge differences between the Danish culture and the German culture as well as between the culture in Ringkøbing and Viborg"*. He continues by highlighting some national differences. In Germany employees do what they are told, which makes it easier to implement lean. However, Danes tend to be more sceptical, but also better at generating suggestions. A consultant explains that Danes are very autonomic, which she believes explain the non-existing *kaizen* culture in Denmark. She explains that some employees have a lot of power and easily make others feel uncomfortable when they present suggestions.

Many find it difficult to embed lean thinking within their organisation. Employees often considers lean as a project with an end. Few companies promote or relocate employees with lean experience in a tactical way.

13.3 Processes

13.3.1 Change

Resistance toward change

All companies experience some extent of resistance toward lean. Middle managers show the highest resistance toward lean while operators often have a positive attitude in the beginning. If lean does not progress and operators do not get feedback, the majority of companies experience frustrated operators who stop supporting lean.

> "Middle managers have shown the most resistance toward lean because the management has not been good enough to redefine their roles and responsibilities" Manager (Danecto)

In order to create support for lean the majority of companies make a job guaranty. At Adico Medical, the lean change happened very fast and some managers could not cope with it. As a result, they have chosen to dismiss some managers. Danecto include the biggest opponents among operators in lean project groups in order to change their mindset and become supporters.

Zentec is one of the few companies who experiences limited resistance toward lean. According to Manager (Zentec) the reason is much effort to get employees involved in projects and thereby create local ownership. Furthermore, lean at Zentec is carried out by local managers and high top management commitment at each factory.

Change model

Neither the manufacturing companies nor the consultancies use a change model. Still, most companies use elements in *planned change* to prepare employees for changes.

> "Each manager is an individual person and has his own way of creating support from his employees. Furthermore each site has different cultures and different approaches have to be taken" Manager (Danecto)

The companies have different opinions of whether a *burning platform* is appropriate. Some created a *burning platform*, which created support for lean. However, the majority of companies do not believe in a *burning platform*. Manager (Zentec) argues that a *burning platform* often influences the employees completely opposite the intention.

> "We experienced a lot of friction when we only focus on the hard values in the process. Knowledge and understanding is a good way of motivating employees instead of using a burning platform" Manager (Zentec)

Most companies use a vision and generate short-term wins in order to visualise the goals and results. They also use high information level about lean in order to reduce resistance toward change.

> "We kept a high information level and told about every change and event happening to all employees. Still, we have never been blamed to inform too much!" Manager (Danecto)

Danish companies use different approaches to inform employees about lean. For example, Adico Medical sat up a hotdog production done by the employees to show lean principles in a fun way.

Figure 13-2: Hotdog production

Adico Medical and Zentec use questionnaires throughout the change process in order to identify whether employees are dissatisfied. Hereby, initiatives and adjustments can be made in order to gain acceptance for the change.

13.3.2 Management

Findings about management are divided up into top management, middle management, bonus systems, and *gemba* management.

Top management

Danish companies' top management show different engagement to lean. Companies such as Adico Medical started lean based on top management initiative. The top managers' early commitment stresses the importance of lean throughout the company.

Many other companies started lean based on middle manager initiative. Even though top management supports lean it has mainly been middle managers' responsibility to create the changes, which has slowed down the process.

> "Top management has still not realised that lean is not just a six month project, but a continuously trip and it has become a problem that the CEO never say the word lean" Manager (Zentec)

Middle managers

All interviews indicate that middle mangers are the main obstacle for lean. Especially when top management show high commitment much focus is on motivating operators. Middle managers are often forgotten in the process and feel stuck in the middle.

Danish companies experience that middle managers need different roles and responsibilities when implementing lean. From being a traditional manager and problem solver, lean managers have to coach, support, and show leadership. It is difficult for middle managers to adapt the new manager role.

> "The most difficult part about lean is to get the management to understand they have got a new role. They most raise questions and not give answers" Consultant

Middle managers do not feel well-equipped to work with lean as their lean knowledge is to low.

Gemba management

Most of the companies express the importance of getting managers visible on the production floor in order to support employees and understand the daily production and problems. However, most companies find it difficult in practise.

A few interesting initiatives are made in order to get managers to *gemba*. A company has set up PC stations on the production floor, which enable managers to take decisions on the spot. Zentec schedule when each manager must visit teams at the daily board meetings on the production floor.

A consultant stresses that it is important to find a balance with *gemba*. Top managers should not get too involved as it might hold employees back from generating ideas. Also, senior managers have to be careful not to dismiss middle managers if they get to active in daily operations.

13.3.3 Performance measurement

Most companies and consultancies emphasise that performance measures motivate employees to make continuous improvements. The importance of choosing the right measures is also emphasised. For example, if the purchase department receives bonuses based on their ability to negotiate purchase prices they will buy large quantities, which is against lean principles (Consultant).

Many companies use Policy Deployment or Balanced Scorecard as performance measures. Performance measures are in all cases based on strategic goals and cascaded down through the corporation.

At Danecto, each team of employees creates their own measurements but has to include QCD measurements and an employee satisfaction measurement. Lean managers help each team to set realistic targets and it is more likely that targets are set too ambitious than too low according to Manager (Danecto).

13.3.4 Learning and knowledge

Education and training

Education and training of employees in Denmark is found important. Many different approaches and levels of education in lean were experienced.

Adico Medical and Danecto use a structured lean education model. One company used a generic model but had to tailor-make it in order to make it relevant for all employees. The models include real life project.

Figure 13-3: Danecto lean education model

Most companies and consultancies stress the importance of using education in practise immediately after the education.

> "Education in simple and relevant tools (e.g. PDCA, Isikawa, 5 times why) combined with practical training is without doubt the best approach" Consultant

Most companies do not provide extra education for middle managers. As a result, middle managers feel insecure because they do not have a deeper knowledge about lean than operators. Also, they do not feel well-equipped to adjust to a new management style.

> "First line managers are the most critical group of employees and needs much education (…) It is very important to educate them in lean so they can incorporate lean in their daily activities" Consultant

Knowledge sharing
Most companies find it difficult to share knowledge about lean internally. Only few companies experience a positive synergy between different factories or even between departments within a factory.

Only few companies have set up a formal knowledge sharing system. Zentec has set up networks of change agents from different factories that regularly meet to share knowledge, inspire each other, create ideas and develop best practices. Adico Medical has developed a database with lean tools and techniques.

Zentec's central lean managers' responsibilities are mainly to inspire local lean employees, coordinate activities, educate, and create a network between different colleagues in order to share knowledge.

13.3.5 Improvement

Most companies use two types of improvements. The first is either radical improvement projects carried out over several months or 3-5 days *kaizen blitz* events. Secondly, most companies work with everyday *kaizen* improvements. All companies express that radical improvements and *kaizen blitz* events result in satisfying performance improvements. However, they express that it is difficult to sustain the improvements in the long run.

The results of everyday kaizen improvements are disappointing for most companies although they use *kaizen* boards and weekly *kaizen* meetings. A company initially experienced that operators were good at generating improvement suggestions. As daily management did not provide feedback, operators lost fait in lean. Adico Medical, who rely on long radical improvement projects with low employee involvement, experience that departments have problems in getting employees to generate suggestions. Local management at Adico Medical does not get further support from internal lean consultants after the consultants leave the initial projects.

Zentec find that operators, who participate in *kaizen blitz* events, become better at generating improvement suggestions. In addition, many express that high employee involvement improves *kaizen*. A 70-80% improvement made by operators is better than a 100% improvement carried out by consultants or managers, according to all consultants.

Only Zentec expressed that employees are good at creating and implementing *kaizen* suggestions. An interesting point is that they use a decentralised approach and rely much on employee involvement.

Bonus and award
No companies use economical incentives to support *kaizen*. Most companies explain that money does not create motivation for Danish operators. Some of the companies use small awards as recognition such as a week free food in the canteen, a t-shirt, or a bag, which have a positive effect.

Standardisation

Some explain that standardised work is not realistic for Danish companies because employees resist too much. Others express standardisation is necessary and a foundation for identifying abnormalities, which help generate *kaizen* suggestions (Danecto and Consultants).

Only one company has introduced standardised work. In the beginning they met much resistance but gradually operators experienced standardisation as an eye opener. Now, employees express a relief because they always know what to do and what is expected of them in different situations.

13.4 Challenges for Danish companies

Findings in Denmark indicate certain areas where Danish companies face challenges in creating continuous improvements and sustaining them. The major challenges are summarised in the figure below and are analysed throughout the master thesis.

Danish companies' main challenge is to sustain improvements and generate continuous improvements. The inner circle illustrates that challenges are faced at all levels of the organisation. The parameters in the outer circle all indicate areas which create an obstacle for sustaining improvements and continuously generating improvements.

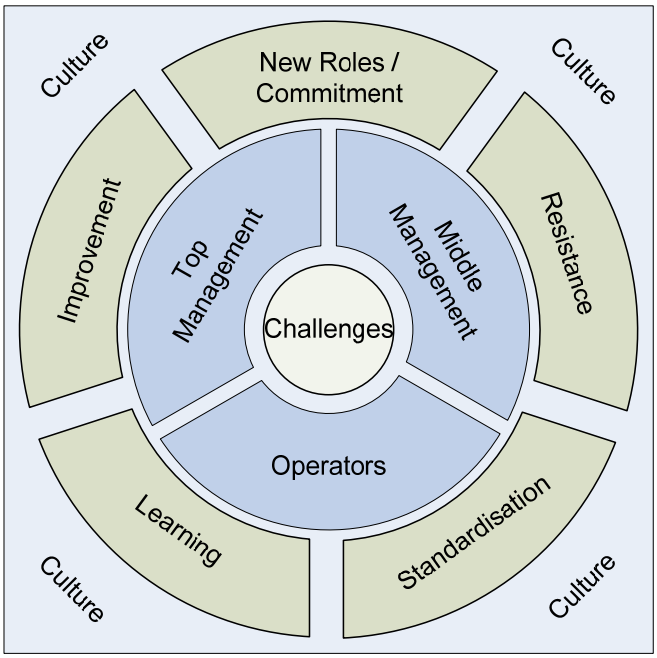


Figure 13-4: Summary of challenges in Danish Companies

14 Findings in Japan

In order to introduce findings in Japan, a small case about Toyota explain our experiences from the four day Toyota visit. Summaries of each company visit are located in appendix p. 87-134.

Case: Experiences from Toyota

Toyota has worked with lean for about 50 years. They have experienced increased sales the last decades and have opened many new plants primarily within USA, Europe, and Asia.

Lean is deeply embedded in Toyota's culture and they keep perfecting the concepts. When you enter Toyota's plant in Nagoya (Japan) you see team members, team leaders, and group leaders who work very steady and focused. Their roles and responsibilities are clearly defined in every situation, which minimise confusion and uncertainties

The manufacturing processes and material handling is carried out very smoothly in a standardised way. Where appropriate, lean tools are applied. One element is especially emphasised by General Manager OMCD Mr. Miura; "*One clear word is takt, it drives everything. Our use of takt time is unique - very different from Nissan and Honda who do not have a takt*". The takt follows several suppliers down the supply chain in order to reduce fluctuations.

The most important management discipline at Toyota is *genchi genbutsu*, where managers spend much time on the shop floor daily in order to see facts.

Continuous improvements are also deeply imbedded in the culture. Each employee must identify problems and make improvement suggestions. If an employee and his team can not implement an improvement a local lean office assists them. If required they get support from the central lean office, OMCD.

OMCD are established in USA, JP, and Europe where lean experts are placed. Their primary role is to support local factories and suppliers. Mr. Otsu emphasises that *"it is important for OMCD to improve processes, but it is far more important to educate employees".*

Whenever OMCD carries out radical improvement projects local involvement is stressed, "*Finding the problems and analysing them is done in cooperation, but the implementation is most likely done by their own resources*" Mr. Otsu. He further emphasises the importance of situational leadership in the process to identify suggestions and implement them. Coaching is used a lot.

Performance measurement is used extensively in order to motivate employees to make continuous improvements. Though, no standardised knowledge-sharing program is established, the performance measures necessitate knowledge sharing among factories in order to achieve the required improvements.

Lean is spread to Toyota's subsidiaries all over the world. Toyota in Japan both sends Japanese lean experts abroad and educates employees from abroad in Japan in order to understand lean. However, "USA and Europe are still far behind us" Mr. Otsu.

At Toyota, employees are first promoted after several years of experience. This is in order to teach employees the Toyota way of thinking before they get responsibility for other employees. This makes it easier to coach subordinates and ensures the ability to create continuous improvements.

14.1 Structure

14.1.1 Organisational structure

Central lean departments

Most Japanese companies have central lean departments who possess lean expert knowledge. Their main responsibility is to assist the company's plants worldwide in

working with lean. Some carry out projects in collaboration with local plants while others merely coach and educate in lean.

> "It is important for OMCD (red. Toyota's central lean department) to improve processes, but it is far more important to educate employees" Mr. Otsu (Toyota)

OMCD at Toyota only carries out projects locally when local staff encourages them to. When this occurs, they evaluate improvement potentials case-by-case and the local staffs' expertise. If OMCD finds it beneficial they engage in a local improvement project otherwise they leave it for the local employees to make the improvements.

Decentralised lean departments
Toyota and Toyoda Gosei have decentralised lean departments at each plant. Their responsibility is to assist the shop floor employees in carrying out improvements. NEC had decentralised lean departments in the beginning but has closed them now and emphasise that lean is part of everyone's daily activities.

Teams
All companies organise shop floor operators in teams. Toyota's structure is illustrated in Figure 14-1 and the structure is widely used by others. NEC has flexible teams who change every day according to the production plan. All other companies use fixed teams for a longer period of time. Team leaders are selected among employees with the most experience and leadership qualifications.

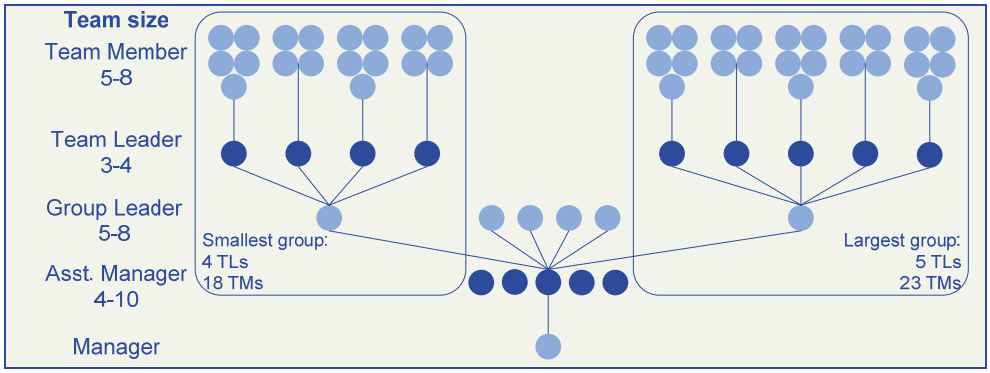


Figure 14-1: Toyota's team structure

Clear roles and responsibility
Most companies express that roles and responsibilities are well-defined and well-known by all employees. Appendix p. 95 shows roles and responsibilities at Toyota.

External consultants
Most companies have worked with lean for decades and do not use external consultants.

NEC, who has only worked with lean for six years, uses a highly experienced *sensei* to assist their lean implementation. In the beginning, the *sensei* visited all plants once or twice a month and after some years once a quarter. The *sensei* works with all levels of

the organisation such as top management's strategic decisions and lean knowledge as well as operators' movements, roles, and responsibilities.

Mr. Sawamura emphasises that NEC would never have achieved the success without a *sensei*. Furthermore, he stresses the *sensei's* ability to teach employees at the workstation while making real life improvements.

> "Consultants are necessary:
> 1. As Change agents – has the experience in advanced enterprises
> 2. Frequent site visits and enthusiastic discussions to be made – otherwise people can not change their mind
> 3. Training on site, not a vocal advocate"
> Mr. Sawamura (NEC)

14.2 Culture

Most Japanese companies have many plants abroad and experience cultural differences. Mr. Miura (Toyota) mentions that European engineers and mangers are bad at observing employees, spending time on the shop floor, and generating *kaizen* improvements.

> "Normally in Europe the management does not like to see the production. They like to see the computer" Mr. Miura (Toyota)

Toyota and NEC experience much job shopping in some countries abroad and find it problematic in regards to lean.

> "There is a high turnover abroad (Europe, China, and USA) whereby knowledge disappears" Mr. Miura (Toyota)

Mr. Sawamura (NEC) explains that if Japanese changes job from one company to another he often gets the same position or a level lower than his prior position. This reduces the incentive for job shopping in Japan and as a result most people stay in the same company for life. Professor Kimura further mentions the slow promotion and discipline, as the backbone of Japanese companies.

In Japan, employees seem very committed to their work. All managers, we asked, work 70-80 hours a week on average. Similarly, all operators work 45 minutes daily overtime on average at Toyota and Mr. Otsu (Toyota) states *"overtime is not a question"*.

In general, all companies state that it is more difficult to implement lean abroad than within Japan. Kawasaki and Toyota explain that overseas plants prioritise techniques before concepts. Otics further states, that they struggle much with managers at USA plants because they have low motivation. However, they experience managers and employees in Indonesia to be very eager to work with lean.

Mr. Kido explains that Kawasaki experiences different results with lean abroad. Assistance from Japanese lean experts or Japanese managers is essential to make overseas plants successful with lean. Most Japanese companies send Japanese experts and post Japanese managers abroad for several years. In addition, foreign employees come to Japan to learn about lean and experience the company culture. At Toyota this occurs once a year, where managers abroad learn about the TPS way of thinking in Japan.

All companies are aware of the importance of national cultures when working in a different country. Mr. Satta (Otics) explains that they implement lean differently in each country.

In general about half of the employees at OMCD (Toyota) are lean trainees. Afterwards many return to their functional departments, which transfer knowledge and culture to the functional departments.

14.3 Processes

14.3.1 Change

Resistance toward change

Most of the companies have worked with lean for decades whereby continuous improvements and changes have become part of daily life. However, they still experience resistance toward change at overseas plants. According to Mr. Miura (Toyota), the main reason for resistance is lack of top management commitment. At Toyota subsidiaries this is not a problem because top managers are carefully selected and educated in lean. However, it is difficult to convince supplier's top management about the benefits.

NEC has only worked with lean principles for six years and experiences more resistance toward change. The resistance mainly comes from middle managers who find their new roles and responsibilities boundary-exceeding. Mr. Kido (Kawasaki) also explains that change toward lean is not frictionless. It is a long process with much work and evidence to convince that lean is beneficial.

The limited resistance toward change can be explained by Japanese culture. Japanese employees do not stand up against the hierarchy such as managers but normally follow and show commitment to their directions. Another factor that explains the low resistance is the fact that most employees work for the same company for life. At the Toyota Tsutsumi plant, the average employee is 39 years and has worked for Toyota for 18.7 years. Similar numbers are applicable at most other companies.

Change model

None of the Japanese companies use a change model. However, they are aware of certain initiatives to create support for new changes. Toyota emphasises local ownership and involvement.

> "Finding the problems and analysing them is done in cooperation, but the implementation is most likely done by their own resources (…) We like to make sure they reach the target agreed upon" Mr. Otsu (Toyota)

NEC explains that the *sensei* had a central role in the change process. He kept repeating the same things and it took long time for NEC managers and operators to understand him. Gradually, they understood his points when they experienced the improvements, which created support to lean.

14.3.2 Management

Top management

Japanese companies express that top management commitment is the most important factor to achieve lean success. Mr. Sawamura (NEC) stresses, *"Introducing lean into an enterprise is the matter of its top management"*.

Furthermore, managers indicate that a passive top management commitment in form of resource allocation is not a sustainable solution. Japanese top managers are seen as leaders who clarify the direction employees must follow.

> "(…) constructive and tenacious manner of the top management. They must never give up and they should play a very important role. Top managers should press for improvements and be fair but should not dwell with details" Mr. Kido (Kawasaki)

Western companies change direction too often and never get one management idea sustained before a new is implemented, according to Mr. Miura (Toyota). Furthermore, they have high turnovers among top managers. Mr. Miura finds it problematic in order to sustain lean improvements and continuously improve.

> "If Danish companies can get their managers to stay longer they will be better" Mr. Miura (Toyota)

Middle management

Mr. Sawamura (NEC) stresses that one of the most difficult elements in lean is the role and responsibility of middle managers. Mr. Sawamura explained that middle managers both had negative and positive reactions.

> "Intense communication between top and middle managers and top managers frequent plant visits reduced the middle managers anxiety" Mr. Sawamura (NEC)

To become middle manager at most Japanese companies, it is essential with "hands on" experience from production lines. Team leaders and group leaders are dedicated to support the lines. The predominant part of their time is used on the production floor. The possible career move from operator to line leader and further to group leader is a high motivation factor.

Bonus and awards
Employees at Toyota et al. receive small bonuses for generating suggestions. Despite Toyota et al. bonus systems, they stress recognition from management and co-workers to be more valuable than money. Furthermore, internal and national competitions to award good suggestions motivate employees.

Toyota creates a high internal competition between divisions to deliver high performance. An incentive for managers is promotion opportunities.

Gemba management
All Japanese managers emphasise the importance of *gemba management*. Mr. Miura (Toyota) explains that root causes to problems are only found by seeing facts on the shop floor. Professor Kimura further stresses that Japanese managers spend several hours on the production floor a day. The time spent on the shop floor is further a way of showing leadership.

Initiatives to *gemba* are present at all Japanese companies. Denso and NEC, for example, use presentations at the shop floor and have placed PC workstations for middle managers in order to take actions on the spot.

Operators, team and group leaders showed examples of improvements at Denso and NEC. This was done with an impressive engagement and they proudly showed their work to us. According to Mr. Yoshida (Denso) this is the best way to recognise operators as it shows the importance of their work.

Visual management
Visual management is widely adopted by all Japanese companies. This includes boards, which show daily planning, performance measurements, *kaizen*, QC-circle activities, standards, history of the lean transformation, and success stories.

To create visibility for managers on the shop floor, NEC does not use U-cells because it hides many processes. Instead, they use straight lines to make it easier to see operational irregularities.

14.3.3 Performance measurement

Toyota uses performance measures to motivate and press managers to improve performance. They develop a monthly Productivity Knowledge Rapport for each geographical area with performance measures within quality, costs, productivity, lead-time, and safety [Figure 14-2].

Department	Target = 100% productivity	Current productivity	Times of target increases
Department 1		102%	5
Department 2		100%	2
Department 3		99%	3
Department 4		97%	1
Department 5		96%	7
Department 6		94%	5
Department 7		94%	2
Department 8		93%	0
Department 9		91%	4
Department 10		91%	0
Department 11		90%	7

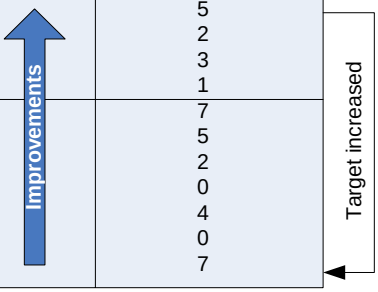


Figure 14-2: Toyota's Productivity Knowledge Rapport

If the current performance is above for example 97% of the target, it is above the acceptance line. Whenever a department reaches 100%, the target is increased and the department is placed last in the table again. This creates an incentive for managers to improve even further in order to get the departments performance over the line again. The goal is to increase the target as many times as possible.

KPI boards are placed in each department at Toyota's shop floor. The boards show the current performance, the history of performance, and targets of KPI's. Factory managers and group leaders set KPI's in collaboration.

14.3.4 Learning and knowledge

Education and training

Japanese companies spend little time on educating employees in lean. At Toyota a two-hour introduction to TPS is given to all employees. When one is promoted additional education is provided. Companies like Otics, Denso, and NEC gives additional education in *kaizen* activities in order to enable operators to create ideas for improvements.

A higher lean education level at overseas factories is necessary and the limited education in Japan is only possible because of employees' loyalty to the company. *"There is a high turnover abroad whereby knowledge disappears"* Mr. Miura (Toyota).

"On the job" training taught by experienced employees is, according to Japanese managers, the most efficient way to learn. Often, team and group leaders are responsible of training operators. None of the companies have developed a fixed education model.

Toyota uses a training program to educate lean expert, which usually takes two years at OMCD. The training program mainly contains practical projects conducted in cooperation with a *sensei*. Half of the employees at OMCD are trainees from different divisions. The purpose is to spread lean thinking at their home divisions afterwards.

Knowledge sharing
In general, all companies find it difficult to share and transfer knowledge to overseas plants. Many companies send Japanese managers abroad for two to four years in order to facilitate knowledge sharing. Furthermore, many companies teach overseas managers about lean in Japan.

Denso has a database with *kaizen* improvements and lean tools in order to generate ideas locally. Denso records successful *kaizen* improvements and sends a DVD to other plants as inspiration. Most companies use conferences in order to promote successful lean initiatives and practises.

Toyota does not put high focus on knowledge sharing activities. Mr. Miura (Toyota) emphasises that it is up to each division's management to get inspiration from other plants and request knowledge themselves.

14.3.5 Improvements

In Japan, most companies use *kaizen blitz* events, everyday *kaizen* improvements, and *QC-circles*. In addition, many use *jishuken* groups and internal *jishuken* groups. Every company use standards to a high extent and reduce takt time in order to identify areas of improvements.

NEC's *sensei*, Mr. Iwaki, explains that the most important element in lean is *"just-do-it"* instead of using too much time on analysis.

Most companies expect all levels of the organisation to generate suggestions. At Toyota, Mr. Otsu emphasises that it is important to motivate, coach, and involve employees in order to make them create suggestions. Management are responsible of keeping *kaizen* activities moving.

> "The top management must step in, look at problems revealed day to day, every hour, give member tasks definitely and follow them up" Mr. Miura (Toyota)

At Denso, *kaizen* were previously carried out in the employees' spare time but has recently changed to be part of their daily tasks. Operators at NEC do not implement improvements because NEC finds it time-consuming and inefficient.

Standards
All Japanese companies emphasise the importance of standards and standardised work down to the very last detail. They argue that standards are better for employees and it is easier to identify problems and thereby improvements.

> "Standards mean the minimum cost and also it means best quality" Mr. Sawamura (NEC)
>
> "People work like machines, it's true" Mr. Miura (Toyota)

14.4 Toyota critique

Experiences from a sceptical book about Toyota is presented in Box 14-1 in order to add a critical perspective of Toyota who always appear to be "best in the class" [Mehri, 2005]. This is not our own findings and impressions from our visit at Toyota.

Box 14-1: Toyota critique

Only one book about lean or TPS is available at the University of Tokyo's bookstore. It is remarkable that this book "*Notes from Toyota-land*" is a cutting edge critique of Toyota's way of doing business. It is written by an American who worked at Toyota in Japan for three years.

Darius Mehri explains how employees at Toyota are overloaded with work and how injures occur at the production floor. *"They work people so hard that some people have to work a thirty-six shift (red. 36 days without a day off)"* (p. 62).

Mr. Mehri further tells that teams are the Japanese way of getting employees to work harder. Each group member receives a performance ranking and if one person is deviant the team sinks in ranking, which put a big pressure on team members.

Toyota has rules for everything, even unwritten rules such as *service overtime. Service overtime* means employees work overtime without pay, because other co-workers do! A survey shows that only 52 percent of employees at a Toyota plant took the assigned holiday.

Mr. Mehri further mentions how Toyota film individual employees in order to analyse whether the employee is fast enough and follow the standards strictly. Embarrassment is further described to be a typical Japanese management tool.

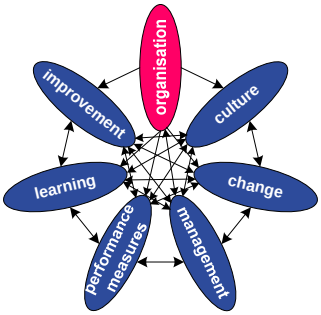
Mr. Mehri explains how constant stress contributed to gout attacks for a co-worker Mr. Hara who became incapable of working. An analysis reported that Mr. Hara had worked twelve hours a day, often seven days a week. This was not unusual in his department. His wife now says, *"I wanted to show the rest of the world how badly Toyota threaded my husband"* (p. 180)

It is important to mention that this scepticism of Toyota is from Mr. Mehri [2005]. It is NOT our impression from the visit at Toyota.

Structure

This part includes the perspective structure, which includes organisational structure. First, the theoretical framework is presented followed by an analysis of findings and theory. Finally, a part recommendation is given.

15 Organisation



This chapter focuses on how organisational structures can support lean. Aside from organisational structures, it includes external consultants' role in the progress and the appropriateness of organising in teams.

15.1 Theory

Organisation structures

Organisations consist of *formal* and *informal* structures. Max Weber regards the *formal* structure as an instrument to obtain different goals [Bakka and Fivelsdal, 1999]. Top managers can use the *formal* structure to manage and control work processes and allocate resources pursuant to the company's strategy. The *informal* structure is a result of employees covering their personal needs by joining social networks in the company [Lacey, 1995].

Industrial societies are characterised by *bureaucratic* organisational structures. Various *bureaucratic* organisational structures exist. Three, of the most common, are *functional*, *product*, and *matrix* structure [Bakka and Fivelsdal, 1999].

Lean organisation

Womack and Jones [2003] have made one of the only contributions to lean organisational structures. They suggest building the organisation around product families and value streams [Figure 15-1]. They also find it important to have a lean promotion function with *sensei* and *improvement teams*.

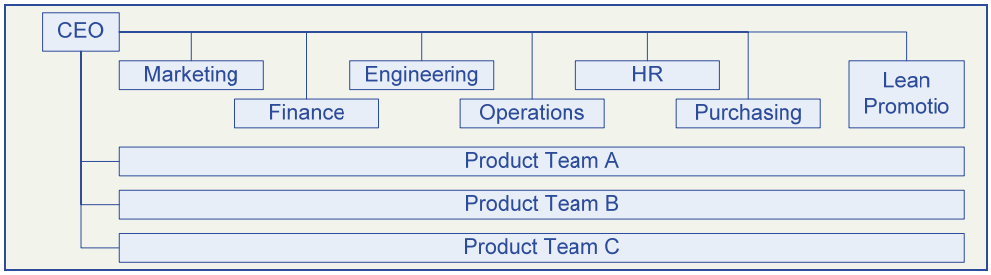


Figure 15-1: Organisation structured in value streams [Womack and Jones, 2003: 257]

Organisations' basic elements

Henry Mintzberg has analysed how different organisation structures occur, how they function, and what characteristic problems they entail. He has identified five basic organisational elements, illustrated below.

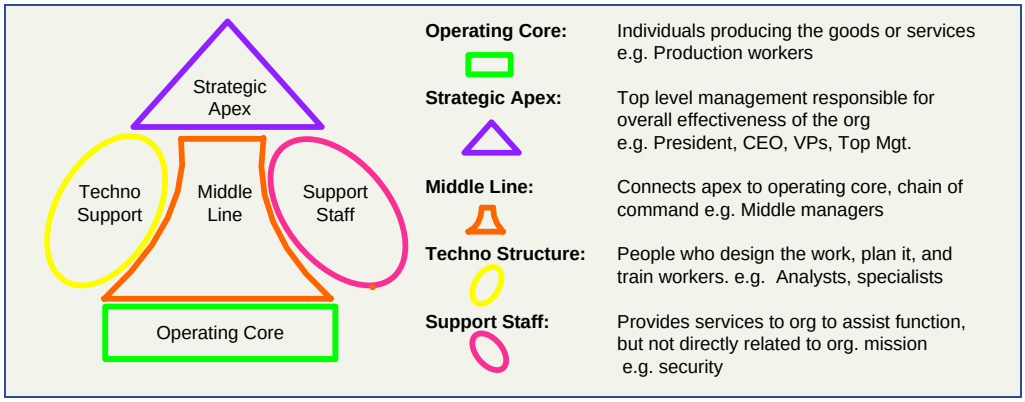


Figure 15-2: Organisational elements

Mintzberg has developed five different structural configurations depending on what basic elements constitute the main parts in an organisation. These are *simple structure*, *machine bureaucracy*, *professional bureaucracy*, *divisionalized form*, and *adhocracy* [Bakka and Fivelsdal, 1999].

Centralising versus decentralising

A distinction between *centralising* and *decentralising* organisational structures is essential. Among theoreticians, many views on advantages and disadvantages exist and some are presented in the table below [Bakka and Fivelsdal, 1999: 49-51].

Centralising – Advantages	Decentralising - Advantages
▪ Better coordination of activities ▪ Top managers easier maintain control of the situation and strategic direction ▪ Decisions taken by best qualified managers ▪ Possible to take quick decisions	▪ Increased motivation from employees ▪ Flexibility and faster decision making on operative levels ▪ Delegate responsibilities to middle managers who grow ▪ Better knowledge about local circumstances

Figure 15-3: Centralisation versus decentralisation

Organising in teams

Lean theoreticians consider teams as a vital organisational initiative for creating sustainable and continuous improvements [Womack and Jones, 1999], [Liker, 2004] et al. Most knowledge about teams is derived from the sports world where the team ideal is based on teamwork, engagement, skills, energy utilisation, and personal flexibility [Bakka and Fivelsdal, 1999]. But how can a company facilitate this?

Some argue the fertile soil is management and management behaviour while others believe organisation structure and culture have a more important role when creating successful teams. Effective teams will always develop different roles within a team in

order to achieve the goal. Contemporary theories pay more attention to personal characteristics when a team is selected [Bakka and Fivelsdal, 1999].

15.2 Analysis

First, the overall organisational structures are analysed including the lean departments and teams role. Afterwards, the role of external consultants is analysed.

15.2.1 Organisation structure

Most of the companies, Japanese as well as Danish, are organised in either a *functional-* or *product structure*. None of the Japanese companies have changed their basic organisational structure as a consequence of lean. Evidently, the traditional structure has not had a negative effect on lean results in Japan.

Consultants warn companies about making large organisational structure changes when they engage in lean. It is a complex and difficult task to change an organisational structure and it impacts the entire organisation. Few Danish companies find it necessary to change the basic organisation structure to support lean.

Only one of the Danish companies changed their organisational structure when lean was implemented. They changed from a typical *functional structure* to an organisation build around product families and value streams. According to the Manager the new structure has both advantages and disadvantages [Figure 15-4].

Figure 15-4: Advantages and disadvantages with organising in value streams

Even though it is a small company (500 employees) the new organisation structure, which was introduced in 2004, is not embedded yet.

15.2.2 Lean department

All companies use a central lean department to support lean activities. The purpose and role differs among companies. However, the organisational structure is divided up into three general forms, described below. The company culture should not be neglected when deciding upon an organisational structure for lean.

> "Whether a company should rely on central internal lean consultants or organise lean more decentralised depends on many factors such as size, background, and culture" Consultant

Adico Medical plans to decrease and close the central lean departments in some years. According to Mr. Miura (Toyota), Taiichi Ohno had same plan when he established OMCD. However, Toyota realised that much knowledge is gathered in the department and it would be too risky to close it.

Large centralised lean department and small/none local lean office

Adico Medical, as the only Danish company, has a large central lean department. Internal lean consultants carry out long radical improvement projects with very low operator involvement. The advantages and disadvantages they experience are highlighted below.

Advantages	Disadvantages
• Central knowledge centre • Knowledge sharing among internal consultants • Lean approach standardised • Coordinating and prioritising improvements • Promotion of lean experts throughout the organisation	• Improvements are regarded as a project • Operators not involved in projects • Resistance from employees • Lack of ownership from middle managers and operators • Lack of sustainable and continuous improvement • No knowledge sharing among middle managers and operators

Figure 15-5: Advantages and disadvantages with Adico Medical's organisational structure

It is doubtful whether this approach will ever lead to continuous improvements even though some of the disadvantages are removed. Employees must be more involved during the initial projects and resources must be provided in form of local lean departments or change agents in order to support the departments in continuously improving their operations. As described further in chapter 19, local middle managers need help to continuously improve as they simply do not have the knowledge or experience to do it initially. Support furthermore reduces stress among middle managers.

Large centralised lean department and medium decentralises lean department

Danecto has large centralised lean departments and medium sized local lean departments or local change agents. Advantages and disadvantages are highlighted in Figure 15-6.

Advantages	Disadvantages
• Central knowledge centre • Knowledge sharing among internal consultants • Lean approach standardised • Coordinating and prioritising improvements • Promotion of lean experts throughout the organisation	• High local employee involvement • Moderate lack of ownership from middle managers and operators • No knowledge sharing among middle managers and operators • Lack of sustainable and continuous improvement

Figure 15-6: Consequences of Danecto's organisational structure

The increased involvement of local managers and operators has a positive effect on ownership and resistance toward change.

Danecto has clear action plans for every middle manager and use a *sensei* to coach. As a result they know which projects to work with and can get help when needed. Toyota has a similar organisational structure. Mr. Miura (Toyota) emphasises that, "*each factory should create their own improvements (…) only by trying themselves they can learn*". As a result, OMCD leaves all improvement initiatives to local plants. All operators and middle managers have deep lean knowledge already, which enables full delegation.

Small centralised lean department

NEC, and Zentec use a decentralised approach with a small *centralised* lean department. The role of the centralised lean department is to coordinate projects, create knowledge sharing, evaluate improvements, and work as support function, but not take part in actual projects. Advantages and disadvantages from Zentec's approach are highlighted in Figure 15-7 whereas the results from another decentralised company's approach are highlighted in Figure 15-8.

Advantages	Disadvantages
• High local employees involvement • High local ownership from middle managers and operators • Coordinating and prioritising improvements • Fair sustainable and continuous improvements	• Limited or none knowledge sharing among middle managers and operators • No central knowledge centre • Lean approach not standardised

Figure 15-7: Consequences of Zentec's organisational structure

Advantages	Disadvantages
• High local employees involvement	• No knowledge sharing among middle managers and operators • Low local ownership from middle managers and operators at many plants • No central knowledge centre • Lean approach not standardised • No coordination • Lack of sustainable and continuous improvement

Figure 15-8: Consequences of another company's organisational structure

A manager from "another company" states that they have not succeeded with a decentralised approach. Only one internal consultant, with moderate lean skills, was placed in the central lean department when lean was initiated. Local employees quickly lost motivation as a result of limited coaching and progress. As a result, the lean department has now increased its size.

NEC and Zentec show a good ability to sustain improvements and continuously improve operations by using a decentralised approach.

Using a *decentralised* organisational structure might lead to different lean approaches at each plant. Lack of coordination, expert knowledge, and knowledge sharing can make it difficult in the long run. To meet this problem at least some employees should be placed in a central lean department to coordinate activities and knowledge.

15.2.3 Organising in teams

Most Danish and Japanese companies organise operators in teams. Many Danish companies think teams are essential for continuous improvements and many express it works well. However, many also find that operators do not generate enough suggestions and seem demotivated at board meetings. Furthermore, many team managers and operators are unfamiliar and uncomfortable with new roles and responsibilities. Companies often have a low information and education level in order to prepare them.

All Japanese companies, on the contrary, express that operators are highly engaged in team work and generates many continuous improvements. According to Mr. Koda (Toyota), organising employees in teams is a fundamental concept for Toyotas approach to problem solving and continuous improvements. Toyota's structure is illustrated in Figure 15-9.

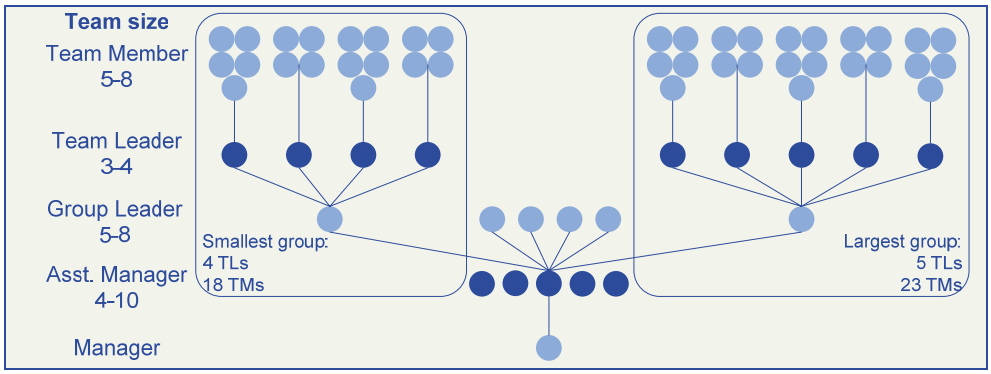


Figure 15-9: Typical Toyota organisation [Liker, 2004: 192]

Box 15-1: Team meeting at Toyota plant

At the Toyota plant visit, we saw how teams gathered before a break to quickly review problems occurred during the day and evaluate their performance. The meeting was quick, but left the impression that employees were highly engaged and showed a high team spirit.

Danish companies might be able to improve the impact of team structure by defining clear roles and responsibilities for operators, team leaders, and first line managers. This might include education in leadership skills. Furthermore, Danish companies should expect that it is a long process to develop highly performing teams and requires continuous feedback and encouragement from upper level managers.

> "Delegation of responsibilities shall go hand in hand with an increased level of competences. If the necessary competences are not in place before delegation of responsibilities it equals placing people on a raft and sail away" Consultant

NEC does not use a fixed team structure, but creates new teams on a daily basis. A condition for this approach is multi-skilled employees and result in increased flexibility. By using a non-fixed team structure NEC does not experience the normal positive advantages known from teams and part of the team spirit might get lost. However, they still receive many improvements from employees.

Specific roles in the team

In any group, people develop different roles [Bakka and Fivelsdal, 1999]. Some are dominating while others are passive. To ensure everyone contributes to the group, Zentec assigns each team member a specific role, such as being responsible for *kaizen*, *TPM*, *5S* etc. [Figure 15-10]

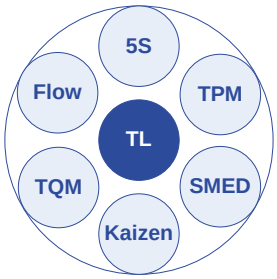


Figure 15-10: Teams where team members each have a role

Specific roles and responsibilities have increased ownership and empowerment at Zentec. They seem better at creating *kaizen* suggestions compared to most other Danish companies. Another company, on the contrary, has experienced a negative impact as they formally gave more responsibility to each team member while middle managers did not follow-up or support their work. As a result, they feel frustrated as their work is undermined. Additionally, one might fear that strong employees will focus much on their own responsibility and undermine less powerful colleagues' responsibility. As a result, all areas of lean will not be treated equally important.

A Danish company and Toyota in USA experience early empowerment is not always the solution.

> "the experience at Ontario taught them that "empowering" employees too quickly when setting up the facility can be premature. Until individuals and teams really understand the Toyota Way and TPS, they are not in a position to be empowered" [Liker, 2004: 186]

A comparison with a football team is made in order to summarize the important issues with a team.

Box 15-2: The production team as football team!

A team has exterior boundaries in form of a football field, which has been decided by officials to have certain dimensions. The ball is the production task that should never be left out of sight and always have all players' full focus. A single player is rarely able to score a goal by own effort, but has to depend on the team. Team members have to work closely together in order to accomplish their common goal – to win. When entering the football field there are clear roles. You are not allowed to kick the referee and use hands etc. Violations will hit the whole team. Each individual player has his own role, one is goalie, and another defender or attacker and one should be in control of the game. A team needs a captain to motivate and support the team. Additionally, a coach is needed at the touchline. It is important that each player stick to his role and the goalie is not suddenly seen up front. On the other hand, a good defender might be able to help attacking in power play. The long-term goal is to win the tournament, but to reach this goal it is important to focus on each game.

15.2.4 Use of external consultants

Most of the Japanese companies have worked with lean for decades and do not see any need to use external consultants. Professor Kimura further mentions that Japanese companies rarely trust external consultants but instead prefer to solve own problems and learn from experiences. Thus, limited input from Japanese companies is included in this section.

It is important for companies to evaluate how consultants should be used to support lean, as it is difficult to succeed if no deep lean knowledge is brought into the company. This section will touch upon these elements.

External consultant support at the initiative lean stage
Danish companies had limited lean knowledge in the initiation stage and most used external consultants but with different purposes and to different degrees. Consultants were used in one or many aspects such as designing lean approaches, educating employees, developing an education program, coaching top and middle management, and contributing with knowledge about specific lean tools.

Some companies experience massive setbacks after lean consultants leave due to lack of ownership and skills. They furthermore loose track of consultants' work, by leaving them too much alone. Other companies also find missing cooperation as a major pitfall. The necessary resources must be allocated in order to enable close cooperation between consultants and future key lean employers. This is the best way to transfer knowledge from consultants to the company.

> "The company must allocate several full-time employees in order to support the consultants and the lean rollout" Consultant

Furthermore, consultants are best used behind the scene to support and coach local project owners. Hereby, local employees get personal experience in leading lean. As a result, the likelihood of long-term continuous improvements increases.

Danish companies agree that they would not have reached the same level of lean without using external consultants. It would have been difficult to acquire knowledge

and keep up motivation among top managers, middle mangers, and operators without external consultants.

Consultants support at the mature lean stages

In the mature stages, most Danish companies use external lean consultants only for specific tasks, such as *TPM*, *kanban* or *SMED*. It reduces the risk of loosing local ownership and helps employees to get up to speed within unknown areas.

The role of a sensei

NEC uses a *sensei* with extensive lean experience acquired at a Toyota supplier to gain knowledge and inspiration about lean. After intensive and continuous work with the *sensei* for six years, they show impressive results.

> "A company needs a sensei to provide technical assistance and change management advice when it is trying something for the first time. This "teacher" will help facilitate the transformation, get quick results, and keep the momentum building" [Liker, 2004: 306]

In the beginning, each plant at NEC was visited once or twice a month by the *sensei*, which Mr. Sawamura finds to be too little. Liker and Meier [2004] find a visit twice a month powerful as long as a strong internal team coaches and clear tasks are planned between the visits.

A *sensei* can have many different management styles. Taiichi Ohno's original approach was harsh instructive while Liker and Meier [2004] find that a *sensei* must merely coach and not take part of the actual work. Mr. Iwaki (NEC) both coaches and takes active part in the improvements.

> "Mr. Iwaki (red. NEC *sensei*) kept repeating the same things the last six years but in the beginning we did not understand what he was saying. Mr. Iwaki never gives up, and this is the main reason for NEC's success with lean" Mr. Sawamura (NEC)

Zentec and Danecto also use a *sensei*. They both use an external *sensei* to support and coach different key players. Manager (Danecto) believes a *sensei* is essential for their success with lean.

15.3 Part recommendations

15.3.1 Organisational structure

As illustrated above, not one best practice to lean organisation exists. It must be adjusted to the company's culture, size, experience, and resources. However, Danish companies, such as Adico Medical, organised with a large central lean department and very low local involvement must increase their local involvement in order to sustain improvements and continuously improve. Thus, two organisational structures are recommended to organise lean.

1. Large central lean department combined with medium sized decentralised lean departments or change agents
2. Small central lean department combined with medium sized decentralised lean departments or change agents

None of the Danish companies grasped the specific advantages each organisational structure provides. Figure 15-11 and Figure 15-12 illustrate primary and support activities which enhance each approach's advantages and reduce the disadvantages.

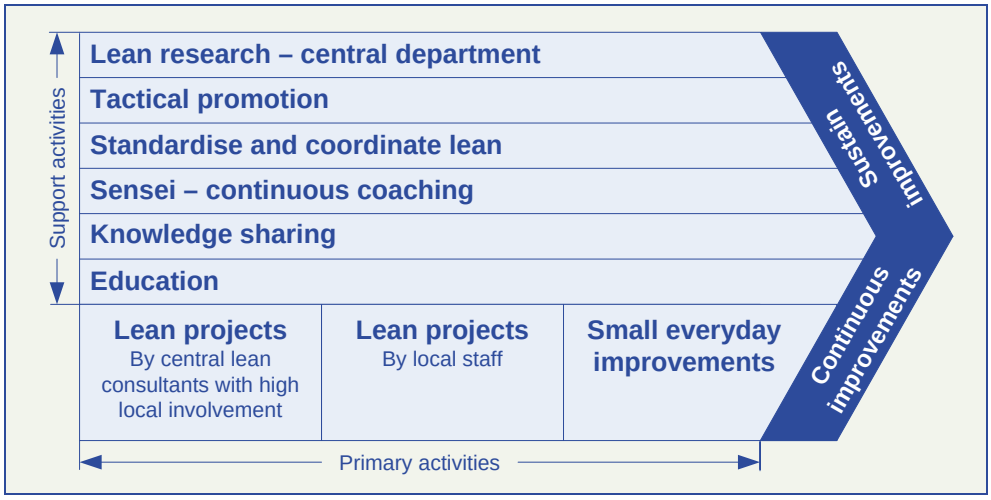


Figure 15-11: Approach 1- Primary and secondary activities - large central department

Figure 15-11 illustrates the primary and secondary activities for the first approach. High local employee involvement must be present at all lean improvements as it increases local employees' lean knowledge, experience, and independency. Furthermore, the large central lean department must use the potential benefits of its size. They can function as a lean research centre, where lean ideas are adjusted to culture and business characteristics. Tactical promotions of lean experts, standardisation, coordination of lean activities, and knowledge sharing across the company are additional advantages.

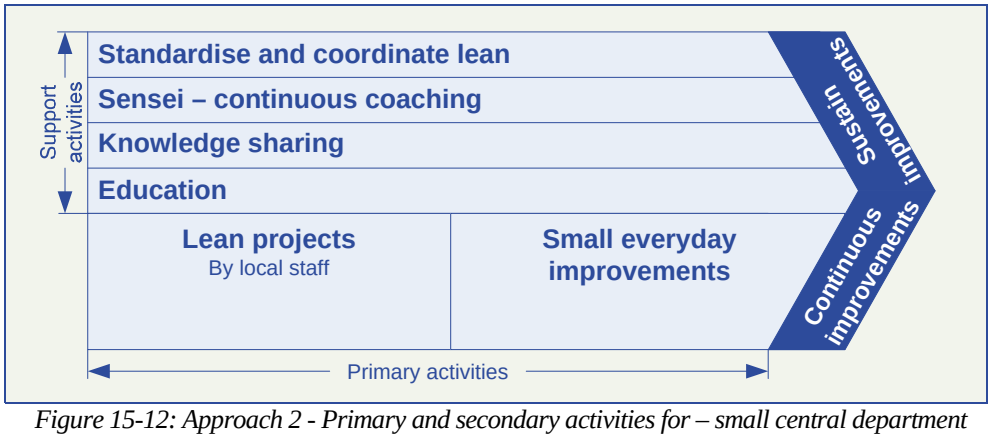


Figure 15-12: Approach 2 - Primary and secondary activities for – small central department

Figure 15-12 illustrates activities for the decentralised approach. The central lean department must focus on standardising and coordinating lean activities across the

company, which facilitates knowledge sharing within the company. A *sensei* is furthermore essential in order to inspire local staff and give ideas to improvements.

Limited evidence from our empirical research supports an organisational structure around value streams and product families. Thus, this can not be directly recommended.

15.3.2 Teams

It is recommended to organise shop floor employees in teams as it facilitate involvement and ownership. However, teams must not be established before team members are prepared to take responsibility. The best team structure must be determined in regards to the culture, employees' skills, etc. Companies must prepare teams for the new roles and responsibilities, illustrated in Figure 15-13.

1. Clear roles, responsibilities	- team members, team leader, first line manager
2. Relevant education	- lean, problem solving, meeting facilitation etc.
3. Feedback and encouragement	- from managers

Figure 15-13: Requirements for establishing teams

15.3.3 External consultants

It is recommended to use external consultants in the initial stage of the lean journey. As the company matures, consultants are only appropriate for specific tasks such as upgrading employees in new skills.

To gain inspiration and knowledge from the consultants and generate local ownership, it is important to:

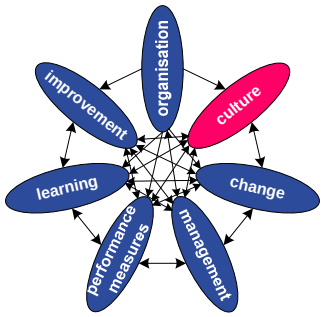
- Use consultants to coach and support while local employees run the projects
- Allocate necessary resources internally to ensure employees cooperate with the consultants and acquire knowledge

A *sensei* is essential at all stages in the lean journey and must support all levels in the organisation. The *sensei* should coach and take active part in and give suggestions to improvements.

Culture

This part includes the perspective culture, which includes organisational culture and national culture. First, the theoretical framework and analysis are presented for organisational culture. This is followed by an analysis of national culture before a part recommendation is given.

16 Organisational Culture



Many books and articles are written about the necessity of creating a lean culture. This section analyses whether a company should change their organisational culture in order to create sustainable and continuous improvements.

This section first presents a general description about culture and how it is possible to change it. This is followed by an analysis of whether or not it is necessary to change organisational culture and how this, if necessary, can be carried out. Furthermore, an analysis of how companies should take subcultures into account is presented.

16.1 Theory

16.1.1 Organisation culture

What is culture?

Although organisational cultures differ from company to company, subcultures within an organisation also exist. Subcultures are created as companies grow and may be based on geographical decentralisation, occupational differentiations etc. [Schein, 2004: 274].

An organisation's culture is originally evolved in order to fulfil employees' need for stability, meaning and predictability. Schein [2004] identifies three interrelated levels in any culture [Figure 16-1]. They range from tangible and visual aspects to assumptions deeply rooted and unconscious in each group member.

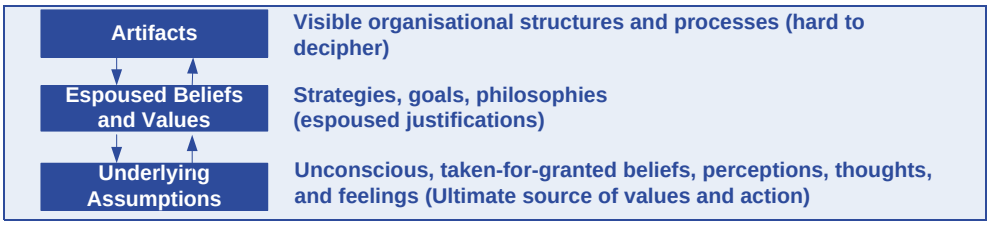


Figure 16-1: Levels of culture [Schein, 2004: 26]

Schein [2004: 88-89] argues that shared assumptions are the result of *"shared patterns of thought, belief, feelings, and values that result from shared experience and common*

learning". Shared assumptions are formed and survive in order to solve a group's problems in regards to *"(1) survival in and adaptation to its external environment and (2) integration of its internal processes to ensure the capacity to continue to survive and adapt"* [Schein, 2004: 87]. External adaptation and internal integration are interdependent and occur simultaneously. External and internal issues employees must come to a common understanding of and deal with is highlighted in Figure 16-2.

External adaptation and survival	Internal integration issues
- Mission and Strategy	- Creating a common language and conceptual categories
- Goals	- Defining group boundaries and inclusion/exclusion criteria
- Means	- Distributing power and status
- Measurement	- Developing norms of intimacy, friendship, and love
- Correction	- Defining and allocating rewards and punishments

Figure 16-2: External adaptation and internal integration issues [Schein, 2004: 88 and 112]

Leadership's role in culture development

The leader or owner plays a vital role during the initial culture evolvement process. Schein [2004] has identified several factors leaders use consciously or unconsciously to embed their *beliefs*, *values*, and *basic assumptions* in the organisation. One of the vital elements is what leaders pay attention to, measure, and control on a regular basis. The leader's *beliefs*, *values*, and *basic assumptions* become embedded within the organisation if it is successful when following the leader. New leaders' ability to influence the organisational culture declines as the mechanisms become embedded during maturity.

16.1.2 Changing organisational culture

The culture of an organisation becomes more challenging for leaders to influence as it matures. Schein distinguishes between natural occurring changes and managed changed.

Natural occurring changes

Natural occurring changes differ at various stages of an organisations existence. Table 16-1 illustrates the most relevant change mechanisms at specific stages. Schein [2004] argues that leaders can use these mechanisms to skew cultural evaluation in a particular direction. It must be noted that mechanisms at earlier stages can be applied in later stages as well.

Org. stage	Change mechanism
Founding and early growth	1. Incremental change through general and specific evolution 2. Insight 3. Promotion of hybrids within the culture
Midlife	4. Systematic promotion from selected subcultures 5. Technological seduction 6. Infusion of outsiders
Maturity and decline	7. Scandal and explosion of myths 8. Turnarounds 9. Mergers and acquisitions 10. Destruction and rebirth

Table 16-1: Culture change mechanisms [Schein, 2004: 292]

Managed Changes

Managed changes can be used in order to speed up the change process compared to natural occurring changes. Schein argues that managers can implement various management systems, such as performance measurement, but they will not *"produce culture change unless the new way of doing things actually works better and provides the members a new set of shared experiences"* [Schein, 2004: 335].

Schein [2004] does not think that a company should engage in managed changes with the sole purpose of changing the culture within the company. It is more important to focus on the operational goal.

> "Before one even starts to think about culture, one needs to (1) have a clear definition of the operational problem or issue that started the change process and (2) formulate specific new behavioural goals" [Schein, 2004: 324]

Rather than changing the culture, a company should identify and use the strengths in the company in a proactive way. When focussing on operational changes small cultural changes might occur as well. This will be sufficient to support the new direction.

> "(…) peripheral culture change is often sufficient to redesign the core business processes and thereby to fix major organisational problems" [Schein, 2004: 391]

Schein [2004] contributes to the field of creating both culture and organisational changes. He has modified Kurt Lewin's model to *unfreeze*, *cognitive restructuring*, and *refreeze*.

Disequilibrium must be created in order to *unfreeze* employees and make them realise that changes must occur. Schein [2004] believes it is necessary to use a *burning platform* and show employees enough disconfirming data in regards to important goals and ideals in order to create *survival anxiety*. In order to make a transformative change and learn something new, unlearning must first occur.

In order to change a culture, employees must feel able to solve the problem and learn something new without loosing identity or integrity (*physiological safety)*. Figure 16-3, illustrates eight steps of creating *psychological safety* which must happen simultaneously [Schein, 2004: 332].

1. A compelling positive vision 2. Formal training 3. Involvement of the learner 4. Informal training of relevant family groups and teams 5. Practice fields, coaches, and feedback	6. Positive role models 7. Support in which learning problems can be aired and discussed 8. A reward and discipline system and organisational structures that are consistent with the new way of thinking and working

Figure 16-3: Eight steps to create psychological safety

Cognitive restructuring of some concepts in the basic assumptions is vital in order to get changes sustained. Basically, there are two ways for learning new concepts; *role models* and *trail and error*.

If the changes create positive results, with regards to important goals and ideals, the new behaviour and the new set of cognitions is reinforced and can become internalised and a part of the basic assumptions. This *refreezes* the change.

16.2 Analysis

16.2.1 Are cultural changes necessary when working with lean?

Mr. Miura (Toyota) said that TPS (lean) should be understood as *"Thinking Production System"* instead of *"Toyota Production System"*. He emphasises that lean is a way of thinking and acting in specific situations. Mr. Tanaka (Toyota) furthermore stated that *"suppliers do not understand TPS. They understand JIT and kanban but that is not TPS"*. He continued by explaining peoples difficulties in getting the right way of thinking, because *"we (red. Toyota) are doing very simple things, but sometimes it is against human nature"*. However, he emphasised that simple tools and techniques are not the most important element in lean *"it is more important to influence the way of thinking"* and to be patient.

Many examples of the Toyota way of thinking were mentioned and observed over and over again during the 4-days Toyota visit. For example the best way of solving problems is go to *gemba* and see facts instead of staying in an office and look at statistics on a computer screen. Similarly, *jidoka* lead to small machine stops but in the long run many mistakes are corrected and quality is improved.

Many Danish companies talk about creating a lean culture. However, there is a gap between their talk about creating a lean culture and what they actually do. This is for example seen at Adico Medical who plans to close the central lean department within few years as they expect lean is embedded within the daily work. Furthermore, Zentec's employees think that lean simply is a project that will soon end. In general, most companies only educate employees in techniques and waste types, but not in the way of thinking.

Professor Kimura describes, that *"lean must never be the objective in itself, it should only be a method to reach the objective"*. Instead the objective should be to *"optimise the value to customers"*.

As mentioned, some lean techniques and ways of thinking are directly contradicting people's traditional way of thinking. Toyota and Kawasaki, with deep knowledge about lean, state that it is important to change peoples' way of thinking and way of solving problems in order to succeed with lean. Employees must first realise that the traditional way of working is not good (*unlearning*) in order to *learn* new ways of thinking. This would mean changing their *shared basic assumptions* and influencing the *external adaptation* and *internal integration* [Figure 16-1and Figure 16-2].

Despite lean presents a new way of thinking it should not be the goal to focus on culture changes as it removes the focus from the real objective. Therefore a company should not focus on cultural changes as such but use simple elements of cultural change tactically along the process.

16.2.2 Ways of changing culture

Culture is very difficult to change in *midlife* and *mature* companies as it has become deeply embedded in employees and work routines [Schein, 2004]. Toyota actively tries to impact their culture to support lean thinking, but they find it very difficult.

> "We have been working with TPS for 50 years and most plants and suppliers abroad for less and 20 years. It is a long process and it takes time to create a culture" Mr. Mizukosh (Toyota)

Natural occurring changes

Schein [2004] argues that it is possible to naturally change culture through technological seduction such as introducing lean in a company [Table 16-1]. He recommends education in lean terms and tools as this might lead to new common language and concepts in the organisation [Figure 16-2].

Many Danish companies have put much focus on education but fail to sustain lean improvements and continuously make improvements. Some companies experience that it is damaging to rely too much on education. The employees became frustrated when they were educated in lean but received little management support and limited progress was made. As desired results have not appeared, employees are not convinced that lean is appropriate. Thereby, no mind changes occur. Thus, education does not seem to be enough to develop new *shared assumptions* and influence employees' ways of thinking.

Another way to make natural changes is through tactical promotion [Schein, 2004]. Japanese companies experience that plants abroad have not grasped the essence of lean thinking and are far behind Japan. All Japanese companies send highly skilled Japanese lean experts abroad in order to transfer knowledge and impact the culture. Toyota furthermore makes tactical promotion of internal lean consultants.

Managed changes

As natural occurring changes do not seem to be adequate, managed changes might. Use of a *burning platform* is described in the chapter 18. In this section it is assumed that companies already have created a *burning platform*.

Unfreeze

As previously described, establishment of *psychological safety* is necessary to enable changes. If the list of *psychological safety* [Figure 16-3] is compared to the Danish companies' activities, a clear picture is created. Most Danish companies put much emphasis on vision (step 1), education (step 2), and performance measures (step 8). However, most other elements are either not used or used by few companies. On the

contrary, Japanese companies tend to use more of the elements in order to prepare all levels of the organisation for changes.

Cognitive restructuring (moving) phase
Once the foundation for change is in place, two basic ways of learning new concepts exist; *role models* and *trail-and error* [Schein, 2004].

Schein [2004] describes *role models* as persons employees imitate. Leaders can for example "walk the talk" throughout the change process and thereby act as *role-models*. Danecto uses this concept combined with a "no-tolerance rule", where managers must stop-up and correct abnormalities on the shop-floor. It is effective but very hard to do in practice, according to Manager (Danecto).

In addition, Toyota encourages employees to see each others' improvements. By visualising improvements, employees better comprehend what changes accomplish and what is possible and they become better at generating ideas.

Trail-and-Error is based on experimenting and inventing solutions until something works. This can be done by involving employees in lean implementation and *learn by doing*. Mr. Iwaki (NEC *sensei*) emphasises that *"just-do-it"* and learn from your mistakes is the most important element in lean. Zentec experiences that employees who participate in a *kaizen* event better understands lean and generate more improvement suggestions.

Refreeze phase
Employees can adopt new *values*, *beliefs* and *assumptions* if they realise that new ways of solving problems have successful results in regards to important goals.

16.2.3 Adjusting lean to subcultures or national cultures

All companies with subsidiaries abroad experience much cultural differences. Furthermore, subcultures exist both between different plants in the same country and between different departments within a plant.

> "Huge differences between the Danish culture and the German culture as well as between the culture in Ringkøbing and Viborg" Manager (Zentec)

So, how should companies take national and organisational cultures into account when working with lean?

Danecto, as the only company, implement lean identical in all countries and subsidiaries and does not account problems so far. The advantage is easier administration. Furthermore, plants will not develop own methods and knowledge sharing between plants will become easier. However, if the specific culture is not taken into account it might be difficult to sustain lean and it may not become deeply embedded in their culture. All other companies adjust the lean approach to national characteristics.

Some Danish companies also adjust lean to organisational differences within the same country (Adico Medical and Zentec).

> "Each manager is an individual person and has his own way of creating support from his employees. Furthermore each site has different cultures and different approaches have to be taken" Manager (Zentec)

However, a consultant thinks companies should be careful to use different approaches within the same country as it becomes difficult to administrate in the long run.

> "You risk getting ten different lean cultures if ten different fabrics implement lean with ten different approaches" Consultant

Consultants argue that the degree of lean centralisation is dependent on the company culture. Franklin [2004] further argues that it is vital to develop a cost-effective implementation plan, which fits the specific organisational culture.

16.3 Part recommendation

Lean evidently represents a new way of thinking and solving problems. However, it is not recommendable to initiate a comprehensive culture change initiative as it would remove focus away from the main objective, lean implementation. Companies should instead use its existing strengths to implement lean. Theory of culture change presents appropriate initiatives to prepare employees for changes, which is recommended below. These focus first on *planed changes* but can lead to appropriate culture changes. Companies must use the techniques in the stated order:

1) Identify clear operational (lean) goals
2) Use natural and managed culture change to support the process, but not with the objective of changing the culture

Natural occurring changes

Companies ought to use tactical promotion of employees with lean knowledge. Internal lean consultants can be promoted to key manager positions. Furthermore, team members with lean experience and leadership abilities should be promoted to team leaders. They will be able to train new employees and act as role models to others. This is a slow, but excellent way of impacting the culture.

Managed changes

Figure 16-4 illustrates a managed change model, which can be used to prepare and support employees for lean changes.

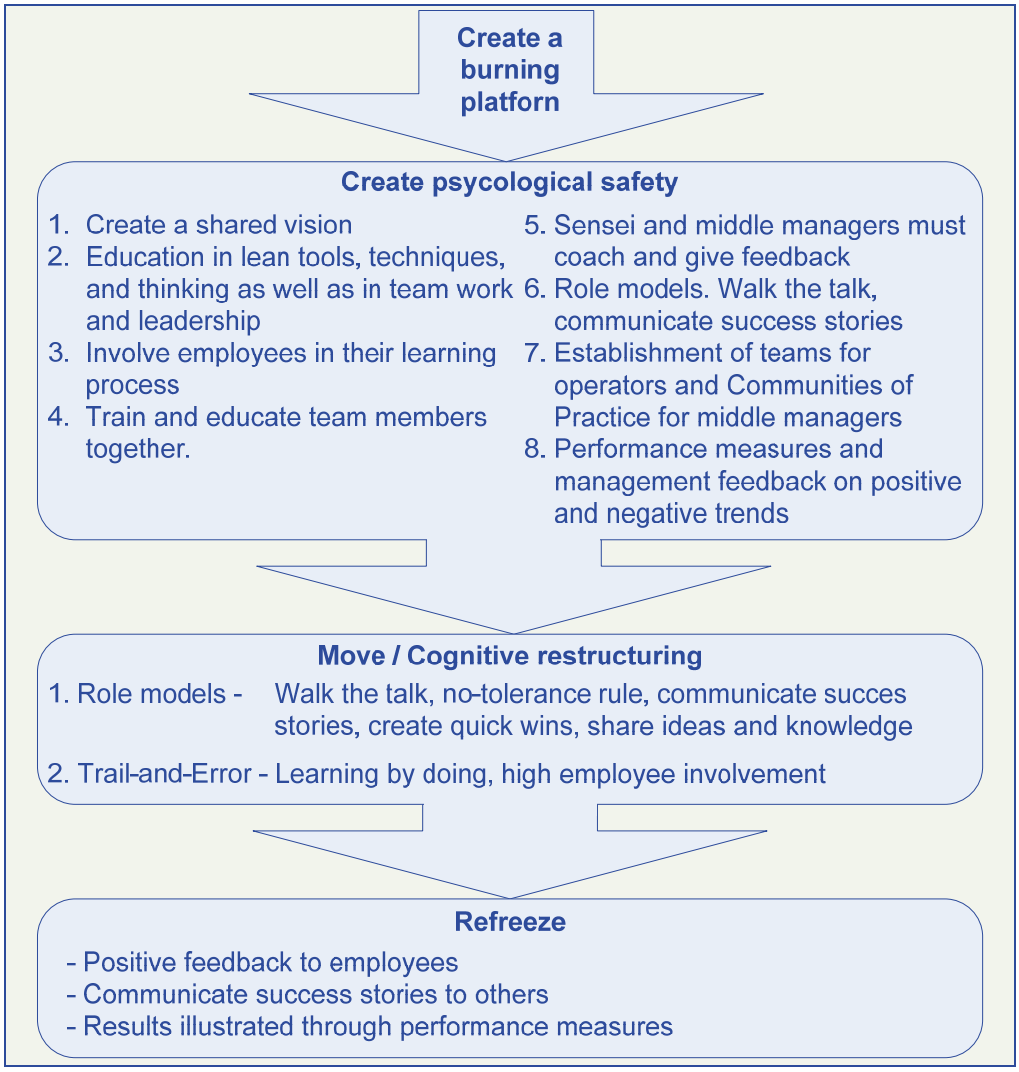


Figure 16-4: Managed lean change

Adjusting lean to subcultures or national cultures

Clear cultural differences exist between countries and plants within a country. Companies should use an 80% standardised approach to carry out lean at different plants and countries. This would improve the administration, facilitate knowledge sharing, and identify best practices. Companies ought to differentiate the last 20% of the implementation approach to cultural differences. This can be done by using local employees and knowledge about culture specific circumstances. Furthermore, internal lean consultants must study the culture in order to be prepared.

17 National culture

The theoretical framework for national culture is presented in chapter 12. This chapter analyses national culture differences of relevance to the lean domain. Finally, a recommendation of national cultures impact on lean is presented.

17.1 Analysis

Japanese culture is often blamed to be the key to Toyotas success while others state that it is of no importance.

> "(…) many visitors assume that the secret of Toyota's success must lie in its cultural roots. But that's just not the case. Other Japanese companies, such as Nissan and Honda, have fallen short of Toyota's standards. And Toyota has successfully introduced its production system all around the world (…)" [Spear and Bowen, 1999: 97]

However, Mr. Tanaka (Toyota) stresses that Toyota factories abroad are not as effective as in Japan.

This section highlights some important national differences between Denmark and Japan in order to evaluate the cultural impact on companies' ability to sustain improvements and continuously improve. The following five cultural differences, with impact on lean, are presented below.

- "Live to work" versus "work to live"
- Loyalty
- Standardisation
- Kaizen
- Perfection in work

"Live to work" versus "work to live"

Lisbeth Clausen [2006] categorises Danes as people who "work to live" and seek to maximise life satisfaction. Japanese, on the contrary, are categorised as people who "live to work", which means to maximise job satisfaction

Japanese usually work many hours a day and considers this respectful toward the company who hired them [Clausen, 2006].

Working Hours	Denmark	Japan	Difference
Annual working hours	1.467	1.970	34%
Scheduled working hours	1.536	1.795	17%
Overtime hours	69	175	154%

Table 17-1: Comparison of working hours [OECD, 2004] and [JIL, 2002]

At the Toyota plant we visited, the average overtime per day is 45 minutes for operators. Everyone is expected to work overtime if the daily production is not met. This, combined with a high usage of temporary workers, gives Japanese companies a

possibility to *level* the production and follow production plans strictly. Danish employees and unions will never accept such working conditions. Rather, they value a fixed working schedule with room for family and personal values higher *(Hofstede: femininity*).

Loyalty

Japanese have an impressive loyalty to their company and *long-term employment* is still widespread. Promotion in Japan is a long process and almost every manager has experience from the shop floor. This enables Japanese managers to be more active on the shop floor (*gemba*) without feeling uncomfortable. Danish managers can often feel uncomfortable as they have little knowledge about work processes.

Employee Tenure [%]	Japan	Denmark
Less than 2 years	22,6	36,5
Between 2-5 years	13,9	16,2
Between 5-10 years	20,7	18,2
Between 10-20 years	21,5	17,7
Above 20 years	21,4	11,4
Average tenure [Years]	**11,3**	**7,9**

Table 17-2: Employee tenure [OECD, 1997]

Box 17-1: Being proud of ones work

At Denso it was clear how everyone at all levels was very proud of his or her work. An operator who demonstrated a quick die changeover radiated a joy and honour that is rarely experienced in Denmark. He proudly executed the work with respect for every little detail in the process and bowed at the end of the demonstration. Another operator proudly explained the consequences for the manufacturer in Europe if he failed to observe an error.

Standardising

Japanese have a high respect for hierarchies *(Hofstede: Confucianism* and *high power distance*).

> "In Japan, when you ask somebody to work in a certain way, they will strictly follow what you say. In Europe this is different" Senior vice president Didier Leroy (Toyota) [EDT, 2004: 6]

Even though Japanese operators do not fully agree with a solution they always accept and support it in order not to make the superior "lose face" [Yao, 2000]. According to Trompenaars, Japan is a *neutral* country, where nobody likes to stand out and everyone respect rules (*Hofstede: high uncertainty avoidance*). This further strengthens why Japanese find it natural to work according to standards, which were seen at all Japanese companies.

The Danish culture is very different as Danish employees are *individualists* who want influence and are used to a *decentralised* approach. Thus, Danish companies face many challenges if they introduce standardisation to the same extent as in Japan. Danish companies are aware of the importance of standardising as a foundation for

sustainable and continuous improvements, but also question whether it can be achieved in Denmark.

Only one Danish company works extensively with standards. Initially, many operators showed high resistance but were forced to develop the standards on their own. As time passed, they expressed joy and acceptance for standards as they always know what to do. They feel less stressed after standards are introduced.

Box 17-2: Standardised coffee shop	Chaos when standards are not followed
When you walk into a coffee shop in Japan you notice instantly that nothing is left to chance. Clear procedures of how to do it the right way is followed down to the very last detail. Not necessarily the most efficient way! The employee greet you "Konnichiwa" without even looking at you and you get a feeling that this is deeply embedded in their training program. When you order a cop of coffee it is first repeated by the girl taking the order followed by three or four repetitions by all other employees in the coffee shop! Afterwards they give you the receipt with both hands together with a little bow. You leave the coffee shop accompanied by four or five "arigato gozaimasu" (Thanks).	One of the first days in Japan we went to the bank to pay our tuition fee of several thousand Danish kroner. We filled out several papers, gave them our passports, and so on. As they could not get the payment confirmed they kept placing more phone calls while more and more staff gathered in order to help out. Employees went around clearly confused and pretty much everything in the bank stopped! They kept apologising, making phone calls, and talking to senior managers. In the end, we had to leave without paying the bill. In the chaos they misplaced several of our documents and had to use additional time looking for them.

Kaizen

Employees at Toyota make impressive amounts of improvement suggestion. This is unique compared to western companies, but not within Japan.

Being a *collectivistic* culture, Japanese are committed and loyal to a group, which strengthen their engagement to work in *kaizen* groups.

> "Since the work groups have to compensate for absences by working harder and doing overtime, they exert pressure on members to turn up at work – which explains why holidays are sometimes not taken and absenteeism is low" Taiichi Ohno [Moldaschl and Weber, 1998: 374]

Japanese has high respect for hierarchies and do not like to stand out of the crowd. This questions whether Japanese employees actually get involved in *kaizen* activities based on passion or because superiors and other group members expect it (*Confucianism*). *"Quality circles are voluntary, but the company strongly recommends the work - and almost everyone participates"* Mr. Koda (Toyota).

Danish culture strengthens collaboration, interdependency and decentralisation, which support kaizen activities (*low power distance*). Furthermore, Danish employees are willing to try new ideas and are innovative (*low uncertainty avoidance*), which are important elements in generating improvements.

On the other hand, Danish employees are highly influenced by the Danish Law of Jante. Standing out of the crowd and display one's qualities by given improvement suggestions, can easily result in personal attack by the group.

> "Another factor that explains the missing kaizen culture in Denmark could be that Danes are very autonomic. Some employees have a lot of power and can easily make others feel uncomfortable when given suggestions" Consultant

Many positive Danish cultural factors support *kaizen* activities and the potential and foundation for successful kaizen in Denmark is present. However, Danish companies still face many challenges in managing *kaizen*.

Box 17-3: The Japanese bamboo people

Merete Møller (Danish Technological Institute) compares Japanese and bamboos. Bamboo is characterised by being strong but very flexible. They are slender but still cannot break. When it is windy the bamboo bend but will always recline when the weather slacken. Bamboo is further characterised by living in many years and have a solid and spread out root system, which is essential for its stability and growth.

Perfection in work

Our stay in Japan leaves a clear impression of Japanese being perfectionist. It is hard to justify based on cultural theories, but is still worth mentioning in a lean perspective.

Things are always on time in Japan. Trains leave on time, shops open and close on time, rules are strictly followed, and templates are always being used (*high uncertainty avoidance*). Japanese pay attention to small details and seek perfection in everything, no matter if it concerns fashion or grocery shopping. This is also reflected in their work, which was both experienced at plant visits and various everyday situations. Mr. Kawazoe (Toyoda Gosei) said, *"We never give up before we reach the target"*. The Japanese perfectionism has a positive impact on sustaining improvements and continuous improvements.



Box 17-4: An obsession of being on time

The morning of April 25th 2005, a train near Amagasaki was delayed by 90 seconds. In Japan trains are always on time and small delays cause problems for passengers with connecting trains. In order to make up for the delay, the driver was speeding. As a result the train came off the tracks and 107 persons died and 555 were injured [Onishi, 2005].

Challenges with a new generation

Many things are changing in Japan along with the globalisation. The traditional cultural values in Japan, which this analysis is based on, will be challenged in the future. It is already easy to see a big difference between the older and the younger generation. *"This book (Red. The chrysanthemum and the sword) explains Japanese culture very well, but the younger generation are different. They are more westernised"* (Professor Kimura).

This leaves many challenges for Japanese companies as they must adjust to the cultural change. This might have a big impact on how lean activities in Japan will be carried out in the future.

Denso is a good example where adjustment is already happening. *Kaizen* activates such a quality circles are now carried out as part of the normal working hours instead of in employees' leisure time.

17.2 Part recommendation

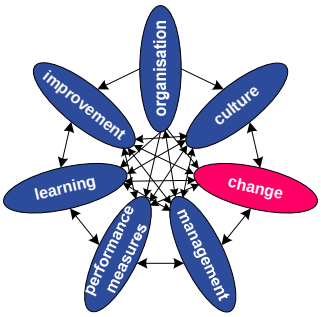
The natural culture analysis shows that elements of the Japanese culture support sustainable and continuous improvements better than in Denmark. As example, the national culture analysis concludes that Japanese culture suits standardised work. Standardised work is not natural occurring in Danish culture but it is shown to be possible and it leads to positive results. As it is challenging to introduce standards in Denmark, Danish companies have to introduce them carefully. This includes much information and employee involvement in the process.

The culture analysis further concludes that *kaizen* fits Danish culture. Danish employees are innovative and familiar with teamwork, which creates a solid foundation for *kaizen*. Danish companies use these skills better, as there is a great potential. To succeed with standardisation and *kaizen* is it necessary to pay attention to self-discipline among Danish employees. Self-discipline can for example be strengthened by using *5S* followed up by audits.

Processes

This part presents the perspective *processes*, which includes change, management, performance measurements, learning, and improvements. In each paradigm the theoretical framework is first presented followed by an analysis and a part recommendation.

18 Change



Employees' resistance toward change is seen as a main obstacle to implement lean, create continuously improvement, and sustain them [Pullin1, 2002]. Thus, it is important to include perspectives from change management theory in order to clarify how change management can be used proactively in relation to lean.

18.1 Theory

Change management is a huge area and only few aspects of change management with high relation to the project objective are included in this part.

18.1.1 Planned change

Within planned change, change models are central tools as they chronological and normative describe the phases change projects must go through in order to become successfully anchored.

> "The experience between whether it (red. change) is a very negative or positive experience is how change is approached" [Denton, 1996: 6]

Kurt Lewin developed one of the first planned change models in form of a three-stage process. Lewin basically argues that the organisation's present situation has to *unfreeze* before any *movement* can happen. Refreezing occurs once the changes are anchored within the organisation.

Figure 18-1: Lewin's planned change model

Lewin's model has had a great influence and inspired many theoreticians, who have created more detailed change models. Kotter, as one of them, has developed a well-known eight-step change model [Figure 18-2].

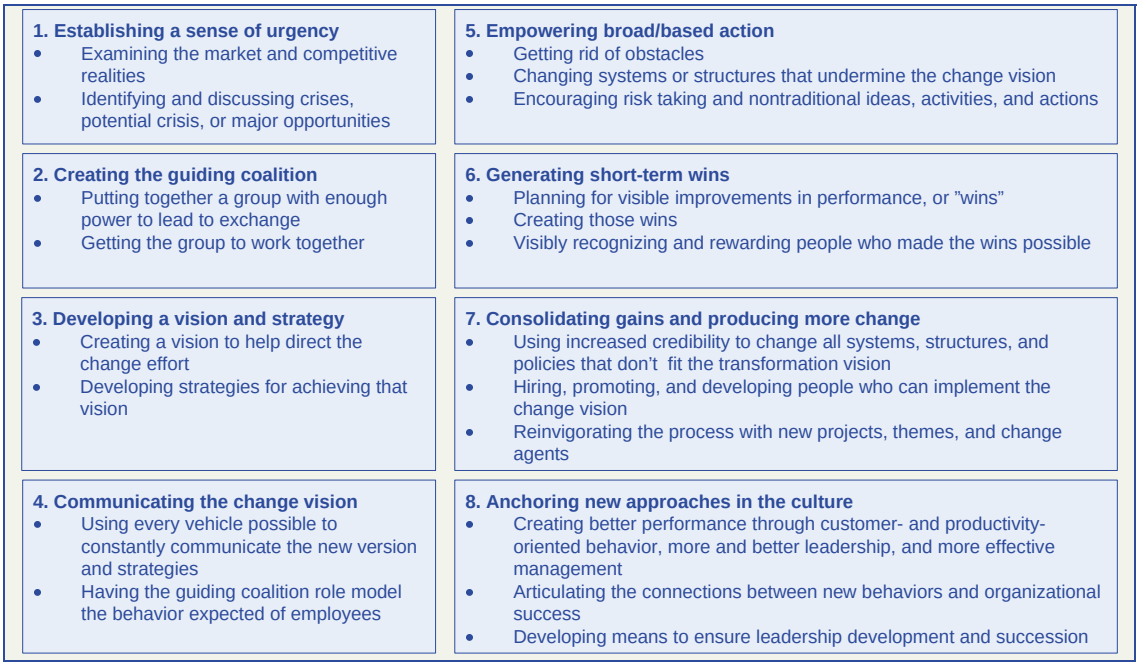


Figure 18-2: Kotter's 8-step planned change model [Kotter, 1998: 21]

Kotter uses the first four steps in the transformation process to *unfreeze* status quo. It is particularly known for the first step about *establishing a sense of urgency*, better known as a *burning platform*. Kotter's idea to create a *burning platform* distinguishes the 8-step model from other planned change models such as the "*action research model*", the "*positive model*" and "*Cummings and Worleys 5 step change model*". Instead, they try to create an open atmosphere and involve employees in order to identify problems and create ownership. In step five to seven new practices are introduced while the last step grounds the changes in the corporate culture and make them sustainable.

Kotter argues that successful changes has to go through all phases while unsuccessful changes often happen because the first steps in the model is neglected [Kotter, 1996]. An explanation is a wrong balance between the concepts *management* and *leadership*. Kotter [1996] argues that successful transformation is 70 to 90 percent leadership and only 10 to 30 percent management.

Kotter's recommendation to follow activities in a distinct order is criticised by many to be too streamlined and not take the complexity into consideration. In relation to this critique, Kotter argues that a project, at a specific time, can be at several stages. The importance is not to complete subsequent phases before a prior phase is completed [Kotter, 1996].

18.1.2 Resistance toward change

Implementation of radical changes often leads to resistance. Thus, it is important to be aware of employees' reaction pattern at different stages throughout the change process.

Doppler and Lauterburg consider resistance toward changes normal and unavoidable. Many reasons lead to resistance toward change, for example when employees feel unclear reasons for initiation of changes or lack of personal advantages [Doppler and Lauterburg, 2001]. Doppler and Lauterburg have developed four principles in regards to resistance, which are illustrated below.

Figure 18-3: The four principles of resistance

It is difficult for change agents to understand resistance, as they might consider changes as obvious [Doppler and Lauterburg, 2001]. *"Understanding how and why each person reacts as they do is critical for developing effective management strategy"* [Moran and Brightman, 2000: 71]. It is important not to make assumptions when it comes to peoples' reaction toward change [Denton, 1996].

Even small changes can lead to stress. It is important to observe resistance when it occurs and deal immediately with it in order to create support and reduce possible stress. Sometimes resistance is obvious and sometimes it is difficult to observe, which depend whether it is shown *verbal/non-verbal* and *active/passive* [Doppler and Lauterburg, 2001]. Moran and Brightman [2000] argue that the time needed for understanding changes is different at different levels of the organisation [Figure 18-4]. Also, there will always be early adaptors and doubters within each hierarchical level.

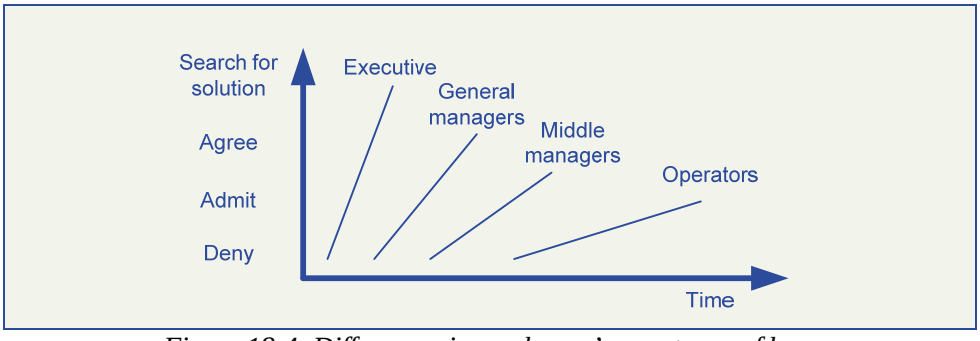


Figure 18-4: Differences in employees' acceptance of lean

18.1.3 Communication and Information

All change models studied emphasise that a high communication and information level is required in order to get successful changes *"Without credible communication, and lot of it, employees' hearts and minds are never captured"* [Kotter, 1996: 9].

Communication and information in change projects have a tendency to be ignored and many theoreticians warn against this pitfall when working with changes. *"(…) reporting is often perceived to be bureaucratic and tedious. It is associated with desk work that takes time away from real work"* [Andersen et al., 2004: 137].

Irgens both warn against *information inadequacy* and *information surplus* illustrated below [Irgens, 2000].

Figure 18-5: Information inadequacy and surplus

An unbalance in the information level might appear as stress related symptoms such as fear, confusion, irritation among employees, increased absence, a high error rate, and decreased productivity [Irgens, 2000]. Thus, it is important to meet the demand for information throughout the change process. The goal should be to get employees engaged and enable them to obtain information themselves [Irgens, 2000].

18.1.4 Involvement

Theoreticians have different recommendation of the extent to which employees should be involved at different stages in change processes. Chin and Benne define three categories of change strategies with different views on employee involvements [Kennedy, 1987].

Empirical rational strategy
Presume that rational arguments and communication of empirical experiences can be used to manage changes successfully. It is presumed that participants necessary for the change are rational thinking and able to see the gains of the change.
A normative re-educative strategy
Presume that participants in the change are controlled by norms and values. The strategy try to influence the participants attitude to the change by relation the change directly to them.
Power coercive strategy
Make an attempt to create political and economic power to support the change.

Figure 18-6: Different change strategies [Kennedy, 1987]

In regards to the *empirical rational strategy*, it is argued that all employees involved in the change must participate from the start. A common platform for change will be created as a result. This includes a shared understanding of the vision and guidelines for the change, which will lead to increased employee support of the change [Smeds, 1994].

Beer and Nohria, who have developed *Theory E* and *Theory O*, add to the discussion about employee involvement. *Theory E*, which is a *power coercive strategy*, is based on a top down approach with minimal employee participation in the change phases. This strategy considers employee participation as an element that slows the change process down while top management is the vital factor in change processes [Beer and Nohria, 2000]. *Theory O*, which is a *normative re-education strategy*, is based on a highly participating management style. The basic idea is that local ownership for the change will entail sustainability within the company culture [Beer and Nohria, 2000].

Theoreticians within planned change believe that top management is important in order to create a vision and change strategy. Furthermore, they must support and measure the change throughout the process.

> "Change is a top-down and bottom-up. Change must be top-down to provide vision and create structure, and bottom-up to encourage participation and generate support. Ultimately, leading change is a shared responsibility of everyone in the organization" [Moran and Brightman, 2000: 68]

18.2 Analysis

Most of the Japanese companies have worked with lean for decades and find it a natural part of their existing company culture. Thus, only few Japanese companies were able to add perspectives to this area.

18.2.1 Planned change

A survey conducted by Capgemini [2002] shows that only one third of the companies use a planned change model or a combination of several change models. This trend is also observed at the Danish companies where nobody uses a planned change model to implement lean. Many use sporadic change concepts in the process.

In Denmark each individual manager is most likely responsible of creating support for lean and it is not done in a structured way throughout the company. The quotation from Manager (Danecto) covers a general perception among Danish companies.

> "Each manager is an individual person and has his own way of creating support from his employees. Furthermore each site has different cultures and different approaches have to be taken" Manager (Danecto)

It requires the right manager and leadership competences in order to create support and lead a lean change (discussed further in chapter 19). Several Danish companies experience high resistance toward lean changes because it is challenging to create support for changes.

Burning Platform (Step 1)

Many argue that a *burning platform* (Kotter step 1) has negative consequences if not sincere and reliable. They try to create motivation instead of threatening employees. Idle threats do not have impact on employees who easily react opposite than presumed

[Pullin, 2002]. Only one company states that this approach is adequate to motivate employees.

Adico Medical works with a *burning platform* and thinks it has a positive impact. A survey by Kaplan [de Waal, 2003] illustrates that 84 percent experience breakthrough results when an executive team creates a *sense of urgency*.

Create and communicate a vision (step 3 and 4)
Most Danish companies develop a vision but few use it actively in the change process, which result in little impact. Adico Medical, as one of the only Danish companies, use their vision effectively and Manager (Adico Medical) has positive experiences with it. Adico Medical's top managers and senior managers developed the vision as ten principles and cascaded it down through the organisation.

A report conducted by McKinsey outline 13 pitfalls for unsuccessful lean implementation. It emphasises a lack of shared vision and objective as the most common pitfall [Pullin1, 2002].

Rest of Kotter's steps and the consequences
A *guiding coalition* is established in form of centralised and decentralised lean offices. The rest of Kotter's steps are either not applied or applied by few Danish companies. Danish consultancies emphasise short-term wins when implementing lean but only few Danish companies use the concept efficiently.

Danish companies do not use a planned change approach to implement lean as the analysis clearly states. This helps explain why Danish companies find it difficult to sustain lean improvements and create a culture, which embraces continuous improvements. It also helps explain why Danish companies experience resistance toward changes and a lack of motivation among employees.

18.2.2 Resistance toward change

A survey reports an error rate of nearly 50 percent in regards to radical change projects and one of the main reasons is employees' resistance [Herzig and Jimmison, 2006]. According to Doppler and Lauterburg [2001] there will always be resistance toward changes. This is also the experience at most Danish companies who implement lean. Only Zentec do not experience resistance. According to a Manager at Zentec this is mainly due to much employee involvement and a company culture ready for changes.

Employees in Denmark request a high education and information level. Danish companies describe that they provide much information and education to all levels in the organisation and experience it reduces resistance toward lean. Even though the information level is perceived as high, there have never been any sign of *information surplus*.

> "We kept a high information level and told about every change and event happening to all employees. Still, we have never been blamed of informing too much!" Manager (Danecto)

The lean start up has happened quite fast for most Danish companies. As a result, information and education about lean is given to different levels in the hierarchy at almost the same time. According to Moran and Brightman [2000], this is risky because different employee groups understand and accept changes very differently. Executives understand and accept changes fast and often try to speed up the process without having the necessary commitment from the rest of the employees [Figure 18-4]. By the time middle managers and later operators start to accept lean, there is a risk that top management already have moved focus to another area as lean results fail to happen. This emphasise the importance of top manages must be patient, keep focus, and support lean activities.

Adico Medical and Zentec measure employees' commitment and resistance to lean by using questionnaires at different stages in the lean implementation. Resistance shown as *nonverbal* and *passive* can hereby easier be addressed before a problem escalates.

> "There are always late adopters who will resist anything new. They cannot be left alone. If you leave them alone they will become cancer and, like cancer, they will metastasize throughout the organization unless they are eradicated. Dealing with them can be tough stuff, and if the process of addressing resistance is not understood and led from the top, it won't get done. And neither will the lean transformation" President Lean Investments G. Koenigsaecker [Koenigsaecker, 2005: 11].

Middle managers

Findings in Denmark identify that middle managers show most resistance toward lean. In a survey, Gapgemini [2002] reports middle managers to be among the most affected stakeholders in a change process. However, the change process is often designed to fit operators [Gapgemini, 2002]. This is very critical as middle managers have an essential role to perform as change agents. Manager (Danecto) faces this problem and explains the resistance as lack of lean knowledge and involvement in the change process.

Many Danish middle mangers are at same level as subordinates in regards to information and lean knowledge. Kotter [1996] describes this as a common pitfall.

Another survey finds that top management creates the change strategy while middle managers must find a way to implement it. This causes a feeling of uncertainty about the best cause of action to follow [Herzig and Jimmison, 2006]. The mentioned pitfalls highlight that local managers do not feel well suited to work as change agents and are not convinced about the appropriateness of lean before they must support subordinates in lean activities. This is a very critical obstacle for the change process. Middle managers might be more committed and prepared if they are involved in creating a vision and the implementation plan.

18.2.3 Involvement

A survey about middle manager resistance reports middle managers understanding of the goals, the necessity of the change, along with the expected benefit as focal [Herzig and Jimmison, 2006]. In general, involvement of middle managers in earlier stages improves understanding and increases commitment. Involvement of middle managers is categorised into three groups [Herzig and Jimmison, 2006].

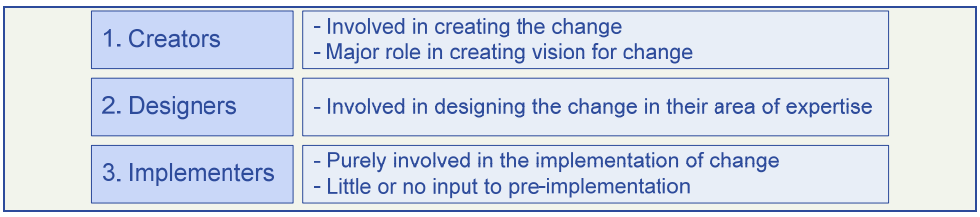


Figure 18-7: Type of involvement of middle managers

Zentec and Danecto use *creators* and *designers*, as employees are involved in the early stages of the implementation. They find it crucial in order to create local ownership, which indicates a *normative re-educative strategy*. Danecto still finds it challenging to create lean supporters despite involving middle managers in early stages.

Adico Medical uses a *top-down approach* to lean implementation. Top management creates an overall change plan with clear targets, indicating a *power coercive strategy*. At Adico Medical, the role of local employees is primarily *implementers* with limited influence of the change process. This results in frustrated employees during and after the initial improvement projects. Afterwards, setbacks are commonly experienced and it is difficult for employees to continue to improve processes on their own.

At Danecto, local employees are more involved than at Adico Medical and can be characterised as local *designers*. By using a *top-down approach* with high employee involvement, Danecto uses a combination of *Theory E* and *Theory O*. As a result lean implementation happen faster than seen at any other Danish company. For some middle managers the changes happened too fast. They could not cope with it and they either stopped themselves or were dismissed. After the initial years of lean implementation, it seems that employees are fairly committed and resistance relatively low. Danecto has managed to sustain improvements and continuously improve.

Top management

All lean theory emphasise the important role of top management and there is no doubt about their role in the change process. Top management has to be deeply involved in creating a vision for lean. Furthermore, they must communicate the importance of and their commitment to lean in the early stages and continuously along the process. This is further stressed by Toyota, who never engages in any lean activity at suppliers if top management is not 100 percent committed.

Zentec's top management is committed to lean in a passive way and rarely take active part in lean activities. Both express it to be a significant obstacle in their daily work as it signals lean to be less important toward the employees.

A survey reports a general need for clear directions and communication between top and middle managers in relation to implementation of changes [Herzig and Jimmison, 2006]. It furthermore concludes that middle managers responsible for lean implementation often do not experience the necessary support from top management in the change stage. This is both in regards, what to implement, and how to assist subordinates in the change transition. Reasons for this uncertainty are lack of general management skills, leadership skills, and additional need for basic lean knowledge before responsibilities is given to middle management [See chapter 19 for detailed discussion].

18.3 Part recommendation

It is important to face the power of employees' resistance and cope with the challenges in order to create support along the entire process. Thus, a planned change model is recommended.

A planned change model must not have an end as it should create the foundation for continuous improvements. Figure 18-8 illustrates a recommended lean change model, which creates the basis for both sustaining improvements and generating continuous improvements. The model must be adjusted to the company culture and the actual situation.

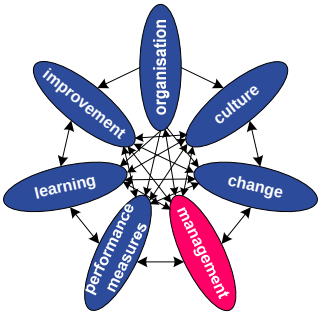
Figure 18-8: Recommended lean change model

In addition to the change model, the following points are recommended:

- Cope with resistance - the faster the better
- Use questionnaires throughout the change process in order to measure the "temperature" of the change
- High information level – throughout the entire process

- Get local managers involved as change agents and early in the process
- Get top management visible as lean supporters
- Ensure addition information and education to middle managers compared to operators

19 Management



Many managers understand and practice lean as a set of tools. Thus, changing managers' roles and responsibilities along with adopting new leadership skills are often forgotten in the process of becoming lean. This chapter addresses these challenges.

"Fortunately, I now see signs that the lean movement is finally tackling the fundamental issues of lean management" Jim Womack [Womack1, 2006: 1]

19.1 Theory

Theories about leadership, motivation, and managers roles are briefly outlined below.

19.1.1 Leadership

Many lean theoreticians emphasise leadership to be an essential element in achieving success with lean and getting improvements sustained [Worley and Doolen, 2006]. In this context it is important to distinguish between management and leadership, which Kotter clarifies below [Kotter, 1996].

"Management is a set of processes that keep a complicated system of people and technology running smoothly. The most important aspects of management include planning, budgeting, organizing, staffing, controlling, and problem solving"

"Leadership is a set of processes that creates organisations in the first place or adapts them to significantly changing circumstances. Leadership defines what the future should look like, aligns people with that vision, and inspires them to make it happen despite the obstacles" [Kotter, 1996: 25]

Management attitude

According to Douglas McGregor, leadership strategies are influenced by a leader's assumptions about human nature. He divides managers into two categories, *theory X* and *theory Y*, which are characterised below [Christiansen et al., 2000: 210].

Theory X	Theory Y
• Humans are lazy	• Humans want to work for a meaningful goal
• Humans have to be forced to work	• Self control and planning is possible
• Humans will not take responsibility	• Humans seek responsibility
• Humans seek security and safety	• Humans seek recognition and self realization

Figure 19-1: McGregor's Theory X and Theory Y

Blake and Mouton add perspectives to McGregor's theory by focusing on *managers' task* and *employee orientation* [Bolden et al., 2003: 8]. The combination of *task* and *employee orientation* explains different types of management styles [Figure 19-2].

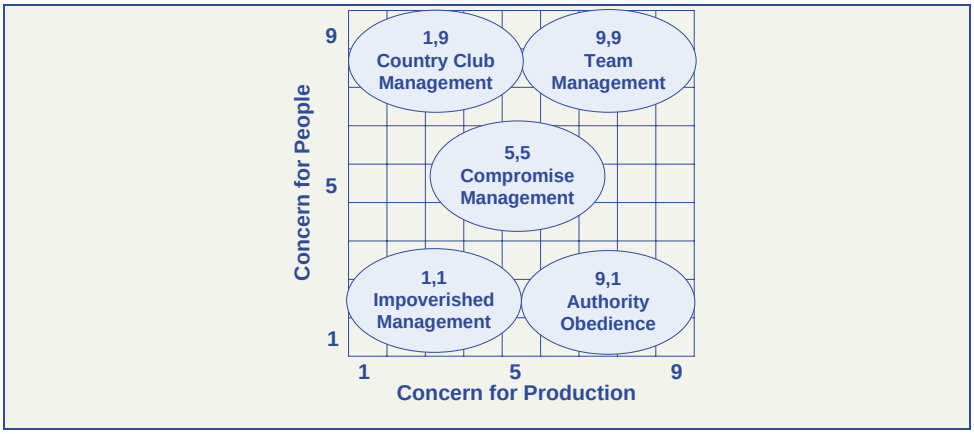


Figure 19-2: The Blake Mouton Managerial grid

Team management is considered the most effective type of leadership [Bolden et al., 2003]. However, the concern for both people and production is a fine balance and difficult to manage in practice.

Leadership styles

Most researchers today conclude that one leadership style is not right for every manager in every situation. Instead, situational leadership theories have been introduced. The Hersey-Blanchard model is based on the amount of *task behaviour* and *socio-emotional support* a leader must provide given the situations circumstances and level of maturity of the subordinates [Christiansen et al., 2000: 241].

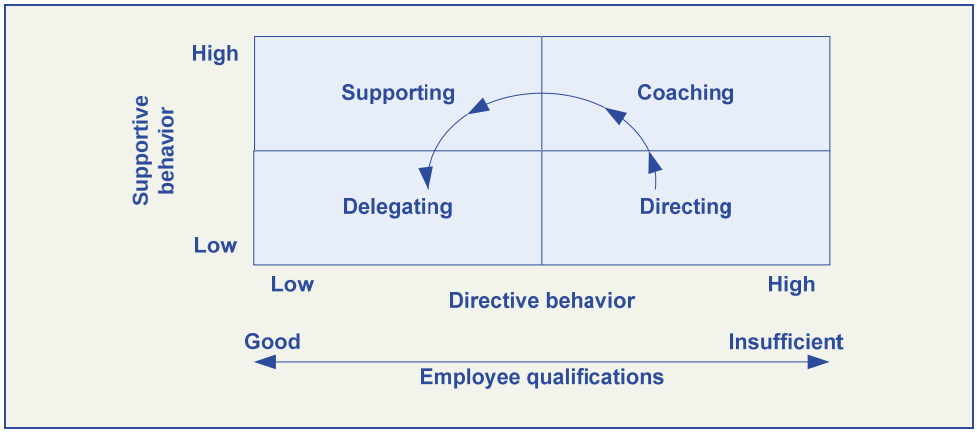


Figure 19-3: Hersey-Blanchard model of situational leadership

Hersey-Blanchard's model is criticised to focus merely on employees and not take the time factor and surroundings into consideration. Managers might react differently when they have to take a fast decision or when the company is in an acute situation, according to Tannenbaum and Schmidt [Christiansen et al., 2000].

Team leadership

The models discussed dwell on leaders as frontal figures who stand out and lead the employees. Later leadership perspectives recognise the importance of leader's relationship with their followers and roles interdependency [Bolden et al., 2003]. Leadership is no longer about being the hero but instead being a team leader. Meredith

Belbin's study of teams concludes that team leaders are more important due to the increased complexity and faster changing roles [Bolden et al., 2003: 13-14].

Characteristics of team leadership
• Delegating role instead of interfering in everything • Value differences between people and not feel threatened by special skills • Projects the vision which others can reflect and act on • Develop colleagues and encourage the growth of personal strengths

Figure 19-4: Characteristics of team leardership

Katzenbach and Smith add to Belbin's characteristics by identifying critical behaviours of leadership [Bolden et al., 2003].

- Ask questions instead of give answers
- Provide opportunities for others to lead you
- Become a matchmaker instead of a "central switch"
- Seek common understanding instead of consensus

19.1.2 Motivation

Motivation refers to the initiation, direction, intensity, and persistence of behaviour. Furthermore, it is the willingness to do something [Christiansen et al., 2000].

In motivation theory, a distinction is made between *direct* and *indirect motivation*. In *indirect motivation*, the action satisfies the need (e.g. money). In *direct motivation* the action satisfies an intermediate goal, which can lead to satisfaction (e.g. job satisfaction) [Christiansen et al., 2000].

Frederick Hertzberg's two-factor motivation theory distinguishes between workplace factors. Some result in job satisfaction and motivation (*motivators*) while others do not but if absent lead to dissatisfaction (*hygiene)* [Bakka and Fivelsdal, 1998].

Motivator factors	E.g. challenging work, recognition, responsibility
Hygiene factors	E.g. status, job security, salary, fringe benefits

Figure 19-5: Hertzberg's motivation and hygiene factors

Hygiene factors such as money are motivating at the lower levels of Marslow's hierarchy of needs. However, money only tends to motivate staff for a short period of time, according to Herzberg [Bakka and Fivelsdal, 1998]. At the higher levels of Marslow's hierarchy, praise, respect, recognition, empowerment, and a sense of belonging are far more powerful motivators than money. Douglas McGregor agrees in this consideration and place money in his *theory X* category and feels it is a poor motivator. Pride and recognition on the other hand are placed in the *theory Y* category and considered stronger motivators [Christiansen et al., 2000].

Hackman adds to the discussion about motivation by basing his framework on the way workers perceive specific dimensions of their job [Bakka and Fivelsdal, 1998]. Three cognitive states arise if jobs contain sufficient amounts of skill variety, task identity, task significance, job feedback, and cooperation with others. These are known as

experienced meaningfulness, *experienced responsibility*, and *knowledge of results* [Lee-Ross, 2005]. Employees become motivated when all three states are present.

19.1.3 Management roles

Ichak Adizes describes four different key roles managers need to possess in varying degrees. This is not only applicable to one specific manager but also to a management team and an organisation. The four roles are characterised below [Faust, 2005: 3-5].

Role	Characteristic
The Producer (P)	• The work is their source of pride • Focus on what needs to get done right now • Have a hard time delegating • Take over others job when getting frustrated • Do not give expert advise but takes over
The Administrator (A)	• Likes to control others results • Careful in their analysis • Delegating with lots of details • Systematic, slow, careful and conservative
The Entrepreneur (E)	• Often push to get ideas implemented • Excited, creative and encouraging attitude • "What can be thought can be achieved" • Focus on new initiatives in the organization
The Integrator (I)	• Integrate others ideas • Focus on getting acceptance for the process • Human-oriented • Good listeners, supportive and nurturing

Figure 19-6: Adizes PAEI Roles

No individual manager can meet all the demands of a corporation. Adizes argues that a one-to-one relation between a role and a person is not necessary and each manager can possess the roles to different extents [Faust, 2005].

Adizes study of hundreds of organisations and managers classify typical roles of top managers and middle managers, illustrated below [Christiansen et al., 2000: 226].

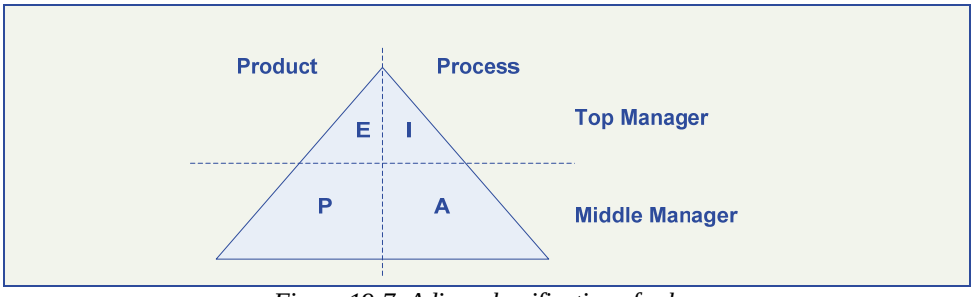


Figure 19-7: Adizes classification of roles

19.2 Analysis

The analysis highlights top and middle managers roles and responsibilities. This is followed by an analysis of motivation, *gemba* management, and promotion.

19.2.1 Top Management's role

Top managements commitment

Japanese top managers take active part in daily activities at the shop floor and appear as pioneers for lean activities. This is a typical example of *integrator* and *entrepreneur* roles [Christiansen et al., 2000]. Lack of top management involvement and commitment at Toyotas' overseas plants is one of their main challenges today [Koenigsaecker, 2005].

None of the Danish companies can approximately match the high level of active top management commitment experienced at the Japanese companies. Most Danish companies experience a passive top management commitment. They allocate required resources but do not participate actively. Zentec et al. experience this is a significant obstacle in their daily work. Top managers must participate more actively in the process in order to support lean.

Top Managements' role and responsibility

Danish top managers either have a *directing* or a *delegating* leadership style, while the Japanese top managers' style is characterised by a *coaching* or *supporting* behaviour (Hersey-Blanchard).

The passive top management commitment and their lack of touch with problems on the shop floor help explain middle managers resistance. The lack of top managements' personal participation signals that lean is not essential and is a job for lower-level workers.

NEC uses intensive communication between top and middle mangers and frequent plant visits by top managers, which reduces resistance among middle managers. This indicates that middle managers must receive a *coaching*- and *supporting* leadership style by superiors during the lean implementation.

19.2.2 Middle managers roles

Middle managers leadership role

Lean principles accentuate middle managers leadership skills as important to create continuous improvements and get them sustained. This is supported by a survey study that reports lack of leadership behaviour to be a main obstacle in lean implementation [Emiliani and Stec, 2004]. Toyota's leadership characteristics are described in Box 19-1.

Box 19-1: Leadership at Toyota

Toyota Chairman Mr. Cho has three keys to lean leadership [Womack and Shock, 2006].

1. Go See – Spent time on the shop floor
2. Ask why – Use the "5 whys" technique daily
3. Show respect - Respect your people

These three keys to leadership are embedded in a Toyota leadership model [Liker, 2004: 181].

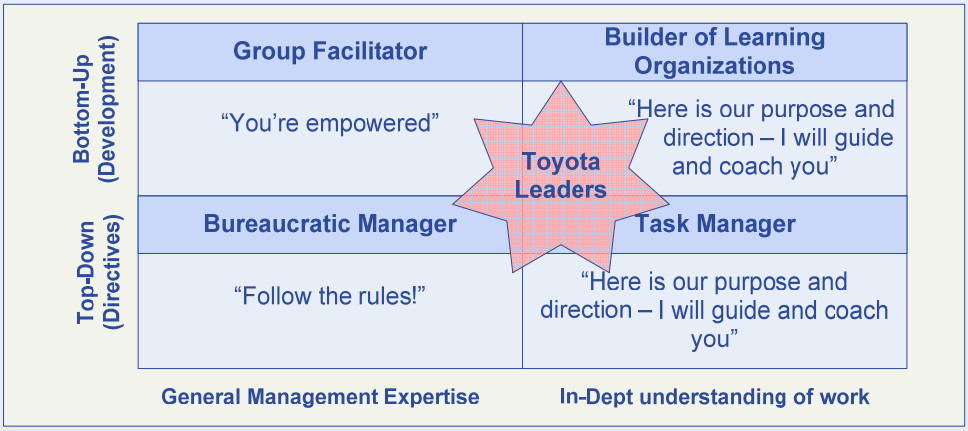


Figure 19-8: Toyota leadership model

The model illustrates that Toyota's leaders need to contain all four kinds of leadership, but the coaching role is dominating. Ms. Otsu (Toyota) explains that in his daily work as lean consultant he uses extensive coaching. In addition, he sometimes shows examples of ways to solve problems and uses situational leadership to tackle different situations.

"(…)Toyota leaders having a combination of in depth understanding of the work and the ability to develop, mentor and lead people, are respected for their technical knowledge as well as followed by their leadership abilities" [Liker, 2005: 182]

Lean leaders must participate and be visual on the shop floor. A consultant recommends middle managers to use a *coaching* leadership style, *"They must raise question and not give answers"*. If employees do not have a deep lean understanding beforehand, it might be difficult to solely rely on a coaching leadership style. Subordinates might not be able to see solutions or act appropriately. NEC's *sensei*, Mr. Iwaki, emphasises that managers must not only rely on coaching initially. They must also show employees different solutions to problems. Womack agrees with Mr. Iwaki as he describes lean leadership as *"follow me… and let's figure this out together"* [Womack2, 2006: 1]. As subordinates' lean knowledge increases, middle managers leadership style must be *coaching* and *supporting*.

Middle managers must also practise team leader skills in order to unite subordinates. *"To implement and sustain lean, teamwork is absolutely vital"* [Alukal, 2006: 67]. A survey reports that middle managers in Denmark welcome the introduction of greater employee participation [Jaeger and Pekruhl, 1998]. It is supported by the national culture analysis in chapter 17 and confirms the potential for Danish middle managers to adopt leadership skills.

Findings in Denmark show that Danish middle managers are used to *manage*, rather than to *lead*. Many Danish companies express the need to change management style to

leadership but find it difficult. Zentec experiences that first line managers spend too little time at being leaders. Instead they take over tasks at the shop floor or use too much time at the office.

> "One of the biggest challenges we experience is to get middle managers to work for lean and be good leaders who are able to coach their team members" Manager (Zentec)

This behaviour is an example of a *producer* role well connected with a *theory X* management attitude. These leadership challenges help explain why Danish companies find it difficult to make continuous improvements and sustain the activities.

Middle managers new qualifications

Difficulties in making middle managers place more emphasis on *leadership* must be considered in relation to their qualifications. Many Danish companies express that middle managers feel paralyzed because they only have the same lean knowledge as their subordinates. As a result, they find it difficult to act in a leadership role and coach subordinates. Furthermore, as they are used to practice a *management* style they find it difficult to adjust to the new requirements.

Top managers' pressure for lean results and operators showing resistance make middle managers feel "stuck in the middle" and the reaction is a *compromise management style* [Bolden et al., 2003].

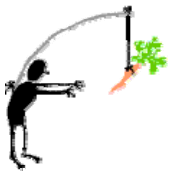
As middle managers simply do not have the necessary knowledge to implement lean, further education about lean and leadership might help them acquire an appropriate leadership style. However, a more *directive* and *coaching behaviour* by superior managers or a *sensei* might assist as well.

First line managers' roles and responsibility

Both Danish and Japanese companies delegate more responsibility to operators and team leaders than seen in most other countries. However, Danish first line managers find it challenging not to intervene and carry out tasks as normal. In addition, they get new responsibilities in regards to continuous improvements and coaching operators. As a result, many feel overburdened and stressed and do not know how they should prioritise their time. *"Lean gives a lot of responsibilities to operators and middle managers need a new role, which they find difficult to accept"* (Consultant). This issue is not unique for Denmark and Mr. Sawamura (NEC) explains, *"the most difficult element in lean is the role and responsibility of middle managers"*.

Toyota uses lists of roles and responsibilities for managers (appendix p. 95). Danecto carries out workshops among groups of first line managers, where all daily tasks are presented. Afterwards, they remove, add, and standardise tasks within the group of first line managers. Manager (Danecto) finds this approach essential in order to focus first line managers' time on continuous improvement while reducing stress. When first line managers' roles and responsibilities are clear they get more time to *lead* and coach as well as follow-up on progress.

19.2.3 Motivation



A survey by "Center for Ledelse" (centre of management) concludes that 73% of the Danish companies find it necessity to motivate the organisation in order to get lean implemented [Center for Ledelse, 1]. Danish companies emphasise *direct motivation* factors such as challenging work, recognition, and responsibility. All Danish companies agree that *indirect motivation* such as money do not increase motivation significantly on the shop floor or for middle managers.

Clematide and Bottrup report in a survey, "*middle managers appreciated the increased decentralisation and their greater influence over the decisions taken elsewhere in the organisation"* [Jaeger and Pekruhl, 1998: 96]. However, findings show that Danish middle managers are often forgotten in the preliminary phases of lean implementation. As a result they are not able to influence the change process or the vision. This de-motivates and explains why middle managers show much resistance toward lean. Furthermore, the limited Danish top-management participation in lean activities does not generate any motivation. *"If employees feel that the executive team does not respect their effort, discouragement may hold and the lean manufacturing effort will fail"* [Worley and Doolen, 2006: 31].

Most Danish companies provide job guaranty in relation to lean. It does not directly motivate employees but ensures they are not de-motivated (*hygiene* factor).

Toyota uses much *recognition* as *motivator*. If employees perform well or make good improvements, they present results for senior managers who give feedback. Japanese companies further argue that internal promotion is a main motivation factor. Especially Toyota uses performance measures and set ambitious targets to motivate all levels of the organisation. According to Mr. Miura, Toyota creates internal competition between departments, which is a highly motivating factor. Other factors that also motivate employees at Toyota are summarised below [Liker, 2005: 195].

Motivation theory	Toyota approach
Maslow's need theory	Job security, good pay, safe working conditions
Herzberg's job enrichment	5S, ergonomics programs, visual management, job rotation, built-in-feedback
Goal setting	Set goals that meet these criteria through policy deployment

Table 19-1: Classic motivation theories and the Toyota approach

19.2.4 Gemba management

During the plant visit at Toyota "*go to gemba and see facts*" was repeated over and over again by all managers. Toyota stresses the importance by including *genchi gembutsu* (*gemba)* as one of the five concepts of lean (Figure 7-4). All other Japanese companies similarly stress the importance of spending time on the shop floor.

> "You have to walk the talk every day, and people really watch what you do, rather than listen to what you say. That is the Toyota System" [Liker, 2005: 77]

Mr. Miura (Toyota) emphasises that every decision has to be taken on the shop floor and if the decision requires a computer it must be located at the shop floor. Imai [1997: 14] supports this as *"Management must maintain close contact with the realities on gemba in order to solve whatever problem arises there"*.

Danish companies do not, to any comparable extent, recognise *gemba* activities. Danecto is one of the few examples who work with *gemba*. As example, they place PC stations on the shop floor and all first line managers must not plan meetings between 10-12 am. The allocated time should be spent on the shop floor. Danish managers' lack of presence on the shop floor causes improvements to erode, as managers do not continuously focus on correcting abnormalities. Furthermore, they do not see typical problems and identify possible areas for continuous improvements.

Zentec, among others, finds it difficult to get managers visible on the shop floor. Japanese companies recognise this problem from overseas branches and Mr. Miura (Toyota) states, *"Normally in Europe the top management does not like to see the production. They like to see the computer"*. Kawasaki has a clear policy that top management must spent 30 minutes on the shop floor every day in order to understand the situation and spot improvements.

> "Even today, as part of top management, I have been unable to separate myself from the reality found in production plant. The time provides me with the most vital information about management is the time I spend in the plant, not in the vice president's office" [Ohno, 1988: 20]

A consultant emphasised that *gemba* management is a fine balance. Too much involvement of senior management on the shop floor can move focus from first line managers who might loose authority in relation to operators.

19.2.5 Promotion

Promotion of managers

Danish employees rarely work at the same company for decades as they tend to shift company in order to get a higher position. A survey points out that *"It is impossible to achieve a Lean transformation with high management turnover"* [Emiliani and Stec, 2004:376]. Mr. Miura (Toyota) supports this finding by saying, *"if Danish companies can get their managers to stay longer they will be better"*.

> "If the manager asks "what should I do if I educate an employee and he leaves the company afterwards?" Than you should ask: "What would you do if you don't give him education and he stays?"" Manager (Zentec)

Toyota and Kawasaki emphasise that it is a long process to create good middle and top managers, as they should have "hands on" lean experience in order to see improvements themselves.

> "Grow leaders who thoroughly understand the work, live the philosophy and teach it to others" [Liker, 2005: 39]

Naturally, it is difficult to control how long time leaders stay in a company. Adico Medical and Toyota carry out tactical internal promotions of middle and top managers with a high understanding and commitment to lean. They both use the central internal lean department to educate managers in lean and promote them afterwards. Tactical promotions might be an incentive for managers to stay longer in the same company along with dissemination of lean knowledge.

Promotion on the shop floor

Team and group leaders hold a vital role as they must coach and encourage team members in lean. Many Danish companies express that team and group leaders find it difficult. At Zentec, middle managers are traditionally chosen based on accumulated seniority. They have realised that seniority do not equal leadership skills and has changed this trend.

> "Team leaders tend to be selected from operators and there is often an assumption that they know how to manage people. But they are often very lost" [Pullin2, 2002: 31]

Box 19-2: Toyota's way of promoting team and group leaders

Toyota always promotes internal team and group leaders. Japanese are very loyal and often work for the same company for a lifetime. In order to become a team leader at Toyota, they must have ten years experience as team members on average. Furthermore, they must pose the right leadership competences.

Toyota finds these two elements important as a team leader must have the right lean knowledge combined with an ability to coach and lead others. Team leaders most have further ten years experience in order to reach the next level and become a group leader.

As Box 19-2 shows, Toyota and other Japanese companies promote highly skilled team and group leaders with leadership capabilities as well as an impressive knowledge about products and processes. Naturally, it would be preferable if Danish companies could imitate this completely, but the higher employee turnover reduces the possibility. Yet, some operators stay in the company for many years and a possible promotion to team leaders might increase the possibility to stay longer.

19.3 Part recommendation

19.3.1 Top Management's roles and responsibilities

Top managements' commitment is of paramount importance for lean implementation. Danish top managers and general plant managers must be more active in the process in order to communicate the importance of lean and motivate subordinates. Naturally, the further down the hierarchy the more active participation must be present among managers. Figure 19-9 highlights top managers' six most important responsibilities.

Top managers primary responsibilities
1. Scheduled daily calendar time for *gemba* management
2. Follow-up on performance measures and push for improvements
3. Communicate success stories, results, expectations, and action plans
4. Support and coach subordinates
5. Evaluate progress and make necessary corrective actions
6. Scheduled plant tours for top managers

Figure 19-9: Top managers' primary responsibilities

19.3.2 Middle managers roles and responsibilities

Middle managers must step into a leadership role. The most important aspect of their job is to coach and support subordinates, carry out daily tasks, and make improvements. 70% subordinate based solutions must be prioritised higher than a 100% solution made by a superior. Thus, it is vital that Danish companies promote new middle mangers according to their lean experience and leadership abilities. Characteristics of a good lean leader are illustrated in the figure below.

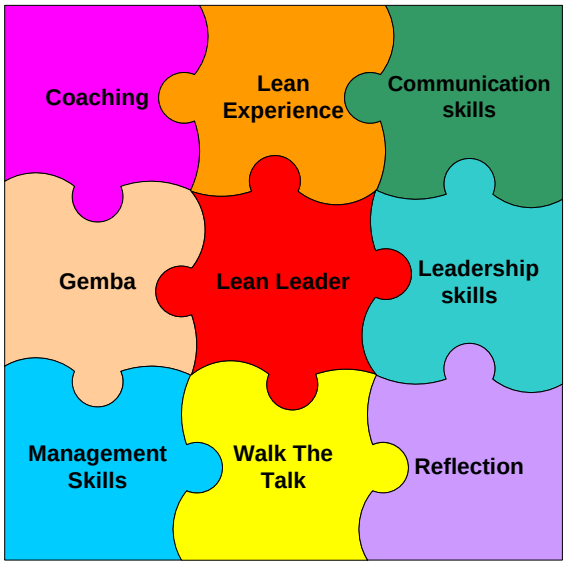


Figure 19-10: Important characteristics for a lean leader

As lean leaders differ from the existing characteristics of most managers, Danish companies must assist them in changing roles. Concrete ways of doing this is:

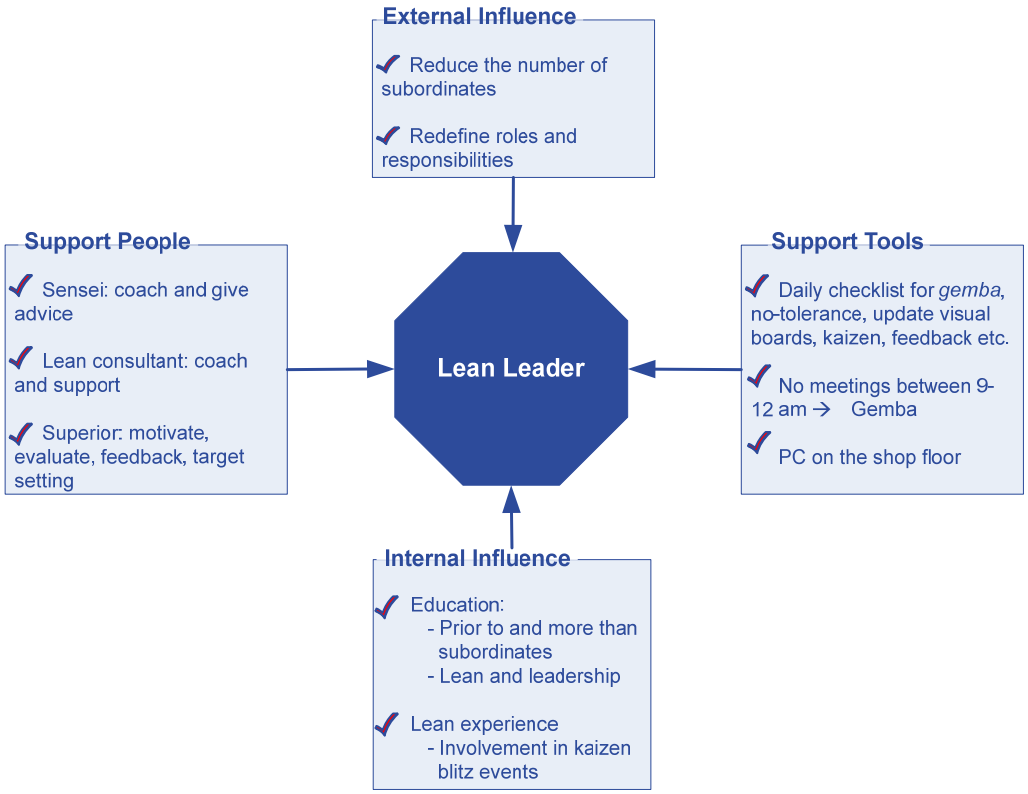


Figure 19-11: Changing leaders roles

19.3.3 Motivation

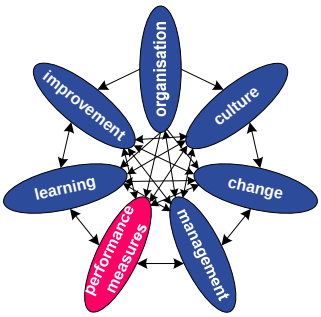
To succeed with lean, it is important to motivate employees at all levels in the organisation. Below, is a list of ways to motivate employees and ways of assuring they are not de-motivated.

Hygiene Factors	Motivation Factors
• 5S • Ergonomic lean improvements • Job security • Information • Visual managers - gemba • Quick feedback • Bonus salary	• Challenge employees • Early involvement in lean • Delegate responsibilities • Success stories / quick wins • Recognition from superior • Valid performance measures • Tactical promotion • Education • Continuous focus, coaching, and feedback from superiors and a sensei

19.3.4 Promotion

Danish companies should actively use tactical promotion of employees with a deep lean knowledge and right leadership abilities. This will disseminate lean knowledge and create leaders who can coach others.

20 Performance Measures



Drastic changes occur when lean is implemented. A company's traditional performance measures are likely to show poor performance in unexpected areas such as productivity, which might lead some managers to doubt the appropriateness of lean. Reduced productivity might occur while the total costs decreases and quality increases. So, what are managers to believe? Research indicates that inappropriate designed performance measurement systems are likely to have a negative effect on the process of adopting lean in an organisation [Åhlström and Karlsson, 1996]. Does that imply that companies should not rely on performance measures when implementing lean?

Maybe not! Much research documents that performance measures are an invaluable technique to drive radical organisation wide changes [Tennant and Tanoren, 2005], [Kaplan and Norton, 2001] et al.. Furthermore, performance measures are well-suited for guiding everyday continuous improvements in order to reach predetermined targets.

In the following, two performance measurement approaches are described followed by a discussion about critical elements of the application. Finally, recommendations for applying performance measures in order to support lean are highlighted.

20.1 Theory

Many performance measurement systems exist such as management by objectives (MBO), business excellence models, Balanced Scorecard, and Policy Deployment. Among these, Balanced Scorecard and Policy Deployment are reviewed below. Balanced Scorecard represents a performance measurement system widely applied in the western business world while Policy Deployment represents a system with origin in Japan and total quality management.

20.1.1 Balanced Scorecard

Balanced Scorecard is not merely a performance measurement system. It is a management system used to implement a company strategy by linking it to carefully chosen performance measures [Kaplan and Norton, 2001]. As several parameters influence the business direction, a strategy must be supported by a set of holistic measures within appropriate areas. Robert Kaplan and David Norton [2001] suggest categorising these in perspectives and recommend a generic model containing of:

- The financial perspective
- The internal perspective
- The customer perspective
- Learning and growth perspective

It is vital that both non-financial and financial measures are used as both intangible and tangible assets are part of the perspectives [Kaplan and Norton, 2001]. Strategy

maps of cause-and-effect linkages are essential in Balance Scorecard (Figure 20-1). They are used to describe how intangible assets get mobilised and combined with other intangible and tangible assets in order to be transformed into tangible (financial) outcomes. The cause-and-effect linkages ensure that measures support the chosen strategy whereby sub-optimisation does not occur.

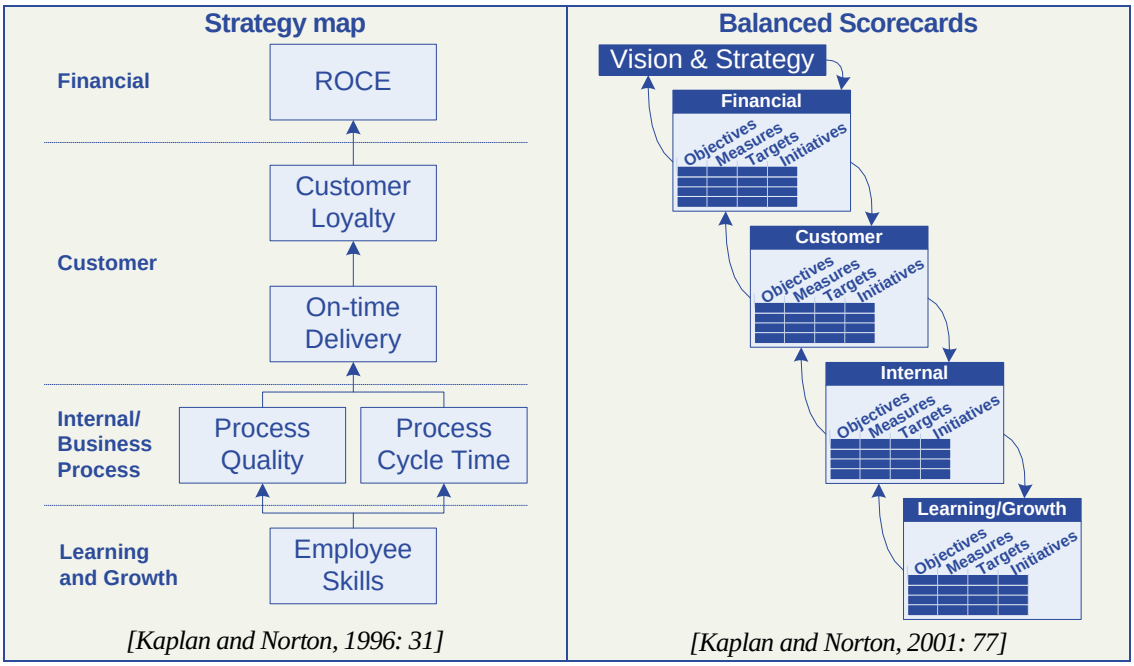


Figure 20-1: Cause-and-effect linkages and Balanced Scorecards

Focus and alignment is according to Kaplan and Norton [2001] the most important factors of breakthrough results. Strategy execution is the top priority in Balanced Scorecard and Kaplan and Norton [2001] recommend a five step implementation approach [Figure 20-2]. Please refer to Kaplan and Norton [2001] for further details.

Figure 20-2: Execution of Strategy –Focused Balanced Scorecard

20.1.2 Policy Deployment / Hoshin Kanri

The performance measurement system, Policy Deployment, was originally developed to support total quality management in Japanese companies. Now, many Japanese companies are using it to support lean as well (e.g. Toyota [Bicheno, 2004]). Few western companies have adopted it (e.g. Hewlett Packard, Intel, Ford [Bicheno, 2004]) while many experience difficulties in applying it successfully [Tennant and Roberts, 2001].

Policy Deployment is a strategy execution tool and not a strategy planning tool. It sets up goals based on the desired strategy. It is not explicitly recommended that goals must be set within certain areas but measures within quality, cost, deliver, employee satisfaction, and safety are mentioned by several authors [Witcher and Butterworth, 1997], [Greenall, 1997], and [Bicheno, 2004]. It is recommended to narrow the amount of measures down to between three and five breakthrough measures or the "vital few" [Bicheno, 2004]. Selecting more result in loss of focus and a dilution of resources according to Wood and Munshi [1991].

Various implementation methods exist but in general they go through a planning, implementation, and review phase [Witcher and Butterworth, 1997]. Bicheno [2004: 49] illustrates a more detailed approach illustrated in Figure 20-3.

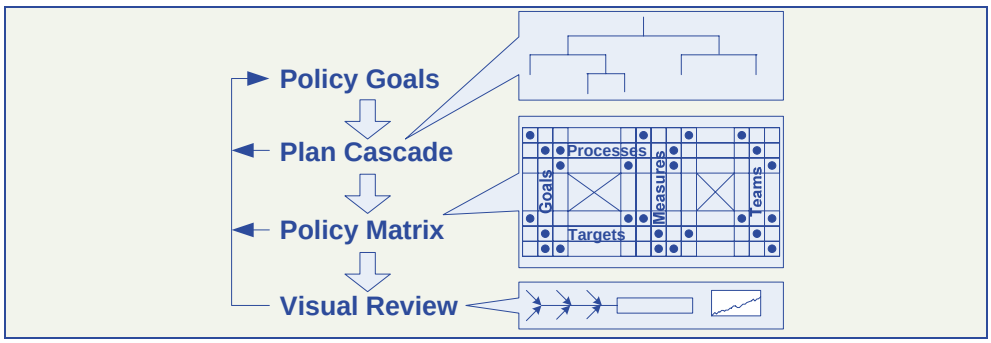


Figure 20-3: Policy Deployment execution process

A high degree of employee involvement is vital in Policy Deployment. Consensus building and shared decision making throughout the cascading process is considered essential for reaching targets afterwards. Among other techniques, a process called *catchball* is used. *Catchball* is a method for a group of people to toss ideas around as a ball. High employee involvement generates input and feedback to upper-levels and creates the basis for an iterative process. The drawback is that many western companies find this part of Policy Deployment difficult to carry out in practise and it is time consuming [Tennant and Roberts, 2001], [Wood and Munshi, 1991], and [Bicheno 2004].

20.1.3 Application of performance measurement

Åhlström and Karlsson [1996] argue that companies must work with three parameters in order to get their performance measurement system to support lean actively [Figure 20-4].

Technical influence:	Design of the performance measurement system
Formal influence:	Formal role and purpose of performance measurement system in the organisation – e.g. 'control or guidance' and 'influencing role versus informing role'
Cognitive influence:	The way in which employees think about and use the Performance measurement system

Figure 20-4: Three parameters which must support lean

Åhlström and Karlsson [1996] also describe that performance measures must be adjusted to fit lean. They argue that ideal measures can not be identified at one management meeting. Instead, they must be changed continuously as managers realise errors and invalidity with the existing set of measures [Figure 20-5] [Åhlström and Karlsson, 1996: 52].

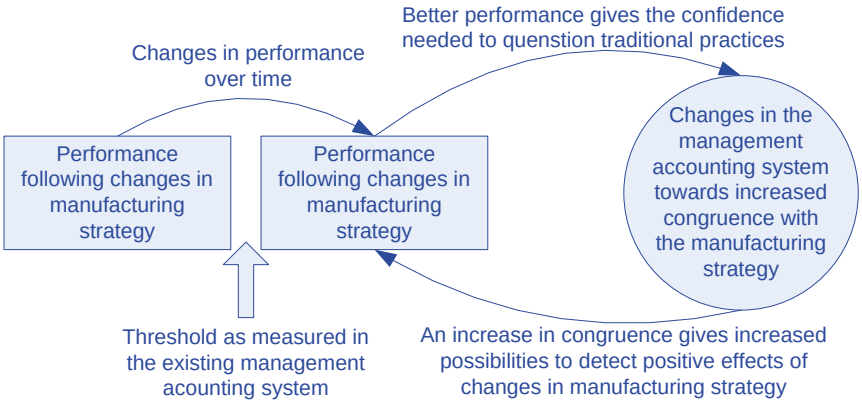


Figure 20-5: Continuously adjustment of performance measures

20.2 Analysis

Most companies use performance measurements. All expressed that it is vital in order to both lead the change process and lead the continuous improvements.

20.2.1 Application of performance measurement

Technical influence

Some companies express that the technical setup of performance measurement system is poor. It is an impediment for lean implementation.

Danecto, who is using Balanced Scorecard, and Zentec and Toyota, whom are using Policy Deployment, all express that their technical set-up of measurements support lean in a positive way. Measures are derived from strategy in both Policy Deployment and Balanced Scorecard. However, Policy Deployment does not necessarily cover a

holistic approach as in Balanced Scorecard. Lack of holistic approach in performance measures can be problematic as Box 20-1 illustrates.

Box 20-1: Best Plant Award

Each year ten American plants receive a "Best Plant Award". It is based on evaluation criteria such as cost reductions, quality improvements, employee involvement, and customer focus.
In year 2005, ten plants were awarded as usual. However, one plant filled for bankruptcy briefly after nomination. "This alone illustrate that it is not sufficient for a company to have a world-class production. Maybe, this company should have focused on something else than winning a best plant award?" [Christiansen, 2005]

Both Balanced Scorecard and Policy Deployment have concrete action plans with initiatives to reach the targets [Kaplan and Norton, 2001] and [Bicheno, 2004]. This facilitates carrying out concrete activities in order to reach targets.

Most other companies' performance measurement system support lean. They use a variety of measures within areas such as cost, quality, delivery, and safety and cascade measures down through the organisation.

Formal influence

Lean is best supported by the *formal parameter* when performance measures play an influencing role as oppose to a simple informative role. This is seen at Toyota and Danecto who use performance measures to drive lean changes. Toyota is achieving this at manager level during Productivity Knowledge Rapport meetings where progress is questioned, discussed, and plans to improve even further are made. Dancto use same type of approach where deviations, root causes, and countermeasures are discussed. Both companies push hard for improvements. Additionally, many companies use performance measures at weekly meetings at the shop-floor and are often displayed on visual boards.

Cognitive influence

The *cognitive perception* of performance measurement system at all levels in the company is essential for the results.

> "Middle managers are often able to read between the lines of what the top management are saying – so they are called on for 40% improvement, they recognize 20% will probably do" [Pullin, 2002: 40]

Especially important are key actors' way of thinking because it influences actions towards subordinates. It thereby influences subordinates' *cognitive perception.* Employees must think that performance measures have an influencing role in their daily work and targets should be met. Both Danecto and Toyota's top management continuously press for improvements and holds frequent reviews. This may help influence middle managers *cognitive perception* so they realise the importance of performance measures and continuous improvements. Middle managers' actions at board meetings on the shop floor must also reflect this in order to transfer the *cognitive perception* to operators.

Some of Zentec's performance measures are invalid and do not reflect realities. This poses an obstacle as they can not be used to drive or support the process. Instead, managers must analyse how performance measures are calculated and to what degree they are adequate. Performance measures should be discussed at review meetings. They must be changed if it turns out that performance measures are inadequate.

Both Policy Deployment and Balanced Scorecard emphasise that performance measurement systems must not become static. Monthly or quarterly manager meetings should be carried out in order to link performance measures with strategic progress. Performance progress, correlation between measures, and initiatives to reach each measure can be analysed and necessary adjustments decided [Kaplan and Norton, 2001] and [Bicheno, 2004]. Bicheno [2004] furthermore describes that weekly reviews at lower levels of the organisation are essential in Policy Deployment. He emphasises that it must be carried out in a "blame free" environment.

Employees must have a clear perception of how their work influences the measures. A concrete way is initiatives in action plans in both Policy Deployment and Balanced scorecard. Bonuses might affect employees' *cognitive perception* of what elements are most important to improve. Bonuses should support the strategy so sub-optimisation does not occur.

20.2.2 Setting measures and targets

At Danecto, operators choose performance measures within predetermined areas such as quality, cost, delivery, and a social measure. Manager at Danecto experiences that operators better relate to the measures and get a sense of ownership toward them. No matter whether employees set measures and targets or not, they must be able to influence the results in their daily work. Adico Medical achieves this as operators write estimated and produced quantity at boards each hour.

Many recommend targets to be achievable but ambitious and should be increased when reached [Pullin, 2005], [Kaplan and Norton, 2001], et al.. At Danecto the current performance is often over target and no systematic approach exists for continuously changing targets. Toyota increases targets whenever they are reached. They emphasise that it is the only way to drive change and continuously improve performance. Furthermore, when employees set targets for own work they feel more responsible for reaching them.

20.2.3 Employee involvement

Pullin [2005] finds it essential to create an understanding of why lean transformation is important. Furthermore, it is important to show the rewards of compliance and the consequences of non-compliance. High employee involvement during the whole process is regarded as an essential way of creating understanding, motivation, and ownership among all employees [Tennant and Roberts, 2001] and [Wood and Munshi, 1991].

Policy Deployment uses high employee involvement whereas Balanced Scorecard is accused of being a top-down approach [Tennant and Tanoren]. However, Kaplan and

Norton [2001] describe that employees should have an understanding of the Balance Scorecard and the company's strategy. Individual scorecards can be developed based on the overall Balanced Scorecard. Tennant and Roberts [2001] argue that it is beneficial to have a higher employee involvement in Balanced Scorecard. He suggests that the *catchball* process from Policy Deployment can be used in Balanced Scorecard. However, western companies find it difficult.

Dancto's owners push hard for improvements. Frequent performance measurement reviews are held where the speed of progress continuously is challenged. Manager (Danecto) states that the top down approach is the main reason for their lean success. Thus, it is possible to achieve good results with lean through a top down approach despite much theory recommends high employee involvement.

Weekly board meetings about performance at the shop floor are essential to support lean. A company experiences problems because they do not use performance measures actively on the shop floor. As a result, employees have lost confidence in lean.

20.3 Part recommendations

It is comprehensive to change performance measurement system and not recommended at first glance. Both Balanced Scorecard and Policy Deployment are appropriate performance measurement systems to support the lean journey. If companies use another performance measurement system it might be appropriate as well. However, it must fulfil a minimum set of requirements in order to support lean implementation, illustrated at Figure 20-6.

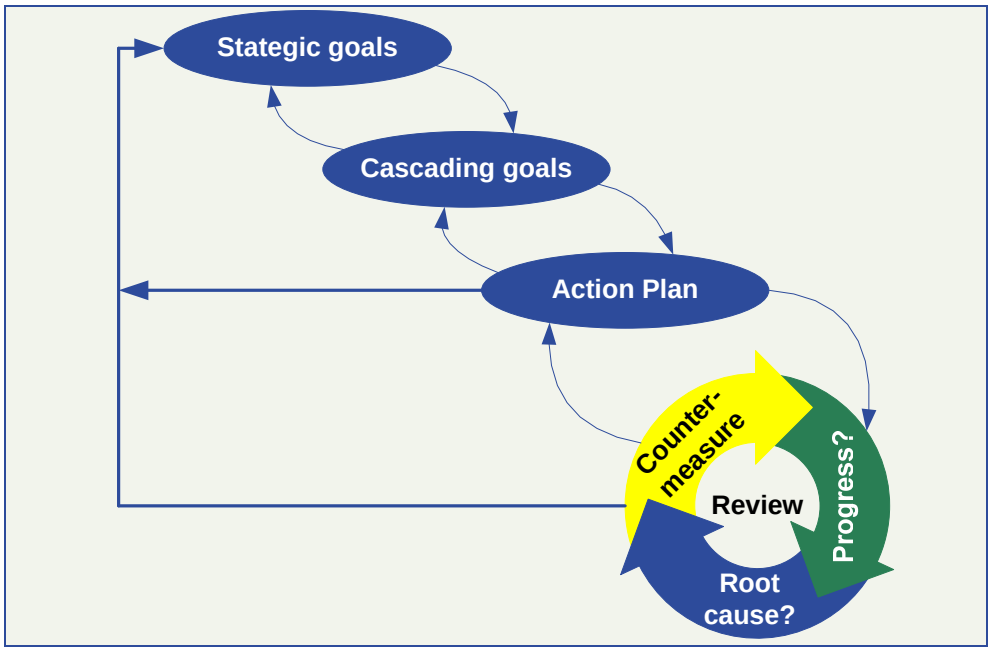


Figure 20-6: Performance measurement system

Two levels of reviews must be carried out. First, frequent reviews on the shop floor and in departments with performance measures. Visual board reviews must be carried

out in order to see if progress is made. If progress is not satisfying tools such as *5 whys* and *Ishikawa* can be used to identify root causes and appropriate countermeasures. Secondly, management must review if measures support the strategy and are valid.

Figure 20-7 recommends how measures are developed and how targets are set.

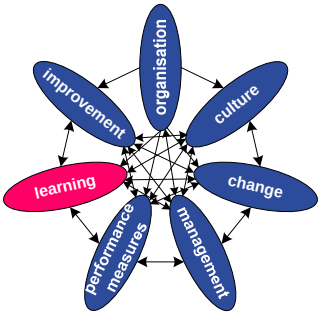
Golden rules for choosing measures	Golden rules for targets setting
1. Framework set by top management	1. Set by employees
2. Employee assist in setting specific measures	2. Ambitious, but achievable goals
3. Employees are able to impact the measures	3. Procedure for increasing targets
4. Valid performance data	

Figure 20-7: Golden rules for choosing measures and target setting

In order for performance measures to have full effect, middle and top managers must continuously emphasise the importance toward subordinates, follow-up on improvements, conduct reviews, and push subordinates to reach the targets.

The more operators and middle managers are involved in all phases of performance measurement, the more likely they become committed to performance measures and strive toward reaching them.

21 Learning



Both Liker [2004] and Imai [1997] draw parallels between lean and a learning organisation. Both state it is the ultimate goal of lean. Furthermore, great potential lies within the knowledge sharing domain as well as education in order to create sustainable and continuous improvements.

21.1 Theory

Theoretical perspectives in regards to organisational learning, knowledge management, and the learning organisation are outlined below.

21.1.1 Organisational learning

Chris Argyris and Donald Schön have made substantial contribution to the domain organisational learning. A vital contribution is *theory of action*. There is a difference between what people say they do (*espoused theory*) and what they actually do in practice (*theory-in-use*). The mismatch between *espoused theory* and *theory-in-use* both occur intentionally and unconsciously.

Argyris and Schön's second vital contribution is the identification of two types of learning as depicted in Figure 21-1 [Smith, 2001: 5]. Both types of learning are based on detecting and correcting errors or mismatches. *Single-loop learning* occurs when actions are corrected within existing governing variables such as values and assumptions. If the governing variables are changed during the learning process it is characterised as *double-loop learning* [Smith, 2001] and [Seo, 2003].

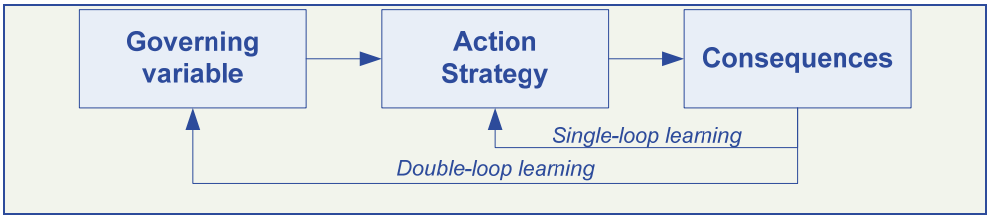


Figure 21-1: Single and Double-loop learning

21.1.2 Knowledge management

Knowledge management is closely related to organisational learning. However, it focuses more on managing and developing knowledge and establishing appropriate channels through which knowledge can flow within an organisation.

An important element in knowledge management is the distinction between data, information, knowledge, and wisdom as illustrated in Figure 21-2. Naturally it must be noted that what to one person is knowledge can to another be information or data.

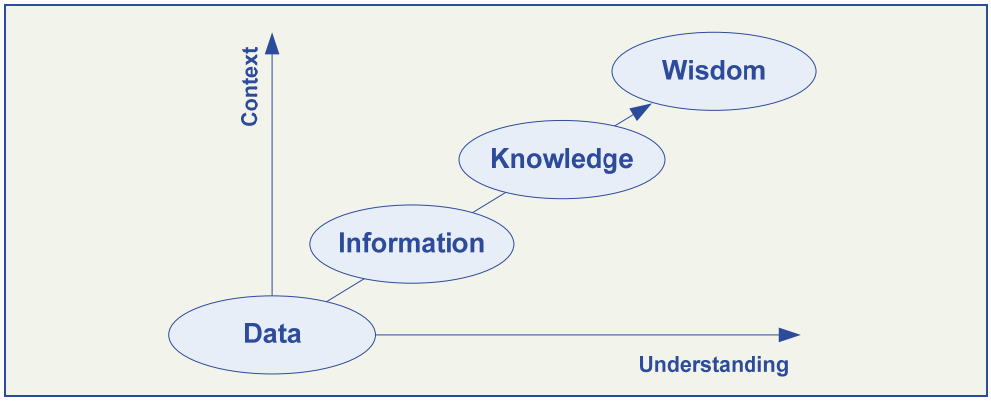


Figure 21-2: The hierachy of Data, Information, Knowledge, and wisdom [http://www.systems-thinking.org/dikw/dikw.htm]

Three processes are fundamental in knowledge management; *knowledge creation*, *knowledge sharing*, *and knowledge reuse*. *Knowledge creation* occurs through exploitation, exploration or codification of knowledge. *Knowledge sharing* is the dissemination of knowledge and making it known within the organisation. Lastly, *knowledge reuse* is when knowledge is integrated within an organisation and can be applied to new situations [Chua, 2003].

Tacit and *explicit* knowledge is described in Figure 21-3 [Wikipedia].

Tacit knowledge	*"knowledge which is only known to you and hard to share with someone else"*
Explicit knowledge	*"knowledge that has been or can be articulated, codified, and stored in certain media"*

Figure 21-3: Tacit and explicit knowledge

Ikujiro Nonaka and Hirotaka Takeuchi contribute to the domain of *knowledge creation* by a model, which illustrates the relation between *tacit* and *explicit* knowledge [Figure 21-4].

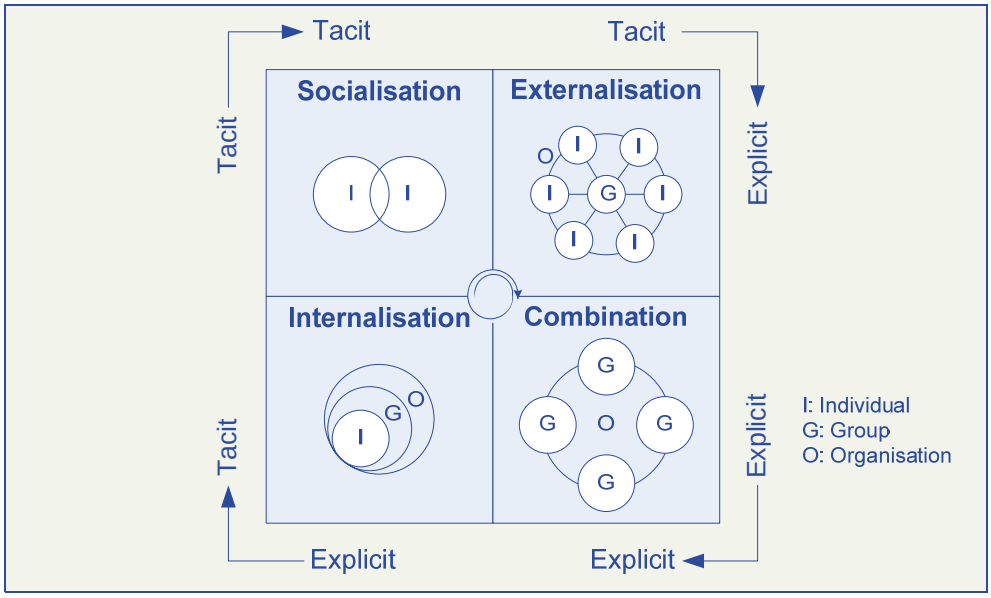


Figure 21-4: SECI model of Knowledge Creation [Nonaka and Toyama, 2003: 5]

The *socialisation* happens on an everyday basis between individuals where *tacit* knowledge is acquired through shared experiences. *Tacit* knowledge is transformed into *explicit* knowledge such as documents, concepts, and images through the process of *externalisation*. This can occur through dialog and reflection within a group of people. The *combination* process occurs when *explicit* knowledge is combined, edited, or processed into complex and systematic *explicit* knowledge, which can be disseminated throughout an organisation. *Internalisation* occurs when employees reflect upon and use *explicit* knowledge in practice, whereby it becomes *tacit*.

According to Nonaka and Toyama [2003], *"knowledge-creating process is necessarily context-specific in terms of time, space, and relationships with others"* [Nonaka and Toyama, 2003: 6].

Hansen et al. [1999] distinguish between *codification* and *personalisation strategy*. *Codification strategy* is when companies rely much on databases and codified documents whereas *personalisation strategy* is when companies rely on knowledge creation and knowledge sharing between people.

21.1.3 Learning organisation

The learning organisation distinguishes from organisational learning by its focus on creating organisations, which continuously and effectively learn.

Peter Senge [2006] recommends five disciplines. When united they create the foundation for learning organisations (Figure 21-5).

Five disciplines of the learning organisational	
Systems Thinking:	The ability to see the whole system and the relationships among parts of the system. Each part influences other part of the system as time goes by. Systems thinking are considered as the fifth discipline, which integrates all disciplines into an ensemble.
Personal Mastery:	The art of *"continuously clarifying and deepening our personal vision, of focussing our energies, of developing patience, and of seeing reality objectively"* [Senge, 2006: 7].
Mental Models:	The deeply rooted assumptions, values, and images people holds about the world and how they should take action.
Building Shared Visions:	Development of a shared vision where people understands what an organisation tries to do and are genuine committed to achieve it. People have a clear picture of how their actions will contribute to the overall vision.
Team Learning:	Team learning can be greater than individual learning. When members have an open mind and use dialog they can enter into a state of "thinking together".

Figure 21-5: Five Disciplines of the learning organisation

Several reviews of the five disciplines critique them for being abstract and difficult to apply in organisations [Bakka, 1999] and [Smith, 2006]. Especially, the disciplines of *system thinking* and *mental models* are difficult to use. Nonaka and Takuchi

furthermore criticise the learning organisation to focus little on knowledge creation [Schlamovitz, 1995].

21.2 Analysis

The analysis is structured in four parts. First organisational learning is analysed followed by knowledge management and education. Finally, links to the learning organisation is analysed.

21.2.1 Organisational learning

As subordinates continuously analyse a managers actions, it is important that congruence exists between their *espoused theory* and *theory-in-use* when working with lean. During the plant visits several mismatches were observed. The most obvious is managers, who communicate their lean support to subordinates and afterwards stop updating boards, focussing on 5S, providing feedback about *kaizen*, and so on. When this occurs, employees lose faith in lean and organisational learning never happen. Danecto's "no-tolerance rule" influences this pattern as managers must never let abnormalities pass without remarking and changing it. Manager (Danecto) notes, that all managers find it challenging to "walk-the-talk".

> "Argyris makes the case that effectiveness results from developing congruence between theory-in-use and espoused theory" [Smith, 2001]

Many lean principles contradict the traditional way of thinking. In order to create organisational learning when lean is first introduced, *double-loop learning* must occur. Examples of areas where *double-loop learning* must occur are many. Employees must change their *governing variables* in order to understand that flow and *just in time* create better results than batch and queue. By asking *five whys* when a problem occurs instead of correcting the superficial problem, the underlying cause gets exposed, which ensure the mistake does not happen again. This is just a few examples, but how can employees change their basic assumptions?

Double-loop learning is made difficult by natural occurring organisational defence routines that protect *"the organisational players from experiencing embarrassment or threat"* [Argyris, 1999: 42]. Defence mechanisms are very difficult to change, and as Argyris explains,

> "we must accept the fact that there is no silver bullet in the field of organisational learning (…) the theory has generated far more than practice can absorb" [Crossan 1, 2003: 39]

Few tools exist to enable *double-loop learning*. Establish groups and base decisions upon quality data and cause-and-effect relations reduce the organisational defence routines [Smith, 2001] and [Crossan 2, 2003]. Middle managers should give positive feedback and encourage employees to make them feel that their contribution matters and get less worried about embarrassment. This was emphasised at many Japanese companies.

Danish companies have until now grasped the idea of *just in time*, *flow*, and *pull*. However, most have still not come to the recognition that Toyota's second pillar *jidoka* can be used to detect and correct errors continuously. Naturally, *jidoka* only leads to double loop learning whenever the governing variables are challenged by using tools as *five whys* and *Ishikawa*. In the short term it leads to machine stops but in the long run to higher machine stability and product quality.

21.2.2 Knowledge management

Both Japanese and Danish companies find it difficult to *create*, *share*, and *reuse* knowledge efficiently. Most Danish companies do not have a standardised approach. Neither do they use formal knowledge sharing networks or databases with lean information.

Adico Medical is establishing a *database* with lean tools and techniques referred to as *"the lean bible"*. Likewise, Denso has a *database* with good ideas and improvements as inspiration for subsidiaries worldwide. Nonaka and Toyama [2003] describe that databases are appropriate for companies to make a *combination* of *explicit* knowledge where new knowledge of best practise is created [Figure 21-4]. When knowledge is codified into databases clear advantages exist as employees can search, receive, and *reuse* codified knowledge. This might reduce expenses for lean experts to travel to plants worldwide in order to assist local plant managers in lean [Hansen et al., 1999]. However, a database is very time consuming to update, as Denso remarked. Furthermore, if it is not continuously updated or contains sufficient information, employees lose confidence and stop using it. Even though databases provide good ideas from prior improvements a degree of customisation is most likely required, which a database cannot provide.

Several Danish companies' internal lean consultants join external lean networks but only Zentec use internal networks for change agents. No company express that they use networks within the company for middle managers or other line managers. Dialog and networking are good ways to *externalise* as well as *combine* knowledge [Nonaka and Toyama, 2003]. *Externalisation* occurs when a network member faces a problem and another already tried a similar situation.

Toyota suggests departments to visit each other in order to share knowledge. However, they do not coordinate any knowledge sharing activities according to Mr. Miura (Toyota). Mr. Miura explains that their high performance targets force employees to get ideas at other departments.

Personalisation and codification strategy

In general, Japanese companies rely much on the *personalisation strategy* and use several techniques to support it. Several use conferences and plant tours once or twice a year and promote or transfer employees with lean knowledge within Japan or overseas. At Toyota, half of the internal consultants are trainees. Afterwards, some return to line manager positions in order to use their lean knowledge. Furthermore, Japanese lean experts travel much overseas and overseas managers often visit Japan in order to transfer knowledge. Japanese use of *sensei* also reinforces their reliance on a

personalisation strategy. *Personalisation strategy* is time consuming and expensive in regards to travel expenses. The advantage is they can customise improvements and transfer lean understanding to managers. In networks, all sorts of management challenges can be discussed.

Most Danish companies have not yet set up knowledge sharing programs and the interesting question is to what extent they should rely on *codification* as opposed to *personalisation*.

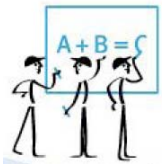
> "effective firms excelled by focussing on one of the strategies (red. codification or personalisation) and using the other in a supporting role" [Hansen et al., 1999]

To choose between *codification* and *personalisation* many factors must be considered. *Codification* is only attractive if the development and maintenance costs are below the value created by *reusing* information and decreasing internal consultants. *Codification* is more appropriate the larger a company is as more employees are able to *reuse* information.

The threat of relying too much on *personalisation* is that knowledge disappears when employees resign. As a result, one could argue that Japanese companies can rely more on *personalisation* than Western companies, as they have a higher seniority.

However, no matter the company's nationality, it is still a fact that many improvements must be adjusted to specific situations. A *personalisation strategy* might be preferable combined with small databases.

21.2.3 Education



According to Nonaka and Toyama [2003], education is a good way of *internalisation* where *explicit* knowledge is transferred to *tacit* knowledge.

Education models

Adico Medical did not use an education model in the initial phase and find it difficult to sustain improvements and enable continuous improvements. They believe that a formal education program can help where additional or follow-up education is carried out.

In general, Danish companies find education very important and use many resources on education. Danecto, Zentec and now Adico Medical use formal education programs structured in levels and carried out over several days [Figure 13-3].

None of the Japanese companies use an extensive education program as most education is provided as "on the job training". However, Mr. Miura (Toyota), Mr. Kido (Kawasaki), and Dr. Kojima (Denso) explain that they use more education abroad as they experience higher employee turnover, less motivation, and less deep knowledge about lean thinking. Figure 21-6 illustrates Toyota's education system in Georgetown, USA.

Toyota's Training Modules							
Courses	Hrs.	Manager	Group Leader	Team leader	Team member	Specia-list	Ass. staff
Assimilation	18	C	C	C	C	C	C
Conflict Mgt.	16	C	E			E	
Effective Meeting Facilitation	16	C	C	C	E*	C	E
How to speak so others will listen	16	E	E			E	E
Intro to Kaizen	18	C	C	C		C	E
Intro Problem Solving	16	C	C	C	E*	C	C
Job Instruction Training	10	E	C	C	E*	E	
Job Relations	10	C	C			E	
Leader as Coach TPS	10	E	E	E		E	
Leadership	16	C	C	E*		E	
Listening	16	E	E	E	E	E	E
PDCA Applications	24	C					
PDCA Intro.	24	C					
Philosophies of Efficiency	10	C					
Practical Problem Solving	16	C					
Problem Solving level II	18	C	C	C		C	E
Proposal Writing/Documents	10	C	C			C	C
Quality Circles Facilitation	8	E	E	E	E	E	E
Quality Circles Participation	8				E	E	
Quality Circles Promotion	4	C	C			E	
Intro Standardised Work	8	C	C	C		C	E
Standardised work, office	8	E				C	C
Suggestion System Training	2	C	C	E	E	E	E
Targeted Selection	9	E	C	E		E	
Worksite Communication	16	E	C	E*		E	

C = Core Course (Required) E = Elective Course E = Required for Pre-promotion program*

Figure 21-6: Toyota's training matrix of core and elective courses [Liker, 2006: 259]

Different education level

In general, Danish first line managers do not receive more or prior education than operators. As a result, they feel frustrated as they are not well-equipped to engage in lean. Also, they find it difficult to coach and lead lean activities during a project as well as afterwards.

Danish companies might benefit from distinguishing the education level according to employees positions and provide team leaders and first line leaders more education than subordinates. Furthermore, they need education in various management techniques as at Toyota Georgetown [Figure 21-6].

Comparison of education models

A comparison between Toyota in Georgetown and Danecto's education models is highlighted in Figure 21-7.

Toyota Georgetown's Training modules		Danecto's education model	
Positive	**Negative**	**Positive**	**Negative**
- Adjusted to specific needs and in the hierarchy - Broad - Yearly education plan	- Comprehensive - No project requirements - Administrative requirements	- Simple - Identical for all - Project requirements	- Not customised to specific needs in the hierarchy - Not broad enough (e.g. no leadership)

Figure 21-7: Comparison of education models

The Danish models tend to be simple but do not take the specific requirements of different organisational levels into account. A compromise is to form a model combined with additional leadership courses as needed.

Practical experience

Extensive education is not enough to ensure sustainable lean results. Bicheno [2004: 157] states that companies should not be *"expecting training to make lean happen"*. In order to transform education into deeply held *tacit* knowledge, employees use in their daily work, it must be practiced and reflected upon. Learning-by-doing is according to Nonaka and Toyama [2003] an effective method to facilitate this.

All Danish companies and consultancies support learning-by-doing and try to carry out education in relation with lean projects. After the initial projects, they tend to focus less on using new knowledge in everyday operations why it gradually erodes. In order to make the acquired education deeply held *tacit* knowledge, it is important to practise their skills continuously. A cycle of little new knowledge combined with continuous practical use is recommendable.

Japanese companies are characterised by a high emphasis on daily "on the job" training. Team leaders with high seniority and additional lean education provide the training. Toyota emphasises the necessity for employees to have much experience before a promotion.

Continuous coaching

Many Danish middle managers do not receive much support from internal consultants after the initial lean projects are carried out. As a result, they forget the lean tools and techniques and improvements slowly erode. Danish companies should establish a structure where middle managers and team members continuously get coaching and guidance for future improvements, e.g. by an internal or external *sensei*.

NEC uses an external *sensei* who coach team members, middle- and top managers in what to do next, whereby the improvement process never stops. NEC, who has only worked with lean for six years, shows remarkable results and feels confident in their ability to continuously improve.

Toyota and Kawasaki explain the best way for people to learn and understand is to be challenged. They ask employees to solve a difficult problem or place them in a difficult situation and they must find solutions on their own.

Education requirements for top managers and lean consultants
Many state that lack of top management commitment is an obstacle for lean implementation. A consultant and Zentec find that top manager's lean understanding directly effect their commitment. As a result, they carry out tailor-made education for top-managers in order to increase their understanding and commitment.

The last element of education is within the internal lean departments. All Danish firms use many resources on education in a variety of management and lean techniques. At Toyota, it takes two years to become an internal lean consultant. The education is primarily practical as Mr. Otsu (Toyota) explains *"experience is the best way to learn"*.

21.2.4 The learning organisation

Systems thinking
Systems thinking are in the heart of lean. The tool *five whys* link a problem or error to the underlying inter-dependent set of actions and effects in order to identify root causes. To be effective, answers to *five whys* must not be based on blaming individuals [Senge, 1994]. Furthermore, *jidoka* results in build-in-quality in all elements of the production why the final quality of the product is improved. Hereby customer complaint decrease and the repurchase rate increase. *Flow* production also helps employees become aware of consequences of their work for future processes, which enables them to improve quality of their work. The examples are numerous and only few are mentioned here.

Shared vision
Many Danish companies have lean visions but not fully *shared visions*. Improvements erode and managers lose focus on lean as time passes. This is a sign of *formal compliance*. Senge [2006] states that employees only show real *commitment* when *personal visions* are incorporated within the *shared visions*. However, it seems unrealistic to align these two factors completely.

A *shared vision* helps guiding a company to become lean. Thus, it would be worth trying to improve the degree of *shared vision* in companies. This can be done by more involvement of local employees and feedback loops. Toyota uses feedback loops to the top-level in relation to *policy deployment*.

Reflection
Senge [1994 and 2006] juxtaposes elements of Argyris and Scheins theories with *mental models*. He suggests that it is possible to impact *mental models* through reflection. Reflection is a natural occurring concept in Japanese culture, called *hansei*.

Box 21-1: Hansei

Hansei is deeply embedded in Japanese culture and a key to learn and grow. The closest English word to *hansei* is reflection. Japanese parents tell their child *"please do the hansei"* if the child does something bad. It means he or she must be sorry and improve his or her attitude – everything is included, spirit and attitude.

According to George Yamashina (Toyota) hansei is essential for *kaizen*.

"Without hansei it is impossible to have kaizen. In Japanese hansei, when you do something wrong, at first you must feel really, really sad. Then you must create a future plan to solve that problem and you must sincerely believe you will never make this type of mistake again. Hansei is a mindset, an attitude. Hansei and kaizen go hand in hand"

At Toyota, managers always point out mistakes or improvement areas. The intention is not to hurt people but to help them improve.

[Liker, 2004: 257-260]

When Toyota's managers' review subordinates work, they always criticise it and point out where employees can improve. This creates a possibility for employees to learn and improve. However, this principle is deeply held within the Japanese culture, and is impossible to use directly in Denmark. Toyota holds *hansei-kan* (reflection meeting) after a change in order to identify improvements. For Danish companies to continue improving, it is vital to perform reflection through *after action reviews* as it increases employees' ability to improve. A moderate form is feasible in Denmark where managers both mention positive aspects and identify areas for improvements. *After action reviews* should be conducted in a standardised manner by teams, middle managers, and consultants followed by a presentation to managers.

Lean approaches to make a learning organisation

Danish companies do not generate as many improvement suggestions as Japanese companies. The root cause is not necessary employees' lack of creativity or reluctance. The national cultural analysis further strengthens Danish culture to support innovative and a solid foundation for *kaizen*. Instead, it might be based on inappropriate leadership and lack of technical tools. In regards to leadership, Danish companies should use team leaders and coaching first line managers. In regards to technical tools, they should pay more attention to *jidoka* in order to identify problems and lean techniques such as asking *five whys* in order to find root causes. Danish companies lack focus on these parameters, which make it more difficult for teams to identify problems and solutions. Toyota highly emphasises the importance of standardising improvements in order to transfer individual and team learning into organisational learning.

As described above, lean has deep roots to a complex and abstract concept such as the learning organisation. The learning organisation embarrasses more concepts and tools than discussed above, but lean provides concrete tools and techniques to achieve a fraction of the potential of the learning organisation. Despite, the Danish companies' current achievements, they still have much to learn from Toyota.

21.3 Part recommendations

21.3.1 Knowledge sharing

A *personalisation* strategy combined with small databases is the most appropriate way to share lean knowledge within a company. Several knowledge-sharing techniques are recommended in Figure 21-8 and Figure 21-9. They are not interrelated and companies can freely choose techniques appropriate for their needs.

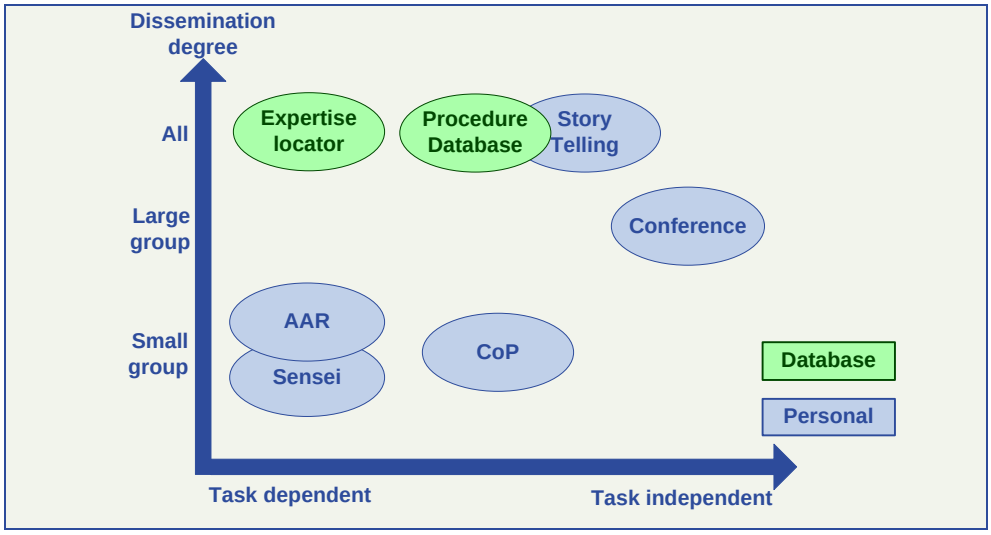


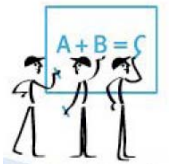
Figure 21-8: Relationship between personal and codification knowledge sharing

Expertise locators Database containing employees' lean experiences. Employees facing a problem can find a colleague at another plant and contact him in order to solve the problem together.	**Procedure Databases** Databases with standards and checklists to carry out kaizen blitz events, design visual boards etc.
Sensei A sensei can coach and guide a group of operators, middle managers, or top managers in specific areas.	**After Action Review (AAR)** Formalised evaluation method carried out after an activity. Identify what was good and what can be improved.
Communities of Practice (CoP) Knowledge sharing groups. Multiple subjects can be discussed such as lean challenges, how to deal with resistance, how to lead employees, personal anxiety. CoP can for example be established among first line managers, middle managers, and consultants.	**Lean Conferences** Yearly lean conferences can function as a large knowledge sharing event where good improvements are displayed. Middle managers, team leaders, lean consultants can participate.
Story Telling Use techniques to develop tactical narrative stories, which support the lean journey. Communicate them throughout the company.	

Figure 21-9: Brief description of knowledge management techniques

In addition to the above-mentioned knowledge sharing techniques, tactical promotion and foreign posting help transfer knowledge to relevant departments. Furthermore, DVD with presentations of improvements can be send to all plants as inspiration.

21.3.2 Education



Different levels in the organisation require skills in different areas and at different times. Top managers must learn about the basic lean philosophy, tools, and management tools, such as performance measures in order to control the lean direction. Middle managers must acquire leadership capabilities and more lean knowledge than subordinates in order to coach them. Education programs such as Danecto's pyramid and Zentec's lean academy are simple and appropriate in Denmark. However, it must be combined with additional education for team leaders, first line managers etc.

Lean knowledge is best acquired through a continuous cycle of education, knowledge sharing, and *sensei* directly followed by *kaizen* improvements [Figure 21-10].

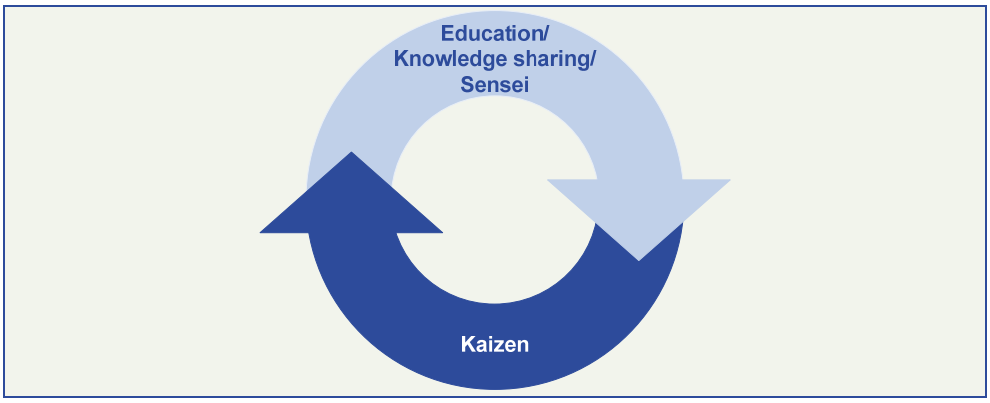


Figure 21-10: Knowledge wheel

21.3.3 Learning organisation

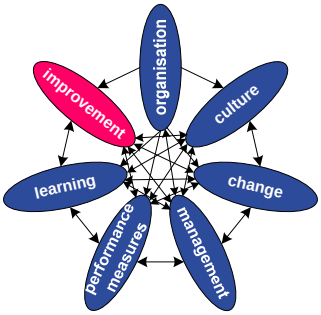
Danish companies focus much on just-in-time and value stream analysis which only represents a fraction of the lean potential. In order to reach the full benefit of lean and improve their abilities to learn and improve they must master the techniques highlighted in Figure 21-11.

Identify abnormalities and Reflection	
- Standards:	Standards help identify abnormalities and learn from errors
- Jidoka:	Stop when errors occur, reflect upon root cause, and correct
- 5 whys:	Identify root cause
- After Action Reviews:	Reflect upon activities and identify areas of improvements
- Challenge employees:	Employees will reflect upon possibilities
Common Vision and Goals	
- Shared Vision:	Get as many employees committed to the vision as possible
- Performance measures (PM):	Align PM with shared vision. Steer direction and results

Figure 21-11: Techniques for improving organisations ability to learn from activities

In addition to the above mentioned techniques, leaders must walk-the-talk and apply a no-tolerance rule. This reduces the uncertainties for employees and reinforces shared direction.

22 Improvements



The essence of lean is continuous improvements. This section focuses both on ways to improve and ways to sustain improvements.

22.1 Theory

Lean improvements are usually divided up into *kaikaku* and *kaizen*. Toyota defines *kaikaku* as a radical transformation and categories the entire lean transformation as *kaikaku*. As this thesis focuses on continuous improvements, *kaikaku* is not discussed further. *Kaizen* is continuously improvements and is presented below. Furthermore, standardisation is included in this section.

22.1.1 Kaizen

Kaizen means change (*kai*) for the better (*zen*) and is translated to continuous improvements. *Kaizen* is improvements that involves everyone and has low expenses. The goal with *kaizen* is to become a learning organisation through reflection and continuous improvements.

Kaizen hierarchy

Kaizen has become a blurry concept and is used in many contexts. Bicheno [2004: 142-144] presents a hierarchy of five different types of *kaizen*.

Figure 22-1: Kaizen Hierarchy

Kaizen flag

Masaaki Imai portrays three types of activities a *kaizen* organisation must be involved in. These are, innovation, *kaizen*, and maintenance [Figure 22-1] [Imai, 1997:3]. Imai refers to maintenance as activities directed toward maintaining current technological,

managerial, and operational standards and uphold such standards. It is achieved through training and discipline. It is important to notice that *kaizen* is for everyone in the organisation.

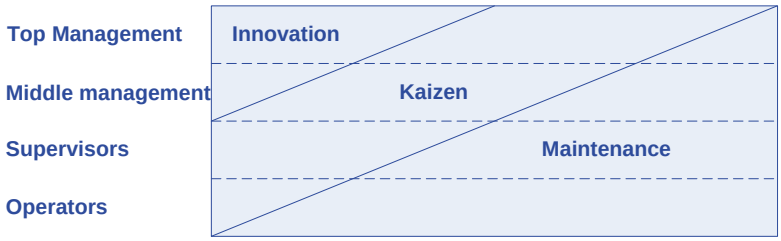


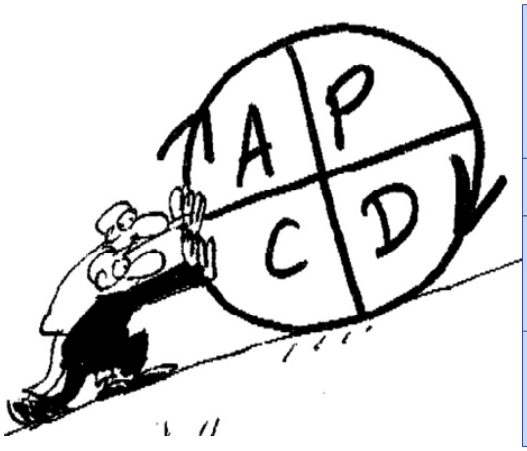
Figure 22-2: Improvements and maintenance

Kaizen Approaches

Two common approaches to continuous improvements are *PDCA* and *DMAIC*, briefly described below.

PDCA

Edwards Deming's Plan-Do-Check-Act cycle was originally developed for quality purpose. *PDCA* is used to guide projects and form measurement cycles. The basic idea is to follow four steps [Figure 22-3] [Bicheno, 2004:140].



Plan	- Determine customer satisfaction - Identify the concern of the problem - Set objectives and a working plan - Collect data and find root causes - Train as necessary
Do	- Implement the improvement
Check	- Where the objectives met? - Review root causes - What was learned - Is the problem completely solved
Act	- Identify further improvements - Write and adopt new standards - Communicate the requirement - Celebrate and congratulate

Figure 22-3: Plan-Do-Check-Act

DMAIC

DMAIC (Define-Measure-Analyse-Improve-Control) is a Six Sigma methodology to make improvements. It is also used in a lean context similar to *PDCA*. Compared to *PDCA*, *DMAIC* expands the plan stage and place stronger emphasis on measurement, tools and quantitative data.

22.1.2 Standardisation

Imai [1997] explains *"one must standardise, and thus stabilize the process before continuous improvement can be made"*. Ohno [1988] further emphasises that standardised work with minimum variance is the essential ingredient in one-piece flow, JIT, and continuous improvements. Deming sees improvements moving from

standard to standard and Juran emphasises the importance of standards by "holding the gains" for further improvements [Bicheno, 2004].

SDCA

PDCA does not explicitly include standardisation of improvements why they risk eroding. In order to sustain improvements, standardisation is incorporated in *PDCA* by a cycle known as Standardize-Do-Check-Act (*SDCA*). *"Only after a standard has been established and followed, stabilising the current process, should one move on to PDCA"* [Imai, 1997: 6]. The relationship between PDCA and SDCA is illustrated below [Imai, 1997: 53].

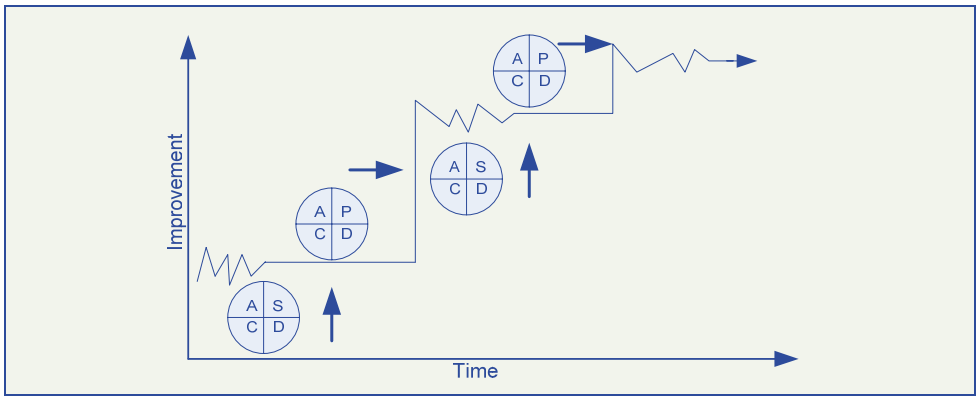


Figure 22-4: Connection between SDCA and PDCA

Basis elements

Ohno [1988] considers the three elements worker, machine, and material fundamental in standardisation. Ohno [1988: 128] lists three elements of standard work procedure:

1. Cycle time - the length of time in which one unit is to be made
2. Work sequence - the sequence of work in the flow of time
3. Standard inventory - the minimum amount of goods needed to keep the process going

Table 22-1: Ohno's three elements in standards

Key features

Imai [1997] in particular brings aspects to standardisation and suggests the following nine key features of standards.

Key features of standards
1. Represent the best, easiest, and safest way to do a job
2. Offer the best way to preserve know how and expertise
3. Provide a way to measure performance
4. Show the relationship between cause and effect
5. Provide a basis for both maintenance and improvement
6. Provide objectives and indicate training goals
7. Provide a basis for training
8. Create a basis for audit and diagnosis
9. Provide a means for preventing recurrence of errors and minimizing variability

Table 22-2: Key features of standards [Imai, 1997:55-56]

Standards at Toyota

Ohno's believes elimination of variation is done by standardisation. The model below shows Toyota's approach to waste reduction by focusing on standardisation [Liker and Meier, 2006: 116].

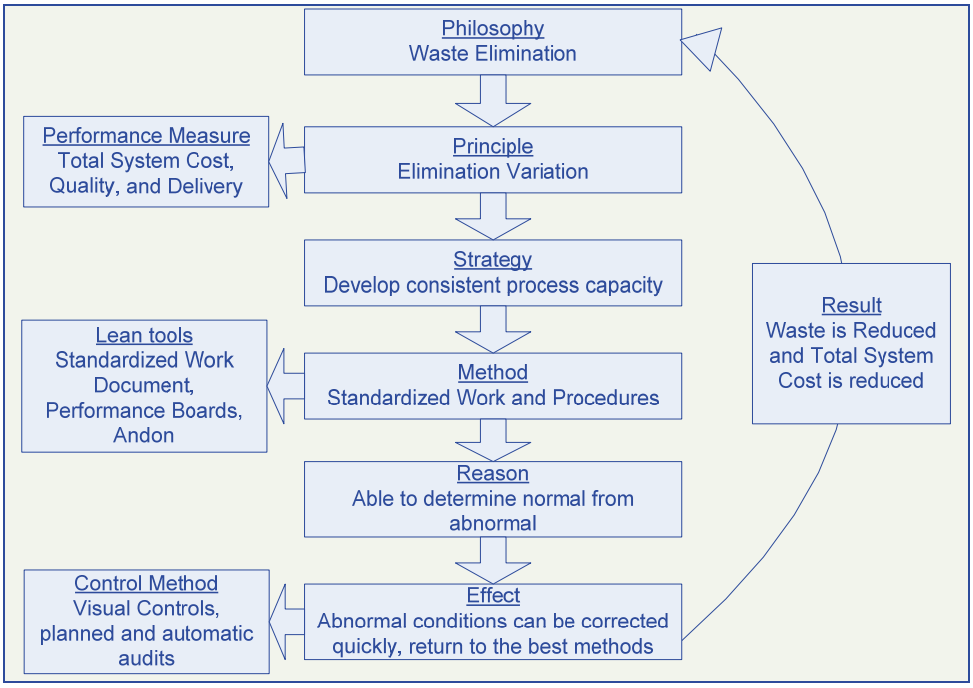


Figure 22-5: Influence on standards in Toyota's approach to reduce waste

22.2 Analysis

First, the analysis includes a discussion about common *kaizen* approaches. Secondly, Toyota's improvement model is used in order to analyse how improvements can be carried out. Finally, standardisation and motivation for *kaizen* suggestions are included in the analysis.

22.2.1 Kaizen approaches

Individual level

Individuals' generation of suggestions and participation in *kaizen* activities is the foundation for *kaizen* [Bicheno 2004]. Many Danish companies expect operators are able to generate suggestions immediately. Unfortunately, Danish companies experience limited results from *kaizen* activities on the shop floor as operators find it difficult to identify improvements. Furthermore, suggestions are often of low quality. This indicates that the foundation for *kaizen* is not yet established.

It is important that employees get the right education, training, and experience in order to contribute to *kaizen*. Danish companies educate employees but operators do not get practical experience in real *kaizen* events.

> "Employees who have participated in a kaizen event are better at providing suggestions for improvements" Manager (Zentec)

Experiences from Japan identify that it takes long time to make it natural for operators to generate suggestions. The table below shows the foundation for *kaizen* suggestions. It is furthermore necessary to support employees in *kaizen* in less mature phases.

Foundation for improvement suggestions	
5S	A clean factory is essential to create improvement
Value stream	Value stream knowledge is an eye opener for employees who suddenly realise the importance of their work in a big perspective
Learn to see waste	Everyone needs to understand what waste is and why it is waste

Table 22-3: Foundation for improvement suggestions

Kaizen Blitz

Both Japanese and Danish companies see *kaizen blitz* as the main engine for continuous improvements. Most companies expressd that they are good at carrying out *kaizen blitz* events. However, many find it difficult to sustain improvements afterwards.

At Toyota it was emphasised that operators should generate ideas to *kaizen blitz*. Therefore, the effort to train employees in generating suggestions must not be neglected.

Experiences about kaizen blitz
- Do not make the kaizen blitz group too big. Everyone has to contribute and learn from the event - Use an extremely high level of information to the rest of the department where a kaizen blitz event takes place (boards, letters, verbal daily briefing) - Involve operators in kaizen blitz event in order to create motivation for more improvements - Follow up on activities - Get supervisors and team leaders on board in kaizen blitz events in order to create local ownership

Table 22-4: Experiences about kaizen blitz

The work team kaizen

Danish companies often view *work team kaizen* activities as empowerment of employees as operators carry out improvements themselves.

Based on the above analysis it is questioned whether Danish companies are mature enough to work with *work team kaizen* at present time. The approach to focus on *kaizen blitz* events at the present stage is appropriate as long as companies use high employee involvement.

Experiences from Japan show that *work team kaizen* need much support. The table below highlights experiences from Denmark and Japan.

Experiences about work team kaizen
- The best way to motivate to kaizen is to improve elements that are irritating in the daily work - Team organisation is essential for work team kaizen activities - A leader to manage work team kaizen activities - When the group is responsible, nobody is responsible - One team member responsible for kaizen creates local ownership and motivation - Support from lean consultants in a coaching way

Table 22-5: Experience about work team kaizen

The Danish consultants all stress that a 70% solution driven by employees is better than a 100% solution driven by the consultant.

> "Kaizen improvements do not have to be perfect – 60% is ok. It is Kawasaki's philosophy that 100% improvements are very time- and resource consuming and the most important thing is that you try to improve" Mr. Kido (Kawasaki)

This point indicates that *kaizen* must be seen in a broader perspective. It should be considered as learning process and all improvement should not be based on measurable facts.

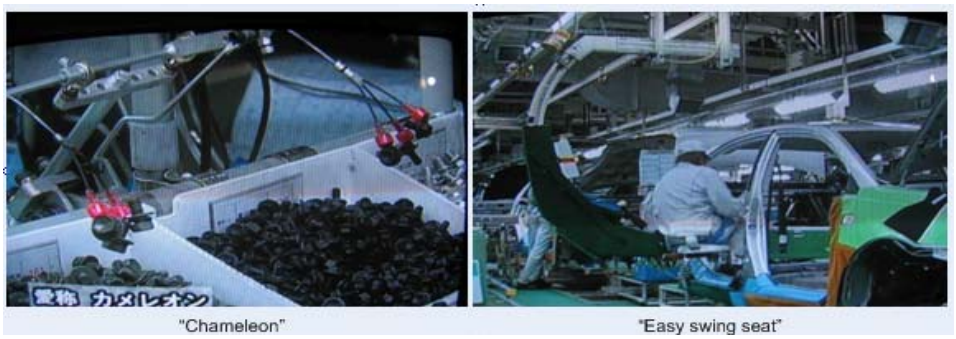


Figure 22-6: Examples of kaizen developed by operators

Jishuken groups

Jiskuken groups are widely used by Japanese companies with great results and are experienced to be an important approach to knowledge sharing. Danish companies are still in an early stage where *jishuken* activities are not relevant. Thus, they must not engage in *jishuken* activities before they have a solid lean experience. It is a big step to include suppliers in *jishuken* activities and Toyota emphasises that they have 50 years experience with lean.

22.2.2 Model for improvements

Mr. Koda (Toyota) views *kaizen* as one of the most difficult concept to copy. Toyota's model for improvements forms the basis for the analysis in this section.

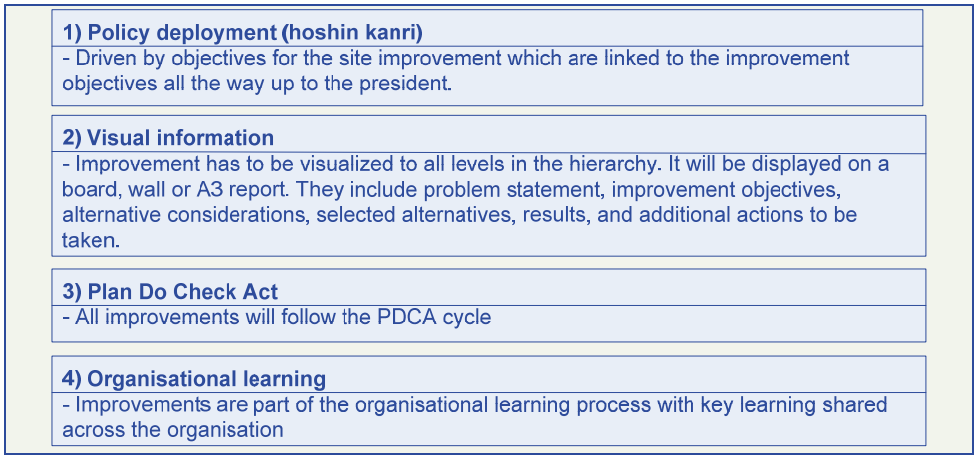


Figure 22-7: Toyota's model to improvements waste [Liker and meier, 2006:402]

Performance measures

Toyota, Toyota Gosei, Kawasaki, and Denso use Policy Deployment and cascades measures and targets down through the organisation based on the overall vision and strategy. Thus, each department and team uses the overall targets as guidelines to create individual performance measures and targets. Consequently, everyone knows in which areas suggestions for improvements should be made. However, Mr. Iwaki (NEC's *sensei*) and Manager (Zentec) argue that strict suggestion criteria limit employees' motivation. If less valuable suggestions influence employees' motivation companies aught to implement them in order to improve motivation.

Danecto use a*ction plans* to manage *kaizen* projects and push for improvements. Hereby, each department knows exactly what improvements are expected the following year and is hold responsible for them at the end of the year. Clear measures and targets to push for improvements are effective at Toyota.

Visual information

Findings indicate that Danish employees have much need for information. Thus, it is important to use boards, walls, verbal orientation etc. to create awareness about activities in the factory. Information is also useful to generate new ideas for *kaizen*. Japanese companies use visual information more than in Denmark. Kawasaki, Denso and Otics et al. stress that this is motivating for employees.

Visual information about kaizen is not only for the shop floor. Management at Toyota use A3 reports about *kaizen* project. A3 reports give a quick overview and enable managers to evaluate and give feedback.

> "Kaizen do not succeed in Denmark because management do not show interest and forget to follow up on initiatives from the employees. This is demoralising for the employees who actually puts an effort in coming up with suggestions for improvements" Consultant

PDCA

The PDCA approach is considered to be a foundation for lean [Liker and Meier, 2006]. Bicheno [2004] argues that Western organisations often adopt "*Do*" but neglect the *PCA*. The impression from the Danish company visits strengthens this statement to some extent. Even though *PDCA* is widely seen at production boards it is questioned whether the steps are followed as intended.

In order to use *PDCA* efficiently each step has to be followed strictly. According to Mr. Otsu (Toyota), the planning of a *kaizen* event is critical in order to gain sufficient result. Up to six weeks preparation is needed before a 3-5 days *kaizen blitz* event is carried out. Danish companies seem good at carefully planning events in advance.

Many Danish companies forget the *check* phase. Toyota and Toyoda Gosei emphasise the importance of having clear objectives for each improvement. No matter if the objective are reached or not companies must review the process in order to discover root causes of good and bad elements of the process. The review should also create the basis for new improvements. Furthermore, follow up activities are essential. Already in the *plan* stage it must be decided when follow up activities should happen, by whom, and what is checked.

The Japanese companies emphasise that *act* is the foundation for new improvement. This step is widely neglected by the Danish companies.

Mr. Iwaki (NEC sensei) does not fully support project tools like *PDCA* as he argues that companies spent too many resources on planning and analysing instead of "just do it". Therefore, it is important to have a fast evaluation in order to identify "just-do-it" improvements and *kaizen* events.

Organisational learning

The foundation for *kaizen* is based on employees' ability to develop ideas [Imai, 1997]. Toyota deliberately implements suggestions of low economical value in order to motivate and create organisational learning at the shop floor.

> "Western manager's almost exclusive concern with the cost of the change and its economic payback" Mr. Imai [1997]

The *PDCA* approach strengthens organisational learning as all activities should be reflected upon. Mr. Otsu, stresses, *"how you arrive at the decision is just as important as the quality of the decision"*.

22.2.3 Motivation for *kaizen* suggestions

Toyota's employees generate many suggestions compared to western companies. One of the big mysteries is how Japanese companies get employees to generate *kaizen* suggestions. A survey comparing companies in England and Japan is summarised below [Oliver et al., 1998].

	England	Japan
Percentage of plants with teams in the factory	76	100
Suggestion schemes		
- Suggestions per employee	2.0	28.9
- Percentage of suggestions implemented	62	78
- Typical reward per suggestion (US$)	247	28
- Percentage of plants setting targets for suggestions	0	89
Problem solving		
- Percentage of plants with problem-solving groups	83	100
- Percentage of employees involved	48.9	81.8
- Hours of meeting per month (hours)	2.6	2.6

Table 22-6: Comparison of English and Japanese companies

The survey indicates that rewards in form of money do not motivate employees to generate *kaizen* suggestions. Japanese managers explain management commitment and recognition of employers as the main motivation which is described in chapter 19.

22.2.4 Standardisation

Japanese companies use standards to an extremely high degree and believe that they are the root to continuous improvements. Even though many Danish lean managers recognise the importance of standardisation little is done in practice. The quotation by Ohno is still applicable.

> "Japan enthusiastically embraces the idea of establishing standards, while the West looks upon standards with certain degree of cynicism" [Ohno 1988:54]

The cultural analysis concludes that Danish culture do not support standardised work well. However, the manager of the only Danish company who has worked with standards mentions that it turned out to be an eye opener for many employees and many supports it. This indicates that it is possible to use in Denmark.

Managers must introduce standards carefully in order to reduce the potential resistance among employees. It can be done by involving teams to create best practises with support from an experienced lean employee. To make employees adopt standards, *poke yoke*, clean workstation (*5S*), and an ergonomic layout are experienced to be efficient techniques.

> "Building kaizen before standardising would be analogous to building a house on quicksand. You may get it built, but it will be sinking fast!" [Liker and Meier, 2006:125]

Maintenance of standards

Toyota and Kawasaki emphasise that organisational structure is important for maintaining standards. In this context the role of a team leader is important. The team leader must ensure standards are followed and continuously renewed. Danecto's "no-tolerance rule" seems to be efficient, as all managers must ensure standards are followed by going to *gemba*.

Before introducing standardisation it is necessary to break away form myths about standardisation [Figure 22-7].

Myths of standardised work	
	If we have standardised work…
Myth 1:	- anyone can learn everything about the job by looking at the document
Myth 2:	- we can bring anyone of the street and train them in few minutes
Myth 3:	- we can post the standard procedure and people can remember how to do their job
Myth 4:	- employees develop their own standardised work
Myth 5:	- operators will do the job properly and not deviate from the standard

Table 22-7: Myths of standardised work [Liker and Meier, 2006:122-124]

22.3 Part recommendations

It takes long time to make it natural for employees to generate suggestions for improvements. Thus, employees need necessary knowledge and experience in order to generate suggestions and participate in *kaizen* events. Management has do perceive *kaizen* as a long-term goal and not only focus on short-term wins.

A focus on *kaizen blitz* events with high local involvement in the immature stage help employees gain experience, which they can use in *work team kaizen* later on. *Kaizen blitz* events are the engine for improvement and have to reach a steady level as illustrated in Figure 22-8. Focus should not be moved to *jishuken* group activities before a solid *kaizen* culture is created.

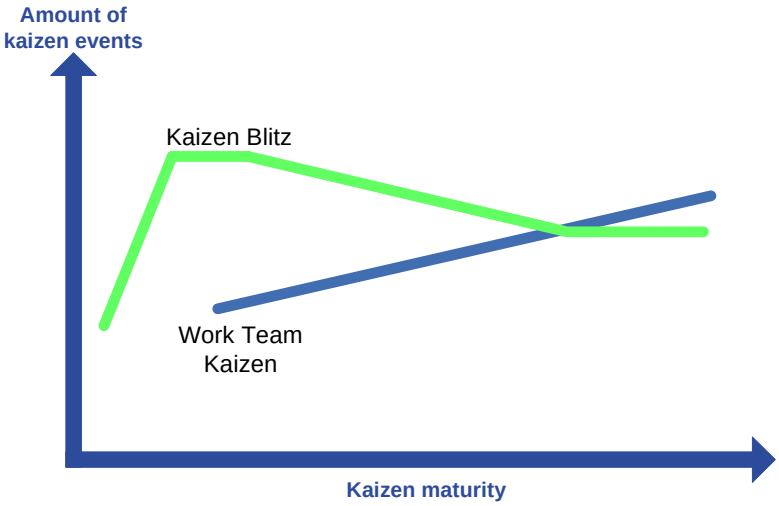
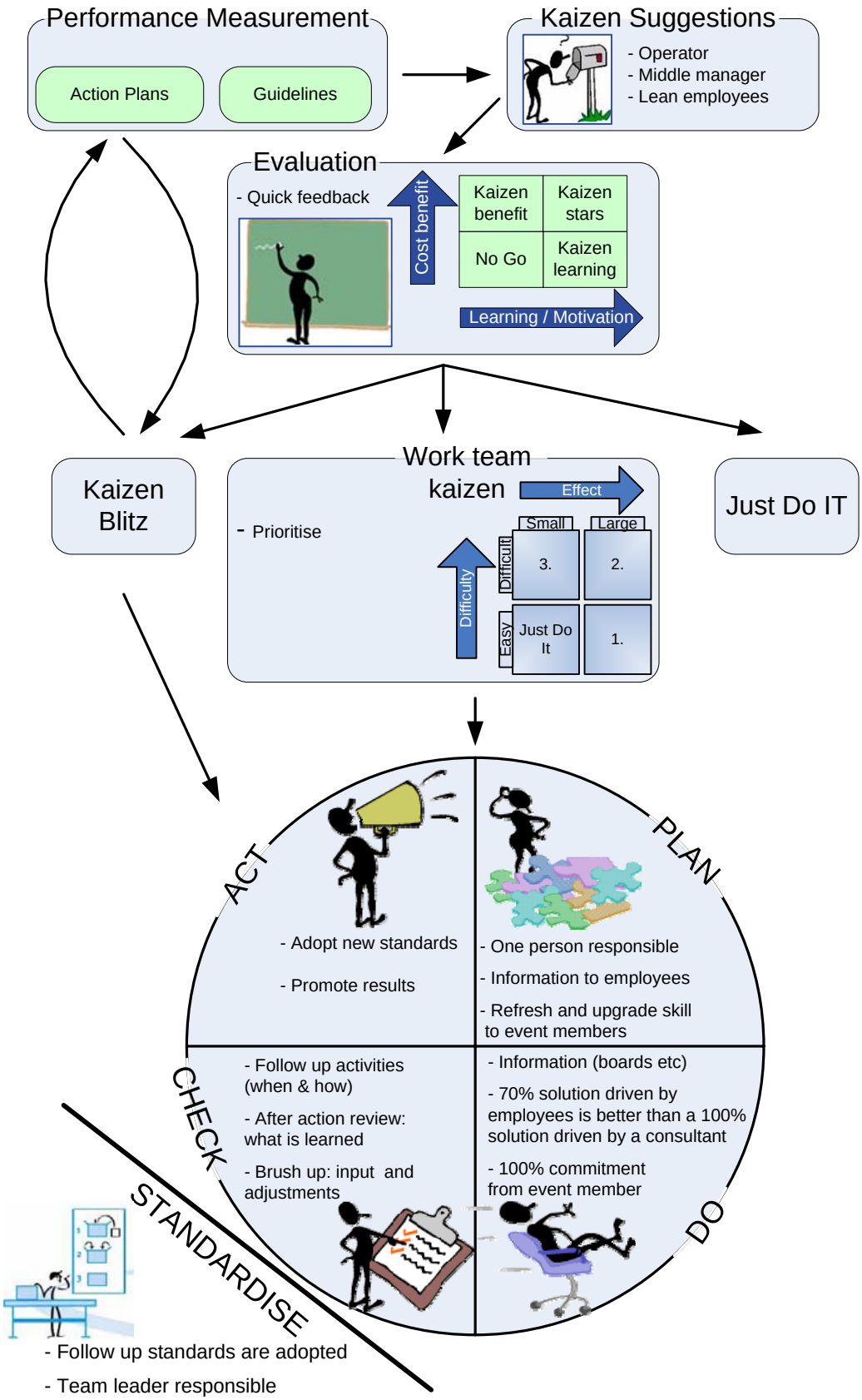


Figure 22-8: Evolution of kaizen blitz and work team kaizen

Kaizen model

A model to manage *kaizen* activities is illustrated in the figure below.


Performance Measurement
Action Plans
Guidelines
Kaizen Suggestions
- Operator
- Middle manager
- Lean employees
Evaluation
- Quick feedback
Cost benefit
Kaizen benefit
Kaizen stars
No Go
Kaizen learning
Learning / Motivation
Kaizen Blitz
Work team kaizen
- Prioritise
Effect
Small
Large
Difficult
Difficulty
3.
2.
Easy
Just Do It
1.
Just Do IT
ACT
PLAN
CHECK
DO
STANDARDISE
- Adopt new standards
- Promote results
- One person responsible
- Information to employees
- Refresh and upgrade skill to event members
- Follow up activities (when & how)
- After action review: what is learned
- Brush up: input and adjustments
- Information (boards etc)
- 70% solution driven by employees is better than a 100% solution driven by a consultant
- 100% commitment from event member
- Follow up standards are adopted
- Team leader responsible

It is recommended to use performance measurement to manage *kaizen blitz* events in action plans. Performance measurement must also intervene as guidelines for suggestions generated by all levels of the organisation.

Evaluation of suggestions must be done quickly with feedback to employees in order to keep motivation high. The evaluation of *kaizen* suggestion must not only be considered in a cost-benefit perspective but must also focus on learning created from *kaizen* events.

The *Plan-Do-Check-Act* approach to kaizen is recommended. A stronger focus has to be placed on the *Check step*, where *after action review* is recommended in order to create learning.

Standardisation is the foundation for improvements. Thus, it is recommended to pay attention to this area even though it opposes Danish culture. This makes it challenging for Danish companies to introduce standardisation. It is recommended to introduce standardisation gradually and consider the following suggestions.

• Involvement:	Teams have to find a best way to do things themselves
• Layout:	The layout of a work station has to support the standard
• *Poke yoke*:	*Poke yoke* has to be used more widely
• *5S*:	A clean and organised workstation is the foundation for standardisation

23 Final recommendation

The previous three parts present recommendations for each of the seven paradigms affecting lean in companies. The inter-relationship among the paradigms in Figure 3-2 has been highlighted throughout the thesis. This final recommendation integrates important aspects from each paradigm into a united approach for lean. It consists of following two parts:

1. Basic aspects for sustainable and continuous improvements
2. Generic lean model for sustainable and continuous improvements

When united, the two parts facilitate that improvements are sustained while new improvements are continuously implemented.

In addition to the model, the last section recommends where Danish companies, currently working with lean, must improve in order to reach the same high level as experienced in Japan.

3. Significant differences between Danish & Japanese companies

23.1 Basic aspects for sustainable and continuous improvements

Figure 23-1 highlights five elements which must be practiced daily in all phases of lean in order to sustain improvements and make continuous improvements. These five elements are essential conditions for the model presented in the next section. Companies need to pay attention to these areas in order to break away from traditional management styles and align management competences with lean.

5 vital elements essential for supporting lean	Further readings
1. Top management commitment and active participation	Chapter 19.3.1
2. Middle managers must use leadership and gemba	Chapter 19.3.2
3. Use sensei and/or consultants to guide the process	Chapter 15.3.3
4. High involvement of shop floor employees	Chapter 18.3
5. High information level in all phases	Chapter 18.3

Figure 23-1: Five supporting elements to create sustainable and continuous improvements

Few possibilities exist for leapfrogging the lean journey. However, knowledge can be disseminated through tactical promotions of lean experts to line and general managers with high commitment and understanding of lean (Chapter 16.3).

23.2 Generic model for sustainable and continuous improvements

The generic model is illustrated in Figure 23-2. All phases must be followed as illustrated. However, each phase must be adjusted to company specific circumstances such as size, culture, and degree of centralisation. The next five sections elaborate each phase in the generic model.

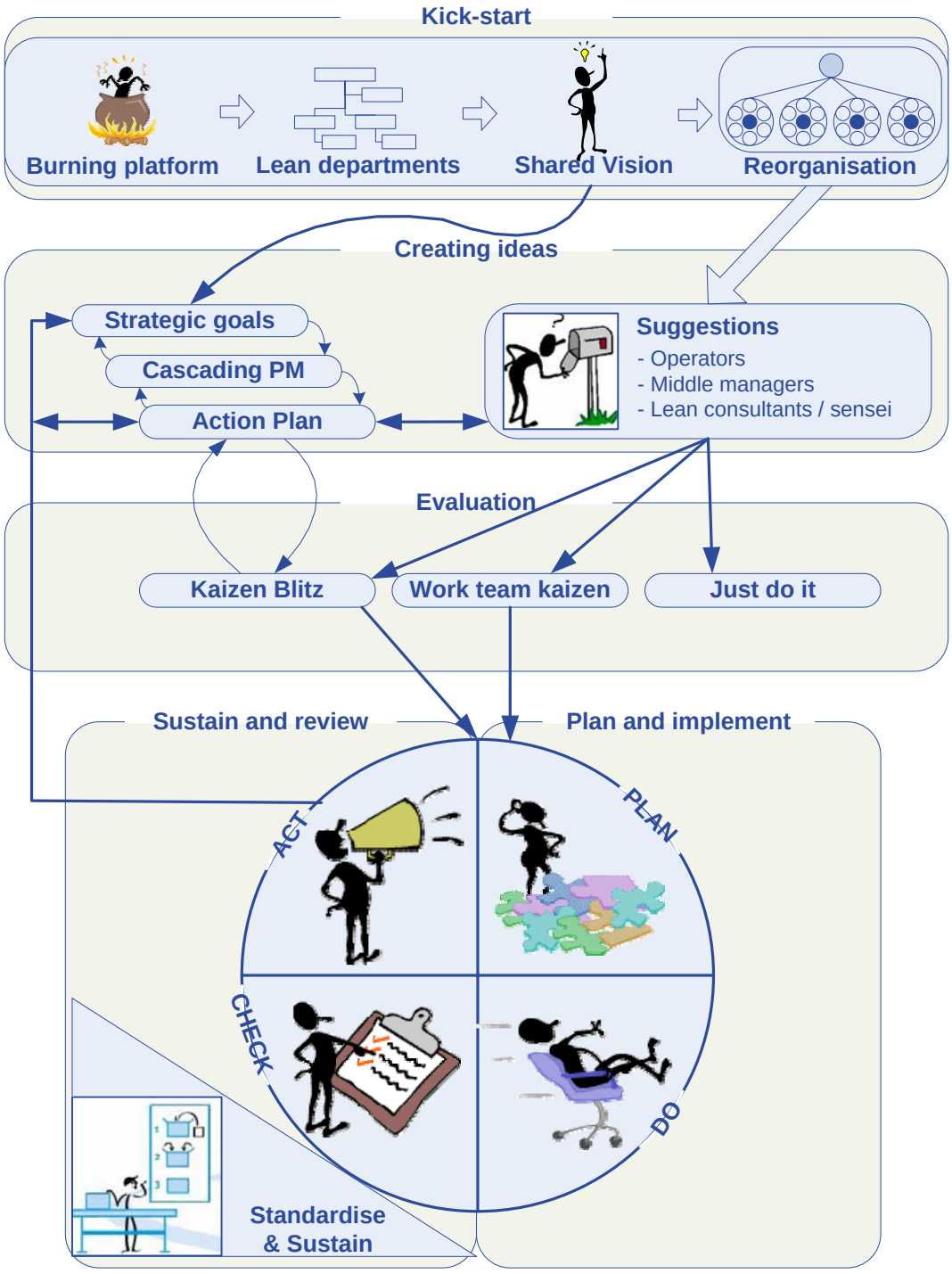


Figure 23-2: Generic model for sustainable and continuous improvements

23.3 Kick start

Figure 23-3 presents a detailed illustration of the *kick start phase* in the generic model.

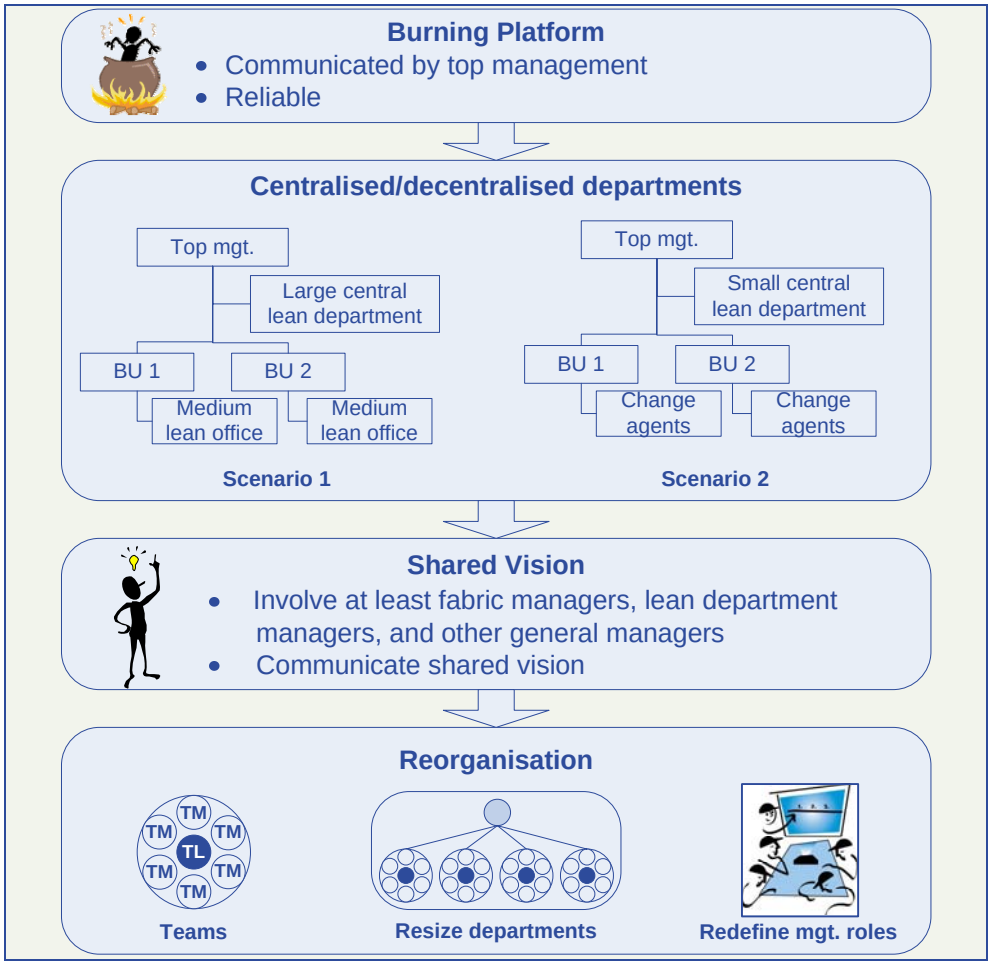


Figure 23-3: Kick start

Based on the paradigms planned change and culture change, it is recommended to initiate the lean journey by establishing a *burning platform*. This makes employees ready for change. Afterwards, the overall organisational structure must be established. Scenario 1 or 2 is recommended in order to ensure local involvement and ownership, which is essential for sustaining improvements and continuously improving.

In the initial stage, it is furthermore important that a wide spectrum of employees create a *shared vision*. All employees must get an understanding of the *shared vision* and why lean is important.

The final phase in *kick start* is to reorganise local departments and management roles. It is recommended to create teams with a responsible team leader. In order to create leadership it is furthermore important to keep the size of departments at a level where managers have adequate time to show leadership and *gemba*. This includes redefining managers' roles and responsibilities.

23.4 Creating ideas

Figure 23-4 presents a detailed illustration of the phase *creating ideas*.

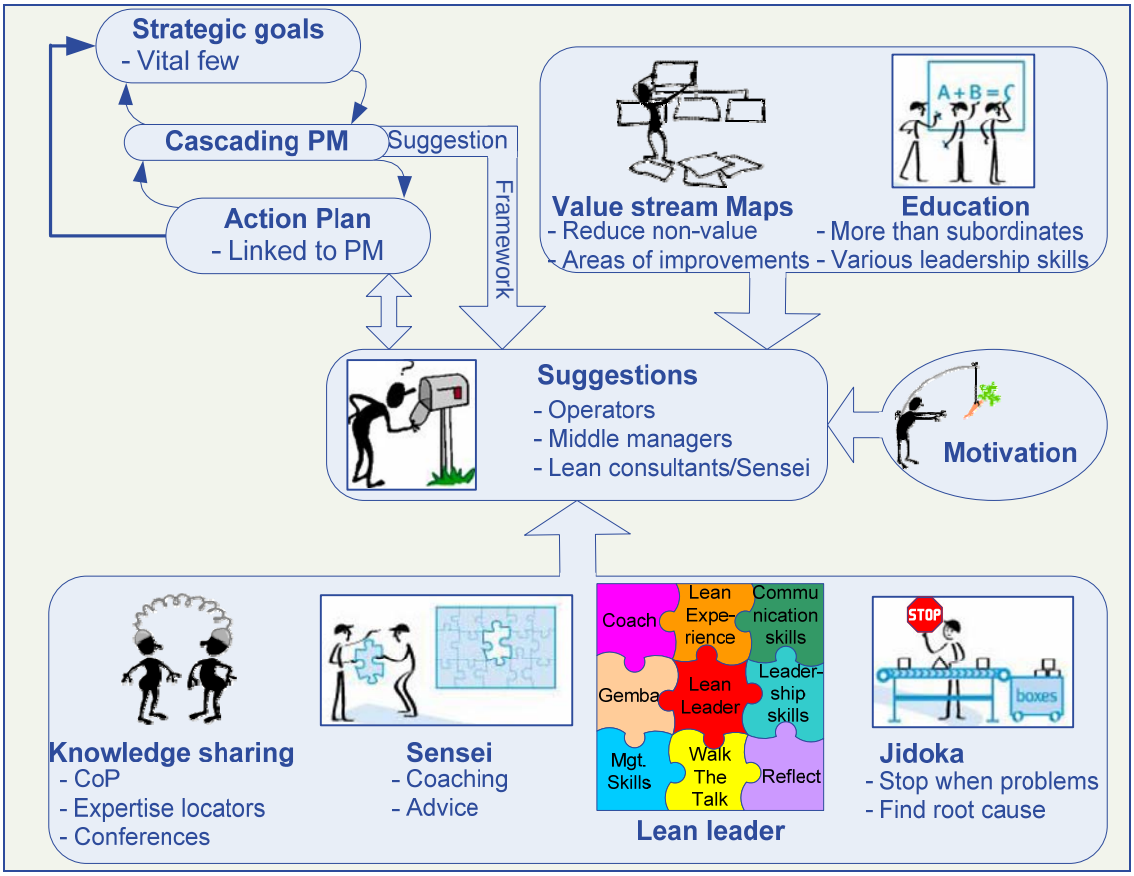


Figure 23-4: Creating ideas

Strategic goals must be based on the *shared vision* and performance measures should be cascaded down through the organisation. They should function as the framework in which improvement suggestions must be generated. Furthermore, an action plan with improvements must be developed accordingly to the strategic goals.

All levels of the organisation must assist in generating suggestions for improvements. This can only be accomplished by continuously providing employees with input, knowledge, and ideas for improving the current processes. A fundamental element is education of both operators and middle managers. In order for middle managers to step into a leadership role they must achieve more education than operators and in various leadership techniques. This enables them to become lean leaders and, for example, act as role models on *gemba*, walk-the-talk, and coach subordinates.

Knowledge sharing activities and a *sensei* furthermore assists employees in generating improvement suggestions. In addition, *jidoka* and value stream maps assists in identifying areas of improvements. Finally, various motivation techniques must be widely used in order to motivate employees throughout the entire process.

23.5 Evaluation

Figure 23-5 presents a detailed illustration of the *evaluation phase*.

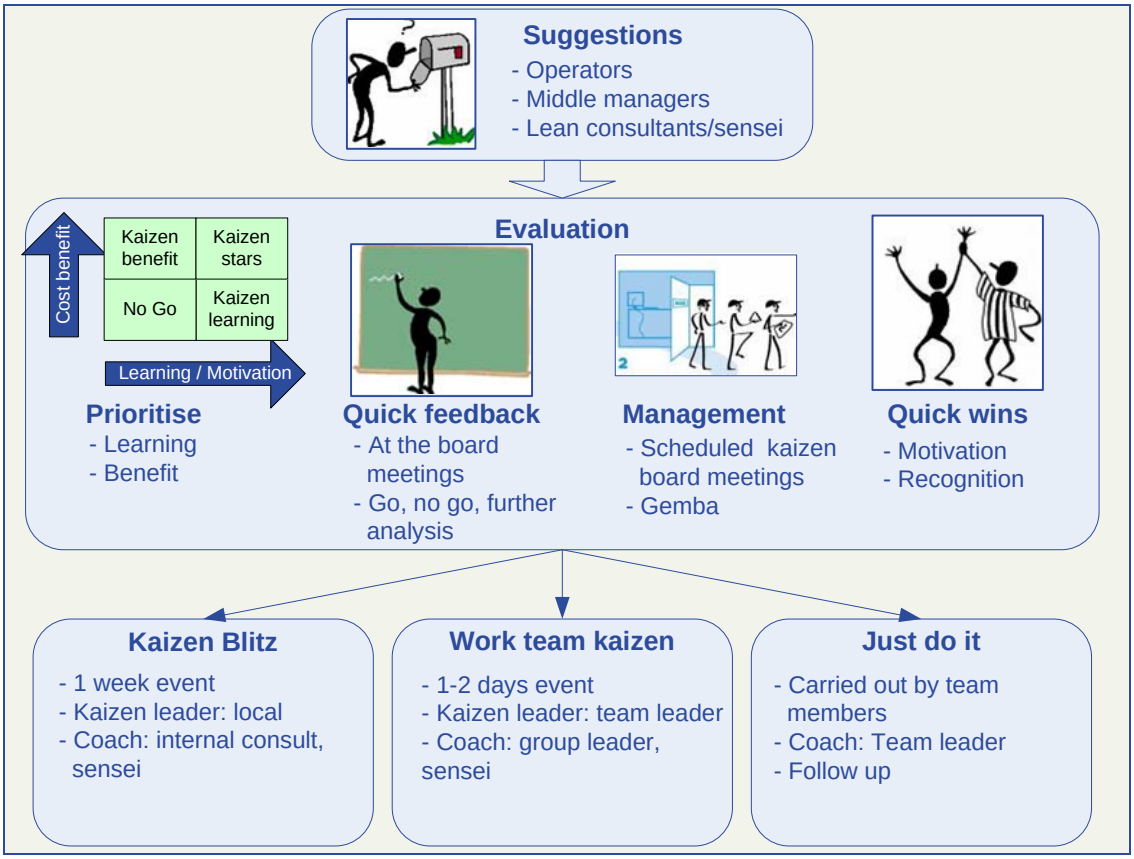


Figure 23-5: Evaluation

It is recommended to view *kaizen* in a long perspective in order to create a learning organisation. Thus, it is important not merely to evaluate suggestions from a cost-benefit perspective but also a learning perspective. Furthermore, prioritising improvements, which lead to quick wins motivate employees and create foundation for further suggestions. Management has to show *gemba* by participating on *kaizen* board meetings and provide quick feedback to subordinates.

23.6 Plan and carry out improvements & sustain and review

Figure 23-6 presents how to *plan and carry out improvements* while Figure 23-7 presents the last phase of the generic model *sustain and review*.

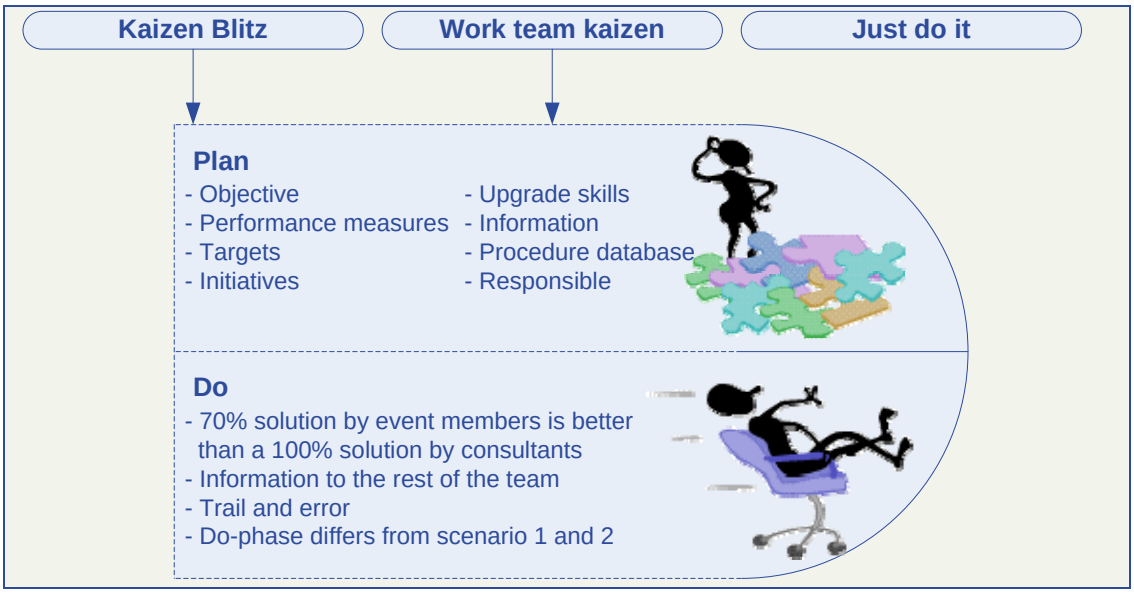


Figure 23-6: Plan and carry out improvements

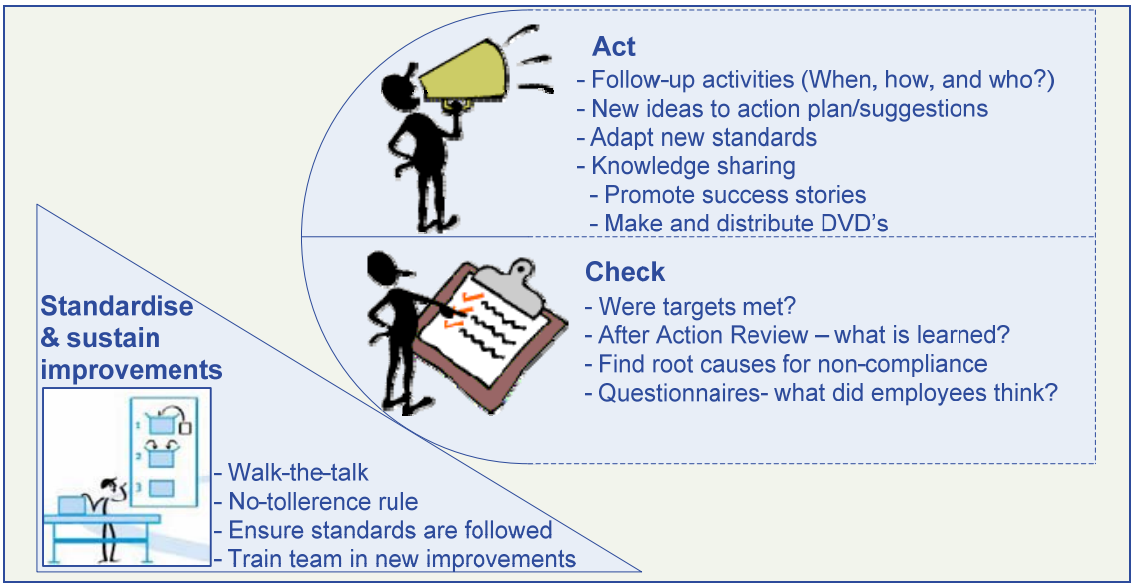


Figure 23-7: Sustain improvements and review process

It is recommended to carry out improvements based on all phases of the PDCA cycle. Furthermore, companies must sustain improvements by ensuring standards are followed. Managers and team leaders play a vital role as they continuously must ensure that standards are followed. This can be done through no-tolerance rule and training teams in the importance of following standards. Finally, continuous improvements ensure that prior improvements do not erode. *Check* and *act* stage creates ideas for further improvements, which ensures a loop back to earlier stages of the generic model for sustainable and continuous improvements.

23.7 Significant differences between Danish & Japanese companies

Our analysis of Danish and Japanese companies working with lean shows that Danish companies still have much to learn from Japanese companies. Danish companies have so far grasped the idea of the first pillar in Toyota's lean temple, *just-in-time*. However, most have forgotten the second pillar (*jidoka*) and other supporting elements to create sustainable and continuous improvements. We recommend Danish companies to include the techniques below in order to sustain improvements and create the basis for natural occurring continuous improvements.

- Jidoka
- Standardisation
- Leadership as opposed to management
- Gemba leadership
- Knowledge sharing
- Continuous use of a sensei
- Reflection and After Action Review

We recommend that Danish companies must consider lean as a *thinking production system* as oppose to a traditional production system. This includes that companies reflect upon and learn from their actions (*after action review*) in order to create continuous improvements and strike for perfection.

Conclusion

This master thesis has analysed how companies can sustain lean improvements and continuously keep improving. This chapter first presents the conclusion of the thesis' holistic approach. This is followed by a conclusion of national cultures impact on sustainable and continuous improvements. Afterwards, a conclusion of the recommendations is briefly outlined followed by putting the research into perspective.

23.8 Conclusion of the thesis' holistic approach

Literature review and a critical evaluation of a number of well recognised lean frameworks conclude that a holistic approach to lean is vital in order to achieve long-term results. This includes companies' ability to sustain improvements while continuously creating further improvements. To follow a holistic approach a number of parameters have been identified. Figure 23-8 illustrates the interrelationship between the identified parameters. As illustrated all parameters influence each other and companies must work with all of them simultaneously in order to create sustainable and continuous improvements.

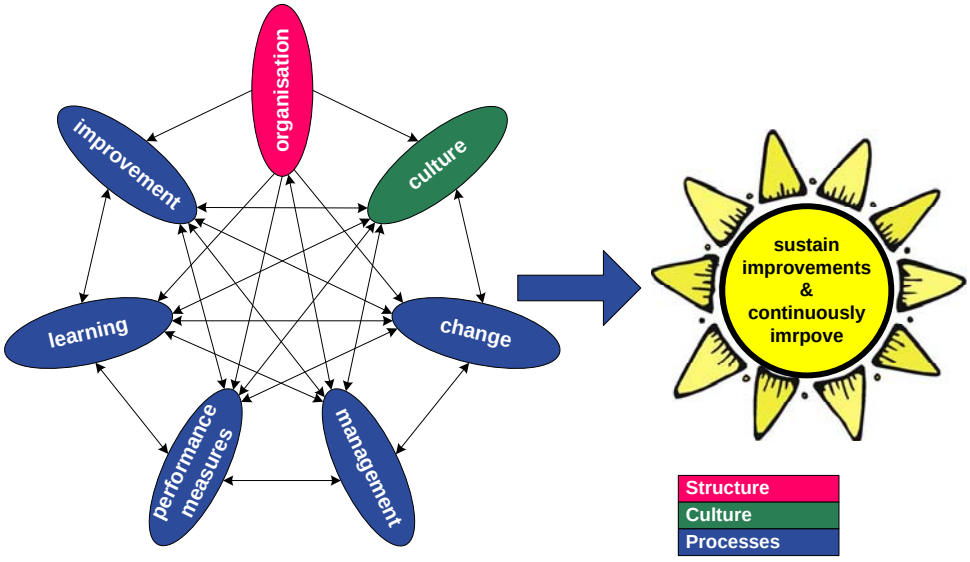


Figure 23-8: Seven important parameters to support sustainable and continuous improvements

23.9 Conclusion of national culture's impact on lean

Our research indicates that Japanese culture has a positive impact on Japanese companies' ability to sustain improvements and generate continuous improvements. Japanese culture is characterised by loyal employees who continuously seek perfection. Furthermore, Japanese culture is well-suited for standardisation, which Danish companies find challenging. Despite Danish companies challenges the research indicates that standardisation can be adjusted to Danish work conditions. Furthermore, it turns out that Danish employees can be satisfied and less frustrated by following standardised procedures.

Danish culture embraces involvement, empowerment, and are team oriented and innovative. These are key factors in creating a foundation for continuous improvements.

23.10 Conclusion of recommendations

A model for creating sustainable and continuous improvements is the main outcome of the thesis. The model can both be applied in companies who want to introduce lean and mature lean companies.

Furthermore, the research identifies areas in which mature Danish companies must focus upon in order to achieve the same high level as experienced in Japanese companies. These include:

- Jidoka
- Standardisation
- Leadership as opposed to management
- Gemba leadership
- Knowledge sharing
- Continuous use of a sensei
- Reflection and after action review

23.11 Putting the research into perspective

As the presented model is genetic it does not grasp company specific circumstances such as culture and size. Thus, before the model is applied in a company it must be adjusted to the company's specific circumstances.

As the generic model only targets sustainable and continuous improvements the model can be further developed. This might include steps in which lean tools and techniques are implemented in order to create a full model for lean implementation.

The thesis' seven paradigms are each of substantial size and constitute a potential for further research. In dept study of each paradigm in a lean perspective can be conducted as well as the interrelation among two or more paradigms. Furthermore, research can be carried out in order to identify how the paradigms can be implemented.

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Glossary

5 S:
- **Seiri/sort**: identify& separate necessary items from unnecessary items
- **Seiton/Set in Order**: neat placement and identification of needed work items
- **Seiso/Shine**: maintain a clean workplace
- **Seiketsu/Standardise**: maintaining *Seiri*, *Seiton*, and *Seison*
- **Shitsuke/Sustain**: *Seiri*, *Seiton*, *Seison*, and *Seiketsu* becomes a natural way of thinking for workers

5W: see *five whys*:

A3 Report: Report written on an A3 sized paper.
Proposal story include: Theme, Introduction, Proposal, Plan, Unresolved issues, Action plans
Status report story: Theme, Background, Objective, Implementation, Total effect, Unresolved problems / Future actions.

Andon board: A line-stop indicator board placed above the production line. It works as follows: When operations are normal the *green light* is on. When a worker wants to adjust something on the line and calls for help, he turns on a *yellow light*. If a line stops in order to correct a problem, the *red light* is turned on. To thoroughly eliminate abnormalities, workers must not be afraid of stopping the line.

Autonomation: Automation with a Human touch. *Autonomation* means transferring human intelligence to a machine. At Toyota, this concept is applied not only to the machinery but also to production lines and workers. In other words, if an abnormal situation occurs, a worker is required to stop the line. *Autonomation* prevents the production of defective products, eliminates overproduction, and automatically stops abnormalities on the production line allowing the situation to be investigated.

Batch and queue: In traditional mass production, products are produced in functional isolated department according to the formula of economic order sizes. First when one batch is finished from one operation it is transferred to another.

Cycle time: the actual time taken by an operator to process a piece of product

Gemba: A Japanese word meaning "*real place*" – now adapted in management terminology to mean "*workplace*" – or the place where value is added. In manufacturing, it usually refers to the shop floor.

Genchi Genbutsu: The tangible objects found at *gemba* such as work pieces, rejects, jigs, tools, and machines

Heijunka/levelling: Levelling is required in order to prevent fluctuations in production. Production is levelled by first making first one model, then another model, then yet another.

Hoshin Kanri: A Policy Deployment framework is a mix of planning and execution. Goals are cascaded top-down and achievements are reported bottom-up.

Ishikawa /Cause and effect diagram: Structured problem solving tool

Jidoka: Defect control. Jidoka is a device that stops a machine whenever a defect product is produced. Jidoka is about automation with a human touch.

Jishuken: Lean study teams to implement lean activities between the company and its suppliers

JIT: *Just-in-Time*: producing only what is needed, when it is needed, and in the exact amount needed. This can be achieved by eliminating all kinds of *muda* in a company's internal processes.

Just do it: Kaizen activities that do not need any planning but can be implemented right away, often by the employee herself.

Kaizen: Continuous improvements

Kaikaku: Radical improvements

Kaizen Blitz: Kaizen event that usually last for one week. It is an intensive event that targets a specific problem. It includes a lean coordinator as supporter and involves local employees to participate in the event. Typically, about six employees participate.

Kanban: Tag-like card that communicates product information. A *kanban* is a tool for managing and assuring *just-in-time* production, the first pillar of the Toyota production system. Basically, a *kanban* is a simple and direct form of communication, located at the point where it is needed. In most cases, a *kanban* is a small piece of paper inserted in a rectangular vinyl envelope. The Kanban describe how many parts to pick up or which parts to assemble. A later process goes to an earlier process to withdraw needed goods.

Levelling: see *Heijunka*

Muda: Japanese word for waste

Mura: Japanese word meaning irregularity or variability

Muri: Japanese word meaning strain and difficulty

OMCD: Operation Manufacturing Consultant Division at Toyota. OMCD is Toyota's central lean department. It includes all experts of Toyota Production System.

One-piece flow: Only one work piece is allowed to flow from process to process. This minimises *muda* in a *just-in-time* production system.

PDCA: *Plan-Do-Check-Act* - the basic steps to be followed in making continuous improvements (*kaizen*)

Poke yoke: Foolproof – a mistake proofing devise that prevents defects from being made.

QCD: Quality, Cost, and Delivery

Quality Control Circles: Quality improvements or self-improvement study groups composed of a small number of employees (ten or fewer). The *QC circle* voluntarily performs improvement activities within the workplace.

SDCA: Standardise-Do-Check-Act - Linked with kaizen and the PDCA cycle. Standardisation of improvements.

Seiri: see 5S

Seiton: see 5S

Seiso: see 5S

Seiketsu: see 5S

Sensei: Someone who is born before you – illustrating a wise person. Professor or and expert.

Shitsuke: see 5S

Six Sigma: Six Sigma is a quality framework and a concept of reducing variations to below 3.4ppm (part per million)

SMED: *Single Minute Exchange of Die* – It was developed by Shigeo Shingo in order to reduce changeover time. The aim is to reduce changeover times to single digit minutes. Today, SMED is one of the tools most practised in lean.

Standard work procedure: For *just-in-time* production to be carried out, standard work sheets for each process must be clear and concise. The three elements of a standard work sheet are:
1. *Cycle time*: The length of time (minutes and second) in which one unit is to be made
2. *Work sequence*: The sequence of work in the flow of time
3. *Standard inventory*: The minimum amount of goods needed to keep the process going.

Takt time: The takt or rate of products sold. Takt time is determined by dividing the total production time by the number of units to be produced.

TPM: - *Total productive maintenance*. TPM aims at maximising equipment effectiveness throughout the entire life of the equipment. *TPM* involves everyone in all departments and at all levels; it motivates people for plant maintenance through *small-group* and autonomous activities, and involves such basic elements as developing a maintenance system, education in basic *housekeeping*, problem-solving skills, and activities to achieve zero breakdowns and accident-free *gemba*. Autonomous maintenance by workers is one of the important elements of *TPM*. *5S* is an entry step of *TPM*.

TPS: Toyota Production System

TQM: *Total Quality Management* – TQM is a holistic approach to manage quality.

Visual management: An effective management method to provide information and *genchi genbutsu* in a clearly visible manner to both workers and managers so that everybody understands the current state of operations and the target for *kaizen*. It also helps people identify abnormality promptly.

VSM (Value Stream Mapping): mapping the value stream

Five whys: A commonsense principle of determining the root cause of a problem. The basic of Toyota's scientific approach is to ask "*why five times*" whenever you find a problem. By repeating *why five times*, the root cause and the nature of the problem as well as its solution become clear.

Work team kaizen: Kaizen event that are made in local teams, often with support from a lean consultant. It lasts between 1-3 days and involves the team members.