



**CHALMERS**  
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# **How to evaluate and sustain continuous improvements**

## **A case study of Volvo Construction Equipment**

Master's Thesis in Quality and Operations Management

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MASTER'S THESIS E2015:038

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## Abstract

Having continuous improvements strategies in organizations are of importance in today's competitive environment. It is also important to sustain the improvements to obtain long-term results. Assuring sustained improvements is however often a challenge for companies and how to investigate if improvements are sustained has not been an area for extensive research. Therefore these areas have been the focus for this study.

A case study with an inductive approach was performed at Volvo Construction Equipment (VCE) that has a continuous improvement strategy called Operational Development (OD) where improvements are performed in teams. Information from these improvements is stored in a database which created an opportunity for investigating to what extent improvements are sustained. The improvements in the database were categorized and resulted in ten categories showing the chosen improvement areas selected by the improvement teams. To investigate what categories of improvements that have been sustained a follow-up tool was created. The follow-up tool was created as an Excel-file where information regarding implementation of improvement, sustainability and positive impacts could be collected. The tool takes three levels of sustainability into account and considers both a static and dynamic perspective. A pilot investigation with the follow-up tool was performed at one of VCE's sites to see what the results could show and this generated information regarding sustained improvements in that site.

In parallel, 20 semi-structured interviews were performed to analyze factors affecting sustained improvements. These factors were divided into *important but not decisive* and *important and decisive* factors. The important but not decisive factors were *timing and importance, common interest and clear goals, and learning* but these alone do not assure sustained improvements based on the case study. *Management involvement, systems view and involving stakeholders, systematic work approach, measuring results, and standardization* were important and decisive factors for sustaining improvements. Another finding was that the above factors are interrelated which indicates that they should not be seen in isolation. Based on the discussion it was also found that the PDCA-cycle has a potential to play a more important role for improvement work and sustained improvements.

Key words: Improvements, continuous improvements, sustaining, important and decisive factors for sustained improvements, and follow-up.



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## Abbreviations

CI	Continuous Improvements
HYFU	Half Year Follow Up. Seminars in the end of the Operational Development cycles at Volvo Construction Equipment where participants present improvement results
IC	Internal Consultant
ECN	Engineering Change Notice is an object specifying which changes have been made to documents and parts.
OD	Operational Development. A continuous improvement strategy implemented at Volvo Construction Equipment
PDCA	Plan-Do-Check-Act. A learning and improvement cycle commonly used for improvement work
SF	Strategic Focus. A strategic direction given by the top management of the Operational Development process at Volvo Construction Equipment
SR	Strategic Reasoning. How the strategic focus, strategic direction from top management is communicated.
Teamplace	Internal communication platform at Volvo Group
TQM	Total Quality Management
VCE	Volvo Construction Equipment



# **1 Introduction**

Organizational development is practiced in most companies with the intention to improve the total organization by improving the functioning of the individuals and the teams to achieve business excellence (Cheung-Judge and Holbeche, 2011). Business excellence is desired by companies and can be achieved by developing creative solutions and performing continuous improvements in products and processes. Continuous improvement efforts are performed by many organizations and are a critical focus of most industrial companies as a strategy to remain competitive (Jamee Ali et al. 2013). However, only performing improvements is not good enough, it is also of importance to investigate the results and outcomes of the improvements and to making them sustained (Kaye and Anderson, 1999). As mentioned by Jamee Ali et al. (2013) the sustaining of improvements is often a struggle for organizations and therefore an area to explore deeper. This is also emphasized by Drew (2004) stating that a difficulty for many organizations is to ensure the sustainability of improvements in the long term (Drew, 2004).

One of the many companies working with a continuous improvements strategy is Volvo Construction Equipment (VCE), a part of Volvo Group. VCE has a continuous improvement strategy called Operational Development (OD). VCE is a learning organization and has realized that to develop OD and ensure sustained improvements in the process an investigation could be beneficial. This master thesis is a part of VCE's continuous learning process to develop and improve OD. The company holds unique data of improvements performed during three years of the continuous improvement strategy and this data is available for the researchers. According to Buchanan et al. (2005) investigating sustainability demands longitudinal study therefore there is now an opportunity to evaluate the amount of sustained improvements. A systematic sustainability analysis at VCE can be performed to investigate the improvements and to understand how to secure the continuous improvement strategy in terms sustaining of achieved results. This could be of importance since as mentioned above a challenge for organizations is to sustain improvements.

## **1.1 Purpose**

The purpose of this study is to investigate continuous improvements performed in a technology organization to understand if implemented improvements are sustained and how they can be sustained. The thesis therefore aims to investigate the extent of sustained improvement work by finding a way to follow them up. Furthermore, the thesis aims to analyze factors that can lead to improvements being effective and sustained within an organization.

### **1.1.1 Problem analysis and research questions**

Continuous improvement strategies are common among organizations that want to become competitive and respond to external environment (Kaye and Anderson, 1999). However, there is not only a need to perform continuous improvements, it is important to also evaluate results and make them sustained (Kaye and Anderson, 1999) which are among the challenges for organizations today (Drew, 2004). To understand the effect of a process or project implemented in an organization, the evaluation should be performed at some time after implementation. Since the improvement work at VCE has been going on during the last three years with a lot of improvements that have been performed, the people involved have had the opportunity to think and reflect over their improvement work. Therefore it can be investigated what has been improved and sustained over time. In the case of VCE no extensive investigation of the improvements has been made to analyze and understand the sustainability of them. There is now an opportunity to investigate sustainability of the improvements and to investigate the results from the OD process during this study. To be able to investigate to what extent improvements within a company are sustained it could be of importance to find a way to follow them up. Having this in mind, the following research question was formulated:

**RQ1:** How can continuous improvements be evaluated to investigate if the improvements are sustained?

As stated by Drew (2004, p.19) “The real challenge is making change stick”. Therefore, this study aims to look deeper into what it is that enables sustained improvements. By understanding how to achieve sustainable improvements and what the key factors are for improvement teams a company increase its efficiency and achieve more long-term results. This in turn can give ideas on how a continuous improvement strategy could be improved and what areas an organization could pay attention to. The importance of sustaining continuous improvements led to the second research question stated below.

**RQ2:** What are key factors for success for implementing and sustaining improvements?

### **1.1.2 Outcomes**

One result from the thesis is a categorization of improvements performed globally from six improvement cycles during three years performed by the different OD teams at VCE Technology's eleven sites. These improvements are also compared to strategic focuses set by the top management of VCE to investigate trends and variations of the improvements and the effect of the given strategic focus. Another result is an evaluation of how improvements can be followed up and also how to work in improvement teams to secure that improvements are sustained. The study results in a follow-up tool that could be utilized when investigating the number of sustained improvements. Based on the outcomes of the

study, recommendations can be given regarding what types of improvements that could be made in the OD process and improvement work.

### **1.1.3 Delimitations**

The OD process is established within different functions of VCE, however this study will only focus on the function VCE Technology which is the product development division. The study focuses on investigating if the improvements in the OD process have been sustained to understand how continuous improvement work within a company can be improved. The categorization of the improvements performed within OD was done globally however interviews have been restricted to VCE's sites in Braås and Eskilstuna in Sweden due to time constraints and possibilities to be able to handle the amount of data. The interviews generated valuable information regarding the OD-teams' improvement work and important factors for sustained improvements.

This study has focused on creating a systematic way of analyzing sustained improvements according to a follow-up tool and due to time constraints it was only put in use for the site VCE Braås. Since VCE is a global organization the intention is that the tool could be used on the other sites in the future but implementing the tool to other sites will not be included in this study. Due to the intention literature regarding the importance of cultural aspects could be of importance for the company. However as it will not be analyzed because of the delimitations of focusing this study on the sites in Sweden it is therefore only included in Appendix A for further reading.

### **1.1.4 Thesis outline**

In the following chapter the theoretical framework for this research will be presented. First there will be a description of organizational development and some lean principles followed by the importance of continuous improvements. Thereafter the theoretical framework continues with a definition of sustainability and presents factors affecting sustained change and improvements within an organization.

In chapter 3 The case of Volvo Construction Equipment, a presentation of the company and the improvement strategy that has been the case analyzed in this research is given. This is followed by chapter 4 Method where the methods used for this study will be described in detail. Methods for data collection and data analysis will be described as well as how the literature review has been performed. The chapter describes the interviews that were performed to get deeper information regarding the improvement work within the OD process.

To investigate the improvements performed a follow-up tool was also created in this study which included structured interviews performed by the Internal Consultants involved in the OD process. Chapter 5 Follow-up tool gives the reader a presentation on the follow-up tool.

This chapter includes information regarding the creation and structure of the tool as well as the testing and validation of the generated results.

In chapter 6 Empirical findings all the empirical findings are presented from the categorization of improvements performed, from the follow-up tool and from the interviews. The empirical findings are subsequently analyzed and discussed in comparison with literature in chapter 7 Discussion. Based on this and the aim of the study conclusions are drawn in chapter 8 Conclusion where possibilities for future research are also presented. The report ends with recommendations presented for Volvo Construction Equipment in chapter 9 Recommendation regarding what the company could consider based on the outcomes of the study.

## **2 Theoretical framework**

In this chapter the theoretical framework for the study is presented. First a description of the importance of organizational development is given which continues with a brief introduction to lean philosophy. The continuous improvement strategy Operational Development at Volvo Construction Equipment is influenced by lean principles through its strategic focuses. Furthermore, theory regarding the importance of continuous improvements in organizations is also given. The second section presents a definition of sustainability and elaborates on important aspects affecting improvement work within organizations as well as sustained improvement work that is mentioned in literature.

### **2.1 Organizational development**

There are various ways to create organizational development to improve the functioning of individuals, teams and operations and by that improve the total organization (Cheng-Judge and Holbeche, 2011). Implementing improvement programs to integrate a process of quality improvement is a common way for organizational development. It can be compared to organizational innovation which is described as a new organizational method in workplace, business practices or external relations and examples are Total Quality Management and Lean which are all implemented throughout intended organizations (Alänge and Steiber, 2011). When diffusing new practices and methods through global companies the organizational culture can be of importance to take into account (Miconnet and Alänge, 1999). With organizational development the desire is to achieve business excellence that can be reached by among other things creative solutions and by consistently working with continuous improvements (Jane Ali et al. 2013).

#### **2.1.1 Lean**

As mentioned above organizational development can be achieved by implementing improvement programs throughout the organization and Lean production is one example. It has become more common today that companies take on lean initiatives and are influenced by the lean way of working. Lean production can be described as a philosophy of reducing waste in all kinds of ways and putting the focus on customers (Bergman and Klefsjö, 2010). In Lean terms, waste is called by the Japanese word “Muda” and stands for all activities that take time to perform but do not create any value for the customer. By defining what adds value and does not add value for the customer, different kind of non-value adding waste can be defined. There are eight types of waste often discussed when dealing with Lean; Overproduction, Waiting, Transport, Over processing, Motion, Inventory, Defects and Underutilization of people's creativity (Liker, 2009).

Reducing lead-time is also a critical focus in the philosophy of Lean to increase efficiency, productivity and profitability (George et al. 2005). As discussed by Liker and Meier (2006) reducing and eliminating waste is seen as the main focus of Lean and reducing lead-time is a measurement that can be used in order to measure the performance in the waste

reductions. Overall, working with eliminating waste results in cost reduction, quality improvements etcetera and therefore reducing waste and reducing lead-time is strongly connected to each other. As reducing lead-time could lead to reduction of waste and in turn reduction of costs (Liker and Meier, 2006) it is clear that these are interrelated.

### **2.1.2 Importance of continuous improvements**

It is important with continual renewal for organizations in rapidly changing environments (Buchanan et al. 2005) where developing of an organization is becoming more and more important (Cheng-Judge and Holbeche, 2011). In companies today it is therefore a huge need for continuous improvements (CI) to stay competitive on the market (Jane Ali et al, 2013). As stated by Kaye and Anderson (1999, p.486) “For an organization to achieve flexibility, responsiveness and the ability to adapt quickly to changes within its environment, the implementation of a sound strategy for continuous improvement is essential”.

CI is defined as “a collection of activities that constitute a process intended to achieve performance improvements” (Jane Ali et al. 2013, p.409). Stated by Liker and Meier (2006), when working with CI it is important to emphasize that the improvement work never ends. Taking one step does not mean that you are finished but instead it is the start of the next step of improvements needed. Therefore as stated by Liker and Meier (2006, p.311) “...improvements must occur at all times at all levels by all individuals” and are beneficial for companies to improve both in the short and long term. There are many benefits to gain from working with CI. Mentioned by Ward (1994) and Jane Ali et al. (2013) companies can increase the quality, reduce the lead time and have fewer errors which in turn lead to a reduction of costs and better quality. This can increase the company’s competitiveness on the market and the satisfaction of customers. There are also benefits to gain in terms of empowering the employees in the work with CI which can increase their commitment to the organization. Therefore it is of importance that both managers and employees get involved in the CI work to make everyone committed to the improvements made (Ward, 1994).

However, when working with improvements the critical part is to sustain them. This can be problematic for a lot of companies since it includes changing peoples’ behavior and mindset towards the importance of sustained improvements (Jane Ali et al. 2013). Therefore it is good to keep track and monitor the activities that supports the improvements and improvement process to remain effective. Assuring that the improvement work is integrated into the organization and the daily work is of importance to direct the mindset towards continuous improvements (Jane Ali et al. 2013).

## **2.2 Sustainability and important factors for improvements and changes**

When analyzing sustainability of improvements and changes it is necessary to define what is actually meant by the word sustainability. A definition is set by NHS Modernisation Agency (2002, p.12), “Sustainability is when new ways of working and improved outcomes

become the norm”. Therefore, when analyzing a change or improvement a while after its implementation it should not have regressed to old ways of working or old performance levels (NHS Modernisation Agency, 2002). In that sense, improvements and implemented changes should persist for a period of time suitable for a specific context (Buchanan et al. 2005). As mentioned by Buchanan et al. (2005) sustainability can be seen as both a trajectory of performance improvements with a more dynamic perspective or as a static perspective. Sustaining through a dynamic perspective, trajectory, means that the change or improvement can be further developed a long time while the static perspective is referring to as pure sustainability of methods and tools. It is also mentioned that for organizations in rapidly changing environments it is critical with continual renewal and therefore a dynamic perspective might be needed. While a more stable environment could utilize a more static perspective. Important to understand is that the definition and measurement of sustainability depends on the actual situation as well as the intentions with the changes and improvements (Buchanan et al. 2005). For this study sustainability will be defined as improvements that are implemented, exist today and/or continuously used after its implementations and/or further developed.

According to Buchanan et al. (2005) there are four factors that affect the sustainability of organizational change. As mentioned, sustaining of change depends on the actual situation the change was implemented in. Therefore it is stated “that the process of sustaining change is dependent on the interplay of multiple factors on different levels of analysis and timeframes.” (Buchanan et al. 2005, p.201). The four factors that can affect sustainability are “Substance of change” that includes importance of the change, change process and timing of change; “External context” referring to uncertainty and instability in the external environment; “Internal context” consisting of an organization’s receptiveness towards change; and seven “Organizational factors” including managerial, financial, individual, organizational, leadership, political and cultural factors that can interact in various ways (Buchanan et al. 2005).

By performing a literature review some aspects affecting improvement and change work and the sustainability of them were identified. In the subsections below, these are further explained.

### **2.2.1 Systems thinking and involving key persons**

To enable continuous improvements and gain long-term benefits from them, it is important to create a common understanding in the organization and to ensure that the employees know how their work can contribute to the overall system (Rodgers, 2008). Systems thinking can be explained as thinking in a larger context. The system itself is put into relation with its environment and the view is on the system and its role in contrast to the larger surrounding (Gharajedaghi, 2011). The means of having a systems thinking is to see and understand the work as a complete system to understand how some efforts can affect

other parameters or persons within the organization (Rodgers, 2008). When applying systems thinking to an appropriate situation new insight can be created and problems and solutions can be addressed more effectively by taking a larger amount of influencing factors into account (Aronson, 1996). According to Aronson (1996) systems thinking is very effective for improvement work, such as problem solving, and some examples mentioned are recurring problems, complex problems and problems with indistinct solutions.

Involving persons that will be affected by an improvement or change is stated by Nadler and Tushman (1997) as creating possibilities for participation which in turn can increase the receptiveness towards a change. Involving other persons also allows for taking important aspects into consideration (Rodgers, 2008). For improvement or change work to be successful and result long-term outcomes it is also beneficial to include key power groups to gain support for the improvement's implementation (Nadler and Tushman, 1997).

### **2.2.2 Management involvement**

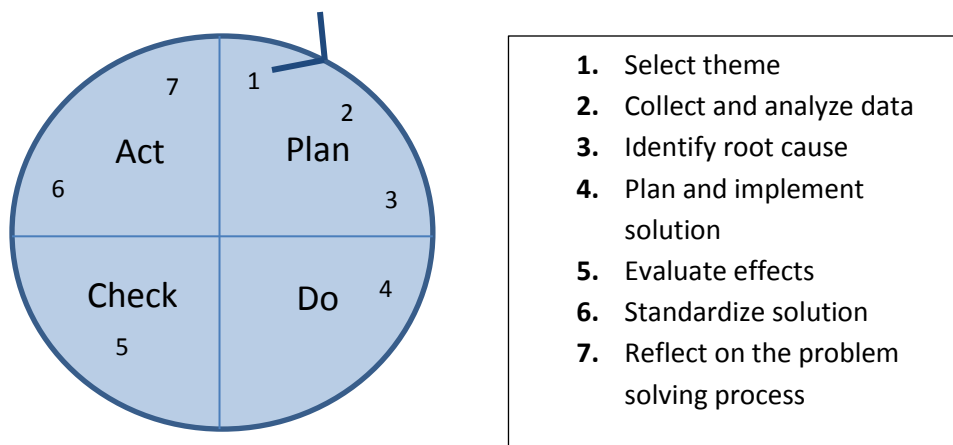
Spitzer (2007) argues that in order for a change to be sustained and improved in the organization it is highly dependent on the management and leaders to be committed and focused on creating motivation for the staff. Stated by Janee Ali et al. (2013) management of improvement work, such as CI, is important for its sustainability and includes management involvement and participation in CI activities. Management involvement can be in the form of participating in weekly meetings or being involved in the improvement teams to create motivation among employees. Other ways of creating motivation are communicating with team leaders and by having recognition systems when improvements have been achieved (Janee Ali et al. 2013).

According to Bergman and Klefsjö (2010) a lot of responsibility lies on the leader in a change or improvement process. The leader is responsible for driving change or improvement work forward (Knorr, 1993) and to manage it successfully it is essential to communicate the needs and importance for changes. As discussed by Fazl Mashhadi et al. (2012) management can influence the employees to a high extent and thereby more easily create acceptance for the upcoming changes and create motivation. Creating an understanding for the change and importance of improvements can be communicated not only through words but also through actions. According to Miller (2004) managers can create better understanding among employees by setting a good example with their own behavior, as management behavior can influence employee behavior. This is of importance as nothing will change unless the people change (Miller, 2004). By changing both managers and employees behaviors more in line with the changes or improvement processes it can be easier to integrate a new way of working into the organization (Fazl Mashhadi et al. 2012). As stated by Nadler and Tushman (1997, p.601) regarding managers; "they can serve as models; through their behavior, they provide a vision of the

future state...” and can thereby affect the change or improvement process with their own behavior. Nadler and Tushman (1997) state that one factor to enhance improvement work and change management is to be a supportive leader that also provides the necessary resources and increase the understanding of the changes being made. The employees can thereby feel involvement to a higher extent which can create ownership and personal connection (Fazl Mashhadi et al. 2012; Miller, 2004).

### 2.2.3 Plan-Do-Check-Act

Working in systematic ways with improvements and changes can be beneficial for successful and sustained results and one example of a systematic way of working is the PDCA-cycle by Deming (1986, 1993) which can be seen in Figure 2.1 with critical steps to perform as stated by (Shiba et al. 1993)



**Figure 2.1** PDCA-cycle and the critical steps (Shiba et al. 1993)

The PDCA-cycle stands for Plan-Do-Check-Act but can also be changed to Plan-Do-Study-Act (Bergman and Klefsjö, 2010). Deming (1986) first described the cycle as the Shewhart cycle and it was presented as a helpful step-to-step procedure to use for improvement work in organizations to work systematically and to learn from previous work. According to Shiba and Walden (2001, p.124) there are important steps that should be performed in each phase for efficient problem solving and improvement work. *Plan* consists of identifying the real problem. This is done by selecting a theme for the improvement work and collecting and analyzing data to find its root cause(s). It is of importance to understand the real problem before starting with execution and implementation to make sure that right problems are attacked and not only symptoms of the problems (Shiba and Walden, 2001).

The following step is *Do* and is the execution phase and consists of planning the work and implementing the solution (Shiba and Walden, 2001). In this phase the actual change and improvement is carried out and the solutions are implemented (Bergman and Klefsjö, 2010). Shiba et al. (1993) also emphasized the importance of also defining measures for the

improvement work to base the evaluation of the outcomes on. It is critical to define how to assure that intended outcomes are achieved to understand when they are achieved (Shiba and Walden, 2001).

In *Check*, the effects of the improvement or solution should be evaluated to understand if the improvement work has led to any positive results (Shiba and Walden, 2001).

If effects are positive it is important to make sure that the improvement is sustained and kept within the organization which can be done in the phase *Act*. This phase consists of integrating the improvement or solution into the organization by standardizing and spreading the solution to others. In this phase, both Deming (1986) and Shiba and Walden (2001) also discuss the importance of learning from the improvement work by reflection, to bring forward learnings to further work in the organization.

#### **2.2.4 Measuring results**

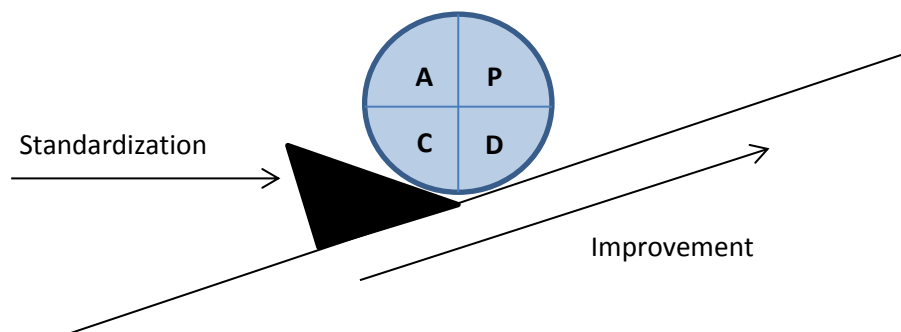
As mentioned above in the PDCA-cycle, measuring results are of importance and also emphasized by Spitzer (2007) stating that measurement and results are important factors for sustainability. These aspects are closely connected as the measurements should highlight the results. Successful results and performances should be recognized to encourage the improvement work (Spitzer, 2007). The importance of measurements and results are also reinforced by George et al. (2005) stating that comparing the new state with the former state will give an indication of the level of improvement. It is important to know the base in order to understand what the improvement or change has achieved and resulted in (George et al. 2005). Sometimes, measuring results can be difficult, as in the case of measuring the productivity of a labor force or transforming productivity into cost savings (Aruleswan, 2009). However, finding a factor to base the evaluation and improvement work on is important to evaluate effects and for sustained results (Shiba et al. 1993; George et al. 2005) To achieve a measuring organization the importance of measuring must be integrated within the organization's culture (Aruleswan, 2009). By understanding the improvement's positive effects the employees can be motivated to further improve it which can lead to dynamic sustainability (Spitzer, 2007; Buchanan et al. 2005).

Stated by Kaye and Anderson (1999) positive effects are not only related to financial results and for improvement work sometimes financial results should be avoided as they can be misleading or complicated to calculate. Positive effects are also related to the results based on organizational, individual and team performance and other benefits gained from the work (Kaye and Anderson, 1999).

#### **2.2.5 Sustaining through standardization**

As stated, the PDCA-cycle can beneficially be used for improvement work and to make sure that implemented changes and improvements stick with the new ways of working and becoming the norm, standardization and integration of work is of importance.

Standardization is intended to hinder the improvement from reverting to old ways of working or old performance levels (Liker, 2009) and is a key factor for sustainable continuous improvement efforts and Lean (Liker, 2009; Bergman and Klefsjö 2010). As mentioned by Imai (1986) in Liker (2009) improving a process is not possible unless it has been standardized first. Changing processes and routines leads to improvements only becoming another variant of the process and can lead to it only being used sometimes or possibly ignored. For this reason there is a need to stabilize and standardize the process to be able to assure usage and continuously improve of it. The competitive advantages will be obtained when improvements are built on each other, rather when improvements are made but then lost or regressed after some time (Liker, 2009). Figure 2.2 below visualizes what has been described above.



**Figure 2.2** Standardization of improvements

A commonly used tool in order to achieve standardization is work documents, but it is essential to create a structure in the organization that supports standardized work (Liker and Meier, 2006). A difficult part of standardization is the behavior change of the individuals and to make sure that new ways of working are sustained by being diffused within the organization, implemented and accepted by the individuals (Liker, 2009). If standardization and supporting of standardized work is not created in an organization that works with improvements there is no base to start from and no points from which comparisons can be made (Liker and Meier, 2006).

### **2.2.6 Learning from results**

Learning is an important factor related to sustainability of CI as stated by Janee Ali et al. (2013). Learning and knowledge sharing within the organization lead to skills development among the employees. A learning organization is better equipped to create competitiveness and sustain CI by learning from previous experiences. It is also emphasized by Fazl Mashhadi et al. (2012) that learning is a core aspect for changes to be successful and sustainable. Sharing positive and negative experiences between employees is important to increase learning within an organization. Organizational learning can lead to better performance by avoiding occurrence of previous mistakes and helps the organization to become more competitive. The ability of learning and the way of learning determines the organization's potential to actually being able to make use of the learnings obtained (Janee

Ali et al. 2013). The process of organizational learning consists of the organization catching and understanding the individuals' learnings to be able to spread the knowledge to other parts of the company (Fazl Mashhadi et al. 2014).

As stated by Johnson et al. (2008) a learning organization has the ability to regenerate on a continual basis from within the organization by utilizing knowledge, skills and experiences of the employees. Most often the individuals' collective knowledge is greater than what the organization "itself" knows therefore it is critical that management fosters and encourages learning processes where knowledge can be collected and shared within the organization. This is a step towards making individuals aware of changes occurring and identifying knowledge and opportunities for improvements and required changes. To create a learning organization key factors are that rather than directing, managers must facilitate learning. Openness for new ideas and views and having both lateral and vertical information flows are factors for creating learning organizations. Moreover, as a part of the learning process in the organization, experimentation by trying out new ideas into actions is important (Johnson et al. 2008).

Argyris (1999) states that learning can take place during two situations. When an organization achieves what was intended there is a match between desire and outcome, this is the first type of situation when learning occurs. The second is when there is a mismatch between the intention and the outcome, leading to a correction taking place to shift the mismatch into a match. In this sense, the author also argues for that discovering of new problems and creation of solutions for a problem do not lead to learning. It is not until the invented solution has been produced that the actual learning occurs. The conclusion is that in order to create organizational learning, discovering problems or inventing solutions are not sufficient prerequisites, but they are necessary for learning to happen (Argyris, 1999).

Two forms of learning, single-loop and double-loop learning, was framed by Argyris and Schön (1997). Single-loop learning occurs within organization's existing assumptions values and norms. This type of learning is most common in organizations and can be exemplified as smaller corrective changes. Double-loop learning is often more difficult to carry out in organizations and this type of learning results in changes in values, strategies and assumptions. Double-loop learning may therefore involve more radical changes and requires deeper reflection on the fundamental aspects and leads to questioning these in order to take corrective actions (Argyris and Schön, 1997).

### **3 The case of Volvo Construction Equipment**

Volvo Construction Equipment is a part of the global organization Volvo Group AB that is a large multinational corporation with approximately 100 000 employees. Volvo Group operates mainly in the business areas of trucks, buses, construction equipment and marine engines (Volvo Group, 2015). VCE is focusing on construction equipment and is a global manufacturer with production plants in Europe, Asia, Latin America and North America. All over the world the company has established marketing, sales and distribution organizations and the company is consisting of about 15 000 employees (Volvo CE, 2015).

#### **3.1 Continuous improvements at VCE Technology**

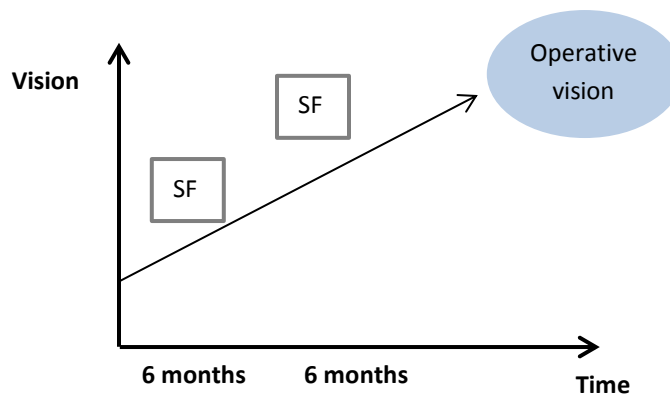
VCE Technology is the product development division of Volvo Construction Equipment and in VCE Technology, henceforth just VCE, the process Operational Development (OD) has been used as an approach to drive continuous improvements during the last three years. OD as performed at VCE, is included in the company's organizational development work. OD is performed as a global process and it is mandatory for all the employees to participate in the process. It is the intention to achieve higher competitiveness by having all employees involved in improvement work and capturing their knowledge in the process. The goal is to create a vital and developing process which gives maneuverability to the organization to be able to adapt improvement strategies to reach better organizational results. The strategy is based on a learning organization and is intended to create a common culture among the involved, influenced by among other things continuous improvements, engagement, communication and integration. The OD process is seen as an integrating process where the management process is integrated in the change process and where various activities towards change are integrated to create a whole. The improvements are driven in cycles of six months by improvement teams with reporting of the work performed, stored in a database (Violin.volvo.net, 2014). This database is accessible for the researchers and consists of reports for almost every team during all of the cycles so far.

The OD process consists of top management, Internal Consultants (IC), coaches, and improvement teams with one team leader and four to nine team members. To create a robust support structure for the OD process, internal consultants (ICs) and coaches are educated in leadership and utilized within the OD process. The ICs assist in securing quality and endurance in the OD process and have an overall responsibility for supporting the respective site's OD process. The coaches act as support for the team leaders in OD and give feedback to team leaders on how they could improve their leadership (Violin.volvo.net, 2014).

##### **3.1.1 Operational Development structure**

The OD process is divided into cycles of six months. At VCE there exists a structured plan for how to work with the OD process during the half year cycles and what steps that are included in the cycles (Violin.volvo.net, 2014).

The management has a lot of responsibilities in the early phases but as time goes on more responsibility is transferred on the teams. First the top management investigates the current facts regarding market, competitors and people in order to realize what needs to be done to improve the organization's competitiveness. Based on this information an operative vision is created by the top management in Brussels in Belgium. The operative vision is set for three to five years and for the organization to develop towards the vision and reach the vision the management sets a Strategic Focus (SF) for the OD-teams to work for and creates a Strategic Reasoning (SR). SR is intended to create a common picture on where the company is today, where they want to be in the future and what needs to be done in order to reach this. SF is a specific direction where the organization, OD-teams, should put the concentration of improvement initiatives on and one example of a SF is to reduce costs. SF is set for intervals of six months and is formulated to create a common picture for the organization to work towards the same goal. This can be seen in Figure 3.1 below (Violin.volvo.net, 2014).



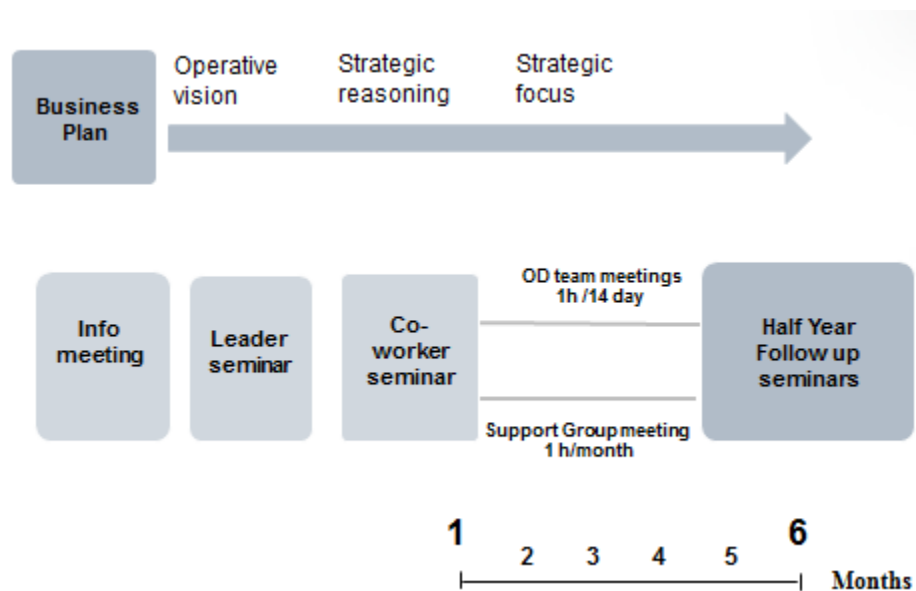
**Figure 3.1** Strategic focus and Operative vision (Adapted from Volvo.violin.net, 2014)

When the SF is set it is first communicated by the SR to the team leaders in the organization through an information meeting and leader seminar. This has the intention to create knowledge of why the vision is set as it is and how the organization should work to reach it. After the leader seminar it is time for the co-worker seminar where SF and SR are communicated to all other employees in VCE to create the understanding of the importance of SF. Based on all information, the different team leaders together with their teams decide upon local improvement areas that should fulfill the SF (Violin.volvo.net, 2014).

During the six month of the OD process the different teams have meetings every other week to follow up on their improvement initiative and progression. Every second meeting a coach is present and observes the meeting and gives feedback on the vitality of the meeting. This is supposed to allow for feedback to learn from. Alongside these meetings there is also a support structure where the team leaders have meetings called support group meetings once a month together with the coaches, internal consultants and the management. The

intention of these support group meetings are to keep track of the entire organization and give support if needed (Violin.volvo.net, 2014).

When the period of six months has passed by a Half Year Follow Up (HYFU) seminar is held where the teams present what they have been working on and achieved. What has been successful and not, what results the teams achieved and how it is contributing to the strategic focus for the specific cycle are presentation topics for this follow-up seminar. After the HYFU seminar, the OD cycle procedure starts from the beginning again. A new SF is set or the old one is kept, leader- and co-worker seminars are repeated and another six month period is started. The structure can be seen in Figure 3.2 below (Violin.volvo.net, 2014).



**Figure 3.4** The Operational Development structure (Adapted from Volvo.violin.net, 2014)

## **4 Method**

In this chapter the methods used throughout the study will be described. The chosen design of the study, the selection of literature for the theoretical framework, and the data collection and data analysis chosen to fulfill the purpose and answer the research questions of the study will be well described and motivated. In the end of the chapter ethical considerations and confidentiality will be discussed, as well as a source evaluation.

### **4.1 Research design**

According to Bryman and Bell (2011) the research design is the chosen framework and guidelines used to collect data and further on analyzing it. In order to deeply access the quality of the study additional criteria and priorities can contribute to form the research design in order to fit to the study (Bryman and Bell, 2011). This study has a qualitative case study as the research design with both primary and secondary data sources. A case study implies intensive and detailed investigation of one single case to observe complexities and particularities. Since conclusions are drawn from the data collected and investigated it constitutes an inductive approach where the findings are connected to theory. This inductive approach in combination with investigation of one single organization leads to the research design of a broadly “revelatory” case study (Bryman and Bell, 2011).

### **4.2 Literature review**

The first step of the literature review was to understand what keywords to focus on. This was done by understanding the scope of the study and by evaluating what areas it was connected to. For this study literature regarding sustainability, continuous improvements, organizational development, improvement work, sustaining improvements, sustaining changes and standardization was used found from the databases Google Scholar and Chalmers Summon. The literature review was started prior to the study and was ongoing during the thesis work depending on the need of information and theory.

### **4.3 Available data and data collection**

The process of triangulation by involving several types of data to include different perspectives of the situation has been utilized for this study (Bryman and Bell, 2011). Both primary and secondary data has been used throughout the study and the primary data have mainly been collected through interviews. By combining available data with interviews as well as observation of leadership seminars more knowledge about the OD process and the performed improvements has been obtained.

#### **4.3.1 Available data**

Each team, within the Operational Development (OD) process, documents and reports the improvement area to focus on for the specific cycle together with stated goals and achieved goals in reports called OD-team minutes. These OD-team minutes reports are documented in the organization’s common database for the OD process. The format of the report was a

Microsoft InfoPath document. The reports included information regarding team leader, team members, number of meetings held, improvement area, stated goals and achievements. As it is supposed to be a living document it also includes an action list where the team can fill in actions and tasks to perform during the improvement work. The incentives for filling out these reports are that it is a part of the OD process and shall work as a guidance and help for the team to carry through their improvement work during the cycle.

These reports had been compiled to an Excel-file which was structured by cycles from cycle one to cycle six including team name, team leader, chosen improvement area, planned goals and achieved goals. In this sense, the improvements made by the organization during these years were already available for the researchers, meaning that there was no need for collecting that type of data. Typically when data has been collected by others than the researchers analyzing it, it is called secondary data (Bryman and Bell, 2011). An aspect to consider about this secondary data is that variations can exist as there are different people, in this case team leaders and team members, filling out the reports. Advantages of utilizing this secondary data were the possibility to perform longitudinal studies and that the researchers did not have to spend the time for collecting the data and therefore time could be saved. This allowed more time for collecting other types of relevant information for the study. However, there are limitations with secondary data which should be considered, such as the researchers' level of familiarity, limited control over the quality and also the complexity of the data. Therefore, when dealing with secondary data, trustworthiness of it is important to consider (Bryman and Bell, 2011).

This data was utilized to understand what type of improvements that have been performed within the organization during these three years by performing a categorization of the improvements. Variations existed in the quality of the OD-team minutes reports. Some reports were extensively filled out while others were not. In cases where the reports were not filled out properly or where it was not possible to understand the improvement area the team had selected, the researchers either searched for other kinds of reports, such as A3-reports or contacted the specific team leader for further information to clarify any ambiguities. In cases where it still was not understandable by the researchers, that specific improvement was not considered or categorized and thereby excluded in the research. The number of excluded reports was 24 and based on the total amount of categorized improvements that was 1341, the researchers do not feel that excluding 24 reports affected the results. How this available data regarding what improvements that had been performed in the organization was analyzed and categorized by the researchers will be described section 4.4.1.

#### **4.3.2 Semi-structured interviews**

The researchers have performed 20 qualitative interviews to collect information regarding the OD-teams improvement work to understand how sustained the teams' improvements are and also to understand important factors for sustained improvements. Performing and analyzing interviews can be time consuming but can also generate deep and valuable data (Bryman and Bell, 2011). As a start four pilot interviews were held on one of VCE's sites in Eskilstuna to analyze what type of information that could be obtained from the interviews. Based on the pilot interviews, the interview questions were modified and new questions were added since other kind of information could be extracted from the pilot interviews.

The 16 remaining interviews were semi-structured telephone interviews with a prepared interview guide as a chosen method for data collection. The interview guide used can be seen in Appendix B. The interviews were performed by the researchers with team leaders of OD-teams regarding specific improvement work they had been involved in. Team leaders were selected for the reason that the team leader might obtain most information about the improvement efforts and the results as a leader most often is well involved. The duration of the interviews were approximately one hour and telephone interviews were convenient since the researchers were based in Gothenburg and the interviewees were located in the cities Eskilstuna and Braås in Sweden where VCE has two of its sites. These cities are located approximately four hours away from Gothenburg each and telephone interviews therefore allowed for more flexibility in the data collection process.

A semi-structured interview allows for flexibility during the interview such as focusing on the most important questions and it also gives the possibility to ask follow-up questions. Another benefit is that semi-structured interviews allow for clarifications of questions when needed (Bryman and Bell, 2011). Clarifications were critical for this study as the study refers back in time and required the respondents to go back in their memory. Sometimes it required clarifications of what OD-cycle and specific strategic focus the interview was focused on (Bryman and Bell, 2011).

The interviews aimed towards obtaining valuable information regarding some improvements performed and how sustained they were as well as how the team worked. In order to collect data without affecting the responses by recording the answers, the interviews were not recorded. The benefit of not recording the answers is that the interviewee might speak more freely however it puts more pressure on the researcher to take extensive notes (Bryman and Bell, 2011). However the researchers felt that the interviews could be held in such a pace that allowed for taking notes by computer as well as asking follow-up questions. The time also allowed for further discussions and the respondent had the possibility to add thoughts to the interview if needed.

#### **4.3.3 Structured interviews according to a follow-up tool**

As stated earlier by Kaye and Anderson (1999) there is a need to not only perform improvements but also to evaluate the results of them and if they are sustained in the organization. Based on theory for this research sustainability is defined as improvements that are implemented, continuously used and/or further developed. To understand to what extent implemented improvements were sustained in VCE there was a need to investigate how this could be made qualitatively to obtain accurate and trustworthy information.

This type of information could be collected through self-completion questionnaires of interviews and depending on the situation the different methods can vary in quality and trustworthiness. A self-completion questionnaire can come in different forms as by mail or postal questionnaires where the respondents answer the questionnaires by themselves (Bryman and Bell, 2011). For this study an online self-completion questionnaire was created in first hand and the intention was to send it by mail to all team leaders and in that way collect information regarding the status of the improvements efforts that had been performed during the six cycles. Before sending out the survey the questions included in the questionnaire were tested and discussed at two different occasions with one person with good experience in self-completion questionnaire and one person highly involved in research projects. After these two sessions some conclusions could be drawn and the decision was made to not send out a survey. The reasons were that the amount of administration would be too high and that the questions could cause confusion among the respondents. Finding contact information to all the team leaders for all six cycles and all eleven sites would require too much time and administration, which was not available for this study. The team leaders have also been changed during the OD process as well as most of the team leaders might have been involved for several cycles. This could cause confusion among the team leaders, the intended respondents, considering what cycle and what improvement area the respondents were answering for. Regardless of how the questions were twisted the confusion and the challenging of the team leader's memory still existed. Many clarifications would be needed and as mentioned by Bryman and Bell (2011) a self-completion questionnaire should be simple and easy to understand. Bryman and Bell (2011) also state that with self-completion questionnaires it is also difficult to affect the number of responses the researchers are able to collect therefore one must prepare for loss of responses. The factors discussed above could have affected the trustworthiness and quality of the study. For the reasons mentioned, sending out a pure self-completion questionnaire to all OD-team leaders within VCE was cancelled and new solutions for collecting valuable data were investigated.

To collect relevant and more trustworthy data another alternative was to let the Internal Consultants (ICs) stand for the collection of information through structured interviews. A structured interview includes specific questions where the interviewer asks the same questions and in the same order to all respondents (Bryman and Bell, 2011). The

researchers could ensure that the exact same questions were asked that could give the information needed to investigate the improvements sustainability. Utilizing ICs was chosen since the ICs have an overall responsibility for support to the OD process and due to their involvement could more easily get in touch with the people needed.

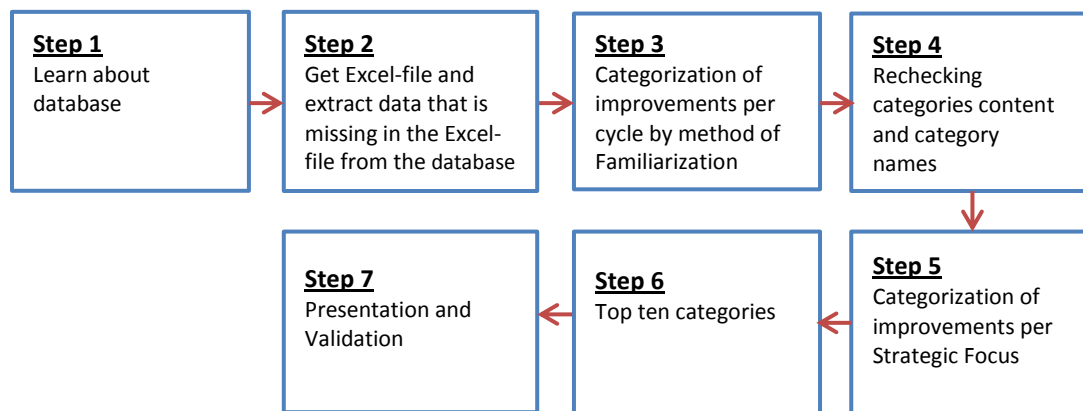
For this study, a pilot was performed at the site in Braås consisting of four ICs where all improvement efforts performed at Braås were divided among the ICs. The researchers created a follow-up tool which functioned as a base for the structured interviews. The follow-up tool will be further explained in chapter 5 Follow-up tool. The ICs were given the responsibility to contact and consult responsible team leader and investigate the status of the performed improvement by performing short structured interviews with the follow-up tool as a basis.

## 4.4 Data handling and analysis

This section describes how the data included in this research has been analyzed. First, a description on how the available data regarding the improvement work at VCE was handled and categorized is given. This is followed by how the collected data from the semi-structured and structured interviews were analyzed.

### 4.4.1 Categorization of the performed improvements

In order for the researchers to structure the already available data compiled in the Excel-file a data handling process was created to be able to analyze it properly. The process can be seen in Figure 4.1 below and it consists of seven steps which will be further explained below. The output of this data handling process resulted in a categorization that showed a result of the global trends in improvement areas chosen by the OD-teams for VCE. The result was used to understand what types of improvements that have been made and how the strategic focus communicated from the top management affected the teams' selection of improvement areas.



**Figure 4.1** Data handling process for categorization of improvements performed within OD

**Step 1 - Basic understanding of database**

Step 1 consisted of understanding VCE's common database, teamplace, for the OD process to understand how to find different cycles' specific strategic focuses as well as finding the teams OD team minutes-reports. This teamplace could also be valuable for finding further information about the teams' improvements in the form of A3-reports. A3-reports only existed for 20 percent of all improvements categorized, however became very valuable for further clarification of the OD team minutes-reports when needed.

**Step 2 - Updating compiled Excel-file**

This step consisted of going through the Excel-file with the compiled data of the improvements performed by the OD-teams. All improvements that could be found in the OD teamplace were not included in the compiled Excel-file. Therefore the researchers compared the content in the Excel-file and the content in the OD teamplace. The missing data in the Excel-file was added to perform the analysis on all the documented improvement areas.

**Step 3 - Categorization**

The next step considered the process of categorizing all the improvements made by the different teams throughout the six cycles. This step was performed using the method of familiarization mentioned by Huberman and Miles (2002). The method refers to the importance that the researchers become familiar with the range and diversity of the data before starting to screen and sort it (Huberman and Miles, 2002). By immersing in the data the researchers can get an overall view of it and find key areas and recurrent themes (Huberman and Miles, 2002). For this study the researchers started by reading through the improvements made to get an overall view of the data. As mentioned above the Excel-file where all the improvements were gathered was structured in the order of the different cycles. All improvements made in cycle 1 could be found in a separate sheet in the Excel-file, all improvements for cycle 2 in a separate and so forth. The categorization was performed per cycle starting with cycle 1 and continuing with cycle 2, 3 and so on. The categorization for cycle 1 formed the base for the rest of the cycles. Depending on what cycle the researchers categorized, some categories from cycle 1 were reused and some categories were added. The different cycles ended up with approximately eight to eleven different categories of improvement areas. To the extent it was possible, the researchers tried to keep the same categories throughout all the cycles. This intention by the researchers to keep similar categories might have affected the similarities in the cycles but was beneficial in the sense that it made them more comparable.

**Step 4 - Validation of categories**

To validate the categorized data each category was rechecked by both researchers to assure the content and category names. Where needed changes were made and category names were updated. As mentioned earlier, to the extent it was possible the category names

throughout the different cycles were similar to reduce the amount of multiple but similar categories.

#### **Step 5 - Grouping according to Strategic Focus**

The improvement areas chosen by the teams are supposed to be driven by a strategic focus communicated from top management. This strategic focus is meant to guide the OD-teams to prioritize and focus on the right type of improvement to fulfill the strategic focus and getting the organization steps closer to the organization's operative vision. Therefore a grouping according to the strategic focus was made. An example is given to explain how the grouping based on strategic focus was performed; cycle 1 and cycle 2 had the same strategic focus that was to "Reduce waste". The cycles' categories were grouped based on similarities to visualize the distribution of categories for that strategic focus. Three different strategic focuses existed throughout these six cycles hence three groupings based on the strategic focus were performed. This analysis showed the patterns of the improvement areas chosen in the organization based on the strategic focuses given and also showed if there existed any variations in the improvement areas chosen by the different teams when the strategic focus shifted.

#### **Step 6 – Compiled list of categories**

To see an overall view of what patterns existed in the organization regarding improvement areas chosen by the various OD-teams globally all categories from the six different cycles were grouped based on similarities in the category names and contents. This grouping resulted in a top ten categories list visualizing the patterns of improvement areas chosen by the OD-teams.

#### **Step 7 - Final validation**

To validate the categorized data the researchers presented the results from the categorization to three persons highly engaged in the OD process to discuss the results and revise category names.

#### **4.4.2 Analysis of semi-structured interviews**

As stated earlier, 20 semi-structured interviews were performed, including the pilot interviews, to obtain information regarding the improvement efforts. Questions asked considered how the teams had been working within the cycle to understand what the success factors were. The analyses of the interviews were made in several steps. One intention with the interviews was to validate the information collected by the ICs by the follow-up tool regarding the sustainability of the improvement work. Another intention was to understand success factors for improvements to be implemented and sustained within the organization.

All interview notes were read through deeply and also structured to analyze the status of the improvements as well as to understand the different teams' ways of working. The methodology of "Grounded theory" mentioned by Bryman and Bell (2011) was used to

structure the gathered information. “Grounded theory” means that a theory is developed based on the analysis of the data. One approach of “Grounded theory” is “Open coding” which is a method where the data is broken down into smaller pieces of valuable text including the most important message from the original text (Bryman and Bell, 2011).

Different status categories were created based on the outcome of the interviews and how the researchers placed the status of the investigated improvement efforts in the created follow-up tool that is presented in chapter “5 Follow-up tool”. The different status categories are described in Table 4.1 below. All improvements investigated through interviews ended up in one of the categories below.

**Table 4.1** Status categories of improvement efforts

Category	Explanation
A	Improvements that have been implemented and still exist today but not continuously used
B	Improvements that have been implemented, still exist today and are continuously used
C	Improvements that have been implemented, still exist today, are continuously used and are further developed after the cycle’s end
D	Improvements that have not been implemented
E	Improvements that have been implemented, but do not exist today. I.e. the improvements have regressed or do not exist any longer

To understand success factors for sustainability, the above categories were grouped based on sustainability requirements which can be seen in table 4.2 below.

**Table 4.2** Sustained improvements and Non-sustained improvements

Sustained improvements	
A	Improvements that have been implemented and still exist today but not continuously used
B	Improvements that have been implemented, still exists today and are continuously used
C	Improvements that have been implemented, still exist today, are continuously used and are further developed after the cycle’s end
Non-sustained improvements	
D	Improvements that have not been implemented
E	Improvements that have been implemented, but do not exist today. I.e. the improvements have regressed or do not exist any longer

Improvements that were seen as sustained ended up in *Sustained improvements* that includes the categories A, B and C. Improvements that were seen as not sustained ended up in *Non-sustained improvements* which includes the categories D and E. This division was created as the study is focused on the success factors for sustainability in the sense of improvements that are implemented, exists, continuously used and/or further developed. Within sustained improvements and non-sustained improvements the data from the interviews were extracted, coded and divided into a few areas by the method of and familiarization (Huberman and Miles, 2002). Common themes connected the data and resulted in the areas presented in chapter 6 Empirical findings, section 6.5 Factors affecting sustained improvements at VCE.

#### **4.4.3 Analysis of structured interviews according to the follow-up tool**

As mentioned, the ICs were utilized to collect information for the investigation of sustainability of improvements. A lot of time was needed for this collection to be able to get in touch with as many team leaders as possible. There were a total of 109 improvement efforts performed in Braås and the ICs could collect information from 49 which are 45 percent of the improvements performed at Braås. This could be considered as a natural loss of answers and could be explained by the ICs not being able to contact all team leaders as some might have been on either sick- or parental leave or no longer employed by VCE.

The ICs interviews with the team leaders were focused on if and how the improvements were sustained. The results from these were compiled into the follow-up tool and later on validated and compared against the some of the semi-structured interviews performed by the researchers. The reason for this was that the responsibility for collecting information was in the hands of others and the researches wanted to make sure that the same understanding existed among everyone.

#### **4.5 Ethical consideration and confidentiality**

The extracted and gathered data was handled in a confidential way. Ethical aspects also needed to be taken into consideration. The researches assured that confidential information was not spread by the researchers through continuous communication with the company regarding how to handle the data. Concerning ethical considerations for this study, all participating staff was informed about the research and its objectives to prevent lack of informed consent and the persons had the opportunity to volunteer to participate in interviews and meetings. Anonymity has been secured in the way that none of the data from interviews is published with names or personal information. Therefore deception or harm to participants is unlikely to have occurred in this study. Due to anonymity, the answers and data collected is not likely to have been affected (Bryman and Bell, 2011).

#### **4.6 Reflection and source evaluation**

Misinterpretations are a risk when dealing with secondary data as stated by Bryman and Bell (2011). However, in this case the researchers have had access to complementary information as A3-reports and being able to contact the team leaders when categorizing the improvement work performed at VCE. Some variations existed in the OD-team minutes reports considering the report structure for cycle one to five compared to cycle six but as the researchers had contact with responsible person creating the structure of the reports, clarifications could be given.

By letting the ICs collect some data there were risks that the collected data might be biased and misunderstandings could occur regarding what and how to collect. For that reason the researchers performed a workshop with the ICs to give them the possibility to understand how to evaluate the answers from the team leaders. The data collected from ICs were also validated by comparing with data collected by researchers to avoid drawing conclusions on biased data.

When dealing with qualitative studies the credibility, transferability, dependability and confirmability should be considered as stated by Bryman and Bell (2011). Credibility considers the importance to ensure that the research is carried out in good practice. This can be done by sharing information collected with the interviewees (Bryman and Bell, 2011). For this study the researchers concluded the interview sessions by presenting a summary of the interview notes in the end of the interview. In this way the interviewer could clarify topics needed or add further information if wanted. The process of triangulation has also been used in order to increase the credibility the study. As stated by Bryman and Bell (2011) triangulation refers to using more than one source of data to strengthen the conclusions drawn. The researchers have drawn conclusions based on the information collected from various interviewees as well as the already available data in the form of internal documents.

Transferability considers to what extent findings can be generalized to other situations with similar settings (Bryman and Bell, 2011). For this study the findings are based on the case of VCE's improvement work and its employees and therefore the findings are specific for this type of constellation. Therefore the transferability of the findings might be questioned for other contexts of settings but could perhaps be utilized for similar organizations and constellations. If the research would have been carried out in another organization with different constellations or during another time it might have resulted in other findings and results.

To what extent the study can be replicated and result in the same findings refers to its dependability (Bryman and Bell, 2011). For this study records of the research process have been kept for all phases of the process and can therefore be accessed to investigate the procedures and replicate them. However, qualitative studies are often based on

interpretations of the researcher that can vary depending on who is performing the study (Bryman and Bell, 2011). If the study would be replicated in the same settings, using the same type of secondary data and the same interview persons the study might end up in similar findings. However, if other improvement areas are chosen for follow-up and other team leaders are interviewed, or if the study is to be performed in a few years the result could end up in other findings.

Confirmability is connected to the researcher's objectivity when making conclusions for the study (Bryman and Bell, 2011). To increase objectivity both researchers have read through all interview notes before drawing conclusions. Due to time limitations, both researchers could not attend all interviews together therefore all interview notes was read and discussed by both instead. As stated by Bryman and Bell (2011) complete objectivity is impossible, but there are ways to increase it.

## **5 Follow-up tool**

To collect information regarding implementation of improvements and if the improvements were sustained within the company a follow-up tool was created by the researchers. How the tool was created, tested and the structure of it will be described below.

### **5.1 Creation and testing**

There were two ways of collecting information and data, either through self-completion questionnaires or by interviews (Bryman and Bell, 2011). The follow-up tool was created as a short questionnaire, but the actual collecting of information could be better controlled by letting the Internal Consultants (ICs) perform short structured interviews. The interviews were held with the team leaders where the ICs asked for specific information about the improvements that have been made. The follow-up tool could have been sent out directly to the team leaders but the researchers concluded that in order to have as little variation as possible in the collected information it was more beneficial to have fewer people that share the same understanding of the tool as the researchers.

A first version and draft of the follow-up tool was created by the researchers and tested by the ICs in Braås. The ICs were given the tool as well as instructions for it in order to perform a follow-up at their site. This test was partly performed as a workshop where the researchers observed the ICs in order to investigate their interpretations of the instructions and how the follow-up procedure might look like. The researchers acted as observers by only interfering when clarifications of the tool and instructions were required. The workshop ended with a session of reflection where the ICs evaluated the applicability of the first version of the tool and how it might be improved. The reflection summarized the importance of clarifying concepts such as “implemented” and “continuously used”. The reflections also highlighted the importance of shortening the instructions for the follow-up tool, which can be seen in Appendix C, and adding a section in the tool for the possibility of free-text comments.

### **5.2 Structure**

Based on the workshop and feedback from the ICs, the follow-up tool was modified by the researchers and resulted in the tool that can be seen in Figure 5.1 below. The modified version was afterwards rechecked with the ICs in Braås in order to validate the results. When the tool was complete, the ICs got approximately two weeks to divide the improvements performed at Braås among themselves and start collecting information regarding the performed improvements.

Name	Site	Function	Team Focus	Goal	Leader	Team	Cycle	Category	Section 1 The improvement has been implemented	Section 2 The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose	Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
									[Y/N]	[X]	[Free-text]	[Free-text]

Section 1 The improvement has been implemented	Section 2 The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose	Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
[Y/N]	[X]	[Free-text]	[Free-text]

**Figure 5.1** Extract from the Follow-up tool

The follow-up tool consists of an excel-file with two sheets and extracts from the tool and its results can be seen in Appendix C. The first sheet shortly describes the instructions for the tool and the second sheet includes all improvements performed at the specific site, in this case, the site in Braås. In the follow-up tool all improvements are listed where site, function, team focus (improvement area), goals, team leader, team name, cycle and the category of improvement area are presented horizontally. Including the category of improvement area makes it easy to analyze the answers regarding sustained improvement and possible tendencies in categories and sustainability of improvements. Including team leader names makes it is easy to see which team leader to consult to follow-up on the improvement. There is also a possibility to open the team's OD-team minutes report, as there is a link in the excel-file which directs you to the database where all OD-team minutes reports are stored.

The structure for collecting information regarding implementation of improvements and sustained improvements has been divided into four sections as can be seen in Figure 5.1

above. Based on the information collected from the team leaders the ICs fill in the different sections. Various confusions of cycle, improvement areas etcetera are eliminated since the ICs has all the information in the Excel-file and can mediate this information to the team leader if needed. In the upper left corners of the different sections, there exists further information and instructions for how to fill in the answers for the different sections.

*Section 1* of the tool will give an answer to if the improvement is implemented or not where 'Y' indicates 'Yes' and 'N' indicates 'No'. To clarify what is meant by 'implemented', it means if the results from the improvement work has been put into use, put into effect and actualized. This is interesting to know since it is when the improvement has been implemented when hard savings such as cost reductions often are obtained. If the improvement has not been implemented, answer "N", *Section 2* and *Section 3* of the follow-up tool is excluded and the respondent is directed to continue on with *Section 4*.

*Section 2* of the tool is divided into three columns with different criteria to fulfill where only one of the columns should be marked with an X. The three different columns are further described below.

- Column 1. If the implemented improvement still exists today the answer would be to fill in an X in this column. An implemented improvement such as a created database or documented process can be sustained by existing in the organization but not used to its fullest potential. If the implemented improvement does not exist any longer in the organization the respondent is directed to continue with *Section 3*.
- Column 2. If the implemented improvement exist today in combination with if it also is continuously used in relation to its purpose, the answer would be to mark an X in the second column. To clarify what is meant by 'continuously used in relation to its purpose' it means that the outcomes from the implemented improvement are used or utilized when and as often as they should be used. An example is given: a new routine has been created for purchasing of material and is documented as a process. When this process is followed for all purchasing of materials it is considered as being continuously used.
- Column 3. If the implemented improvement still exists today, is continuously used in relation to its purpose in combination with also being further developed after the cycle's end, then the answer would be to mark an X in the third column.

These three columns are three variations of sustainability where the first and second column of *Section 2* describes a static perspective of sustainability where the improvement has not undergone any changes. The third column describes a more dynamic view of sustainability where changes and development to the improvement has occurred.

*Section 3* gives the possibility to write what positive impacts the improvement has led to by adding free-text comments. Included in positive impacts is how the improvement has

fulfilled the strategic focus, what goals have been fulfilled, and also what type of benefits the improvement and the improvement work has led to. This section allows for reporting both hard savings as financial and resource savings and soft savings as for example better collaboration and communication.

*Section 4* gives the possibility to write complementary comments to the sections one and two if needed. It could for example be of interest to explain why the improvement was not implemented or why it does not exist any longer in the organization. It can also be of interest to write down if the improvement work led to any positive outcomes even though the improvement was not implemented.

### **5.3 Validation**

The information regarding status of improvement initiatives performed at Braås, collected from the ICs, were compared to data collected by the researchers. Nine interviews with team leaders in Braås had been held by the researchers to validate some of the data collected from the ICs. Based on the ICs placements of the improvements in the follow-up tool and the researchers' placements, six out of nine were placed in the same ways in the tool.

### **5.4 Reflection on the follow-up tool**

The follow-up tool could be concluded to generate a systematic way of investigating if improvement work performed within a company is implemented or not. It could also investigate if and in what ways the improvements are sustained as there are three different types of sustainability included in the follow-up tool. The tool also allows for including free-text comments regarding positive impacts gained as well as regarding why the improvement imitative failed.

Due to time limitations, the investigation was not performed at all eleven sites. Instead the focus was on the creation of a systematic way of collecting the data. This tool was tested and modified and the intention for the future is that it could be applied for the remaining sites with the ICs help in collecting data. Before implementing a new method globally it could be of value to investigate the different sites' national cultures.

The various sites of VCE are at different locations globally and not all countries have the same culture. It could therefore be of importance to understand organizational and national cultures and values before implementing a new method globally. This is of importance to realize how the introduction or diffusion of new practices might be hindered by the culture, as stated by Miconnet and Alänge (1999). The national culture could for example affect how honestly the tool is filled out as what is perceived as right or wrong might vary in different cultures (Miconnet and Alänge, 1999). More theory regarding organizational culture can be seen in Appendix A.

## 6 Empirical findings

This chapter presents the findings from the study regarding how improvements can be investigated and the results as well as how the improvement teams of Volvo Construction Equipment (VCE) have been working. The chapter starts by explaining the level of participation in the Operational Development (OD) process for the various sites of VCE and the different cycles. This is followed by the results from what improvement initiatives that have been performed at VCE during the OD-cycles as top ten categories and the distribution of the categories for each strategic focus given by top management. Furthermore, based on the categorization it was of interest to collect data regarding the extent of sustained improvements and the results collected from VCE Braås will be presented in section 6.4. The OD-teams work approach within the OD-cycles has been investigated through interviews and the results will be presented in section 6.5 and the team leaders' opinions regarding parts of the OD process will be described in section 6.6.

### 6.1 OD participation

The OD process at VCE has been performed for six cycles (three years), each cycle with various amounts of teams involved in the improvement process. Table 6.1 below shows the distribution of teams for all sites of VCE and for all OD-cycles.

**Table 6.1** Distribution of participating teams per cycle and per site

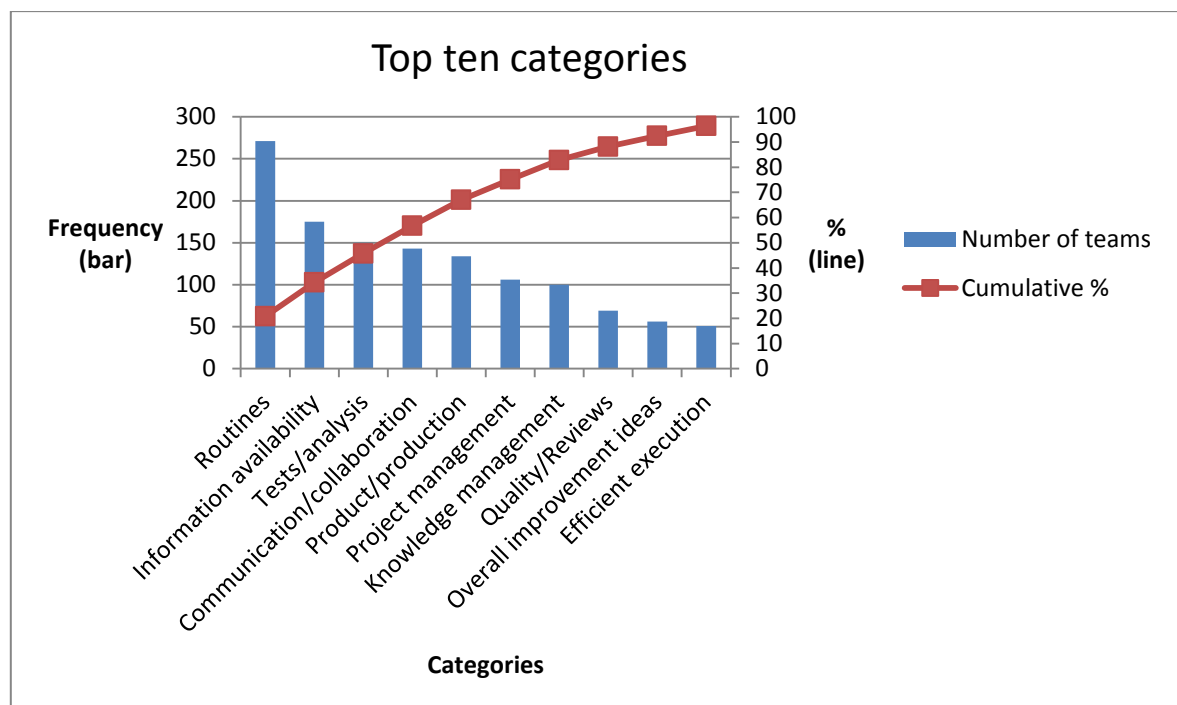
	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Total per site	Percent of 1341
<b>Eskilstuna</b>	28	88	88	95	87	83	469	35,0%
<b>Changwon</b>	41	40	42	41	40	42	246	18,3%
<b>Shippensburg</b>	21	25	31	31	31	27	166	12,4%
<b>Braås</b>	15	17	17	21	20	19	109	8,1%
<b>Konz</b>	0	15	14	17	14	17	77	5,7%
<b>Bangalore</b>	0	12	12	12	13	18	67	5,0%
<b>Hameln</b>	0	11	14	13	13	13	64	4,8%
<b>Belley</b>	0	13	11	12	12	11	59	4,4%
<b>Wroclaw</b>	0	8	6	12	11	6	43	3,2%
<b>Pyongtaek</b>	0	4	4	3	3	3	17	1,3%
<b>Other site</b>	2	6	3	2	1	2	16	1,2%
<b>Brussels</b>	0	1	2	3	1	1	8	0,6%
<b>Total per cycle</b>	107	240	244	262	246	242	1341	

As can be seen in Table 6.1 the number of participating teams for each cycle is quite consistent. Cycle 1 stands out in the table and the reason can be that only five of eleven sites participated in this cycle. Another reason for the lower amount of improvements in cycle 1 could be that it was the first OD-cycle for VCE and that the number of participating

teams from the site in Eskilstuna was much lower compared to the other cycles. Otherwise the specific numbers of participating teams each cycle could depend on the actual team sizes and if the teams have documented their reports in the common database where the researchers have extracted data from for this analysis. Team sizes are between four to nine persons in each OD-team. The table also shows that the site Eskilstuna has the largest amount of teams and therefore stands for the largest amount of improvements in the OD process with 469 teams which is 35 percent of all 1341 team improvements analyzed by the researchers.

## 6.2 Top ten categories

The chart of the top ten categories of improvement areas selected by the OD-teams is presented in Figure 6.1. The chart is based on all the common improvement areas performed globally over the six different cycles. As can be seen the category “Routines” is clearly the largest improvement area chosen by the teams for the OD process. Below a further explanation of the different categories will be given.



**Figure 6.1** Top ten categories

### Routines

The teams in this category have focused on establishing routines, checklists and standardized work. Creating guidelines, manuals, templates, instructions, simplified and improved processes as well as creation of handbooks are examples of improvements made. The intentions were to assure quality, reduce waste and reduce lead time by making work more efficient and clarifying steps, roles and responsibilities.

**Information availability**

The teams have focused on creating and restructuring databases, such as common teamplaces to improve information availability and accessibility. Focus has also been on creating and restructuring storages to improve parts availability and accessibility. Improvement areas have been to simplify the information search by documenting in the right ways and places and creating common databases with relevant and useful content. Databases for improvement suggestions, technical documents, parts information and common parts were examples of improvement areas. The intentions were to make information available and easy to find to reduce time and cost for searching for right information.

**Tests/Analysis**

Improvement areas in this category were to have higher efficiency level in testing to shorten lead time. Performing several tests at the same time, improving verification and validation processes and implementation of better measurements for analysis were examples of improvements performed. Focuses have also been to define test procedures, reduce time for preparations of tests, better planning of the tests and performing analysis earlier. More utilization of simulations was also among the improvements performed to reduce cost and time for testing procedures. Other focuses have been to utilize internal and external customers' information in better ways to improve tests and analysis.

**Communication/Collaboration**

Improvement areas in this category have been focused on improving communication by making both internal and external information sharing more efficient. Meeting time reductions, increasing efficiency level of meetings and reducing amount of unnecessary emails and calls were examples of areas of improvement. Improvements of collaboration both internally and externally have been made through clarifying roles, responsibilities and interfaces to reduce the amount of confusion and double work. Understanding customers' needs and requirements better and creation of better information flows, utilizing visualization better and working more cross functionally were other examples of improvement areas in this category.

**Product/Production improvements**

This category includes improvement areas focusing on reducing product costs by reducing material costs, number of parts and components, rechecking parts' prices, and by replacing expensive hardware with cheaper yet qualitative solutions. Another example was improvement of part designs to reduce costs and reduction of service time for machines delivered to customers. Modularity and platform improvements were also included by utilizing common-architecture-same-technology to use common parts in different products by increasing usage of standard part numbers to reduce part numbers. Included in this category were also improvements related to production costs by reducing machine down time, eliminating wastes in production lines and cutting costs in assembly.

**Project management**

In this category improvement areas have been to improve the daily project work by better planning of tasks and activities in projects. Waste and lead-time for projects as well as project resource costs have been areas of improvement for the OD-teams. Better project management, project portfolio management and project planning have been focuses for improvement.

**Knowledge management**

The teams have chosen improvement areas focused on expanding knowledge of products, customers and processes. Improving overall competence levels in technical, engineering, products and testing areas as well as performing education in Lean and Six Sigma methodologies are examples of what was included in this category. Implementation of better knowledge transfer within the company by creation of systems for better documentation of knowledge to diffuse it better has also been focused on. Cross functional training and sharing knowledge by documentation, communication and sharing of best practices to diffuse lessons learned were types of improvements performed.

**Quality/Reviews**

The teams have been working on improving quality by working more extensively with quality aspects. More utilization of quality tools such as Failure Mode and Effect Analysis to reduce defects and rework are examples included in this category. Some teams have focused on increasing the amount of reviews and self-inspection to improve quality, and others have focused on reducing the review time.

**Overall improvement ideas**

This category consists of improvement areas where the teams have had the focus of generating overall improvements for waste-, lead time- and cost reduction. Idea generation and workshops for potential cost reduction solutions were examples of improvement performed. So were reducing travel times, elimination of unnecessary office supplies and elimination of waste in daily work.

**Efficient execution**

In this category the teams have focused on working more efficiently in the daily tasks. The teams have worked with enhancing the number of closed actions and tasks. Other examples were reducing lead-time for manufacturing approval and prototype material handling and reducing time-to-market by working more structured and with clear targets and goals.

### 6.3 Distribution per strategic focus

The OD process is divided into cycles of six months each with a specific strategic focus communicated from top management. In this section the distribution of the categories of the improvement areas per strategic focus are presented. The distribution is presented both in “number of teams” and “number of teams in percent” to see the relations between the total amount of teams for each strategic focus and the categories. This makes it possible to compare the different strategic focuses towards each other in a better way since the number of participating teams varies between the cycles. Most of the categories are included in the top ten categories described above but for the improvement category that is not included a short explanation of it is given.

#### 6.3.1 Distribution of improvements for cycle 1 and cycle 2

For cycle 1 and cycle 2 the strategic focus was to “Reduce waste” in the form of the eight Lean wastes; Overproduction, Waiting, Transport, Over processing, Motion, Inventory, Defects and Underutilization of peoples’ creativity. Each team leader together with team members selected an improvement area to achieve the strategic focus for the specific cycle. The categories the teams have focused on for the strategic focus “Reduce waste” is presented in Figure 6.2 below. The figure shows the number of teams per category in both frequency and in percentage. The two categories to the right in the chart are separated since the categories were not common for both cycle 1 and cycle 2 and will be further explained below.



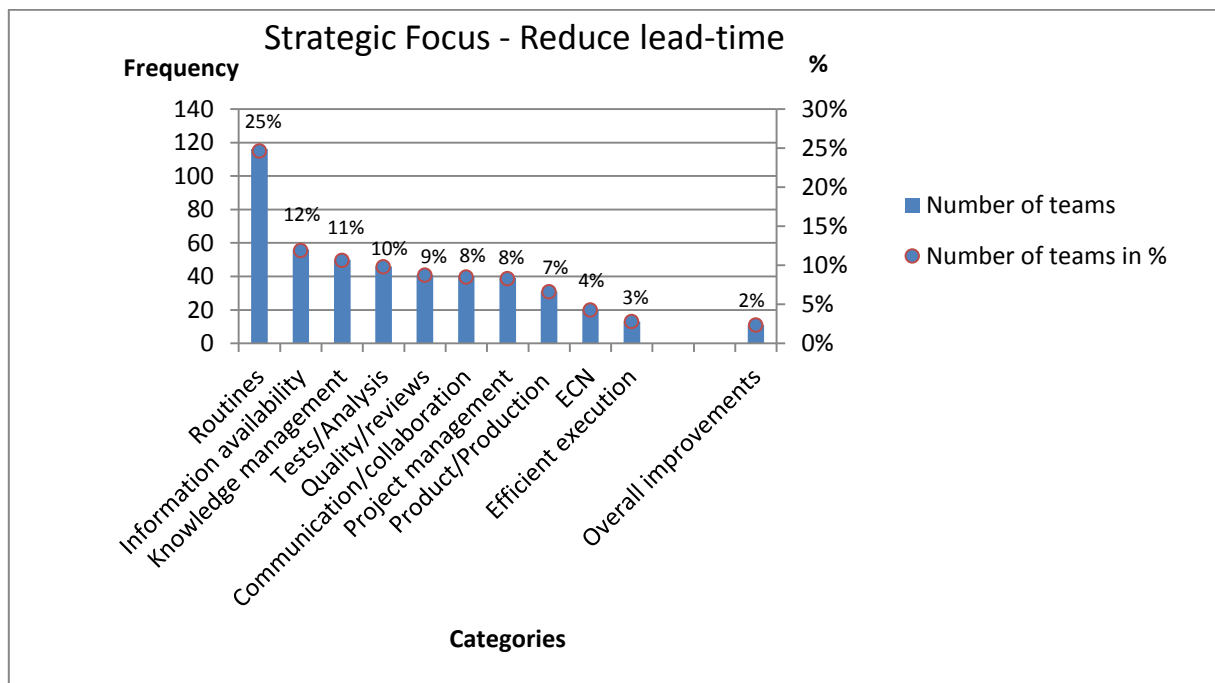
**Figure 6.2** Distribution of improvement areas for “Reduce waste”

### Engineering Change Notice (ECN)

An ECN is an object specifying which changes have been made to documents and parts. Improvements included in this category were improving and optimizing the process and routines for ECNs by launching list of requirements and by working in more structured way to reduce ECNs. The intentions were to handle the ECN process correctly to reduce confusion and mistakes within the organization.

#### 6.3.2 Distribution of improvements for cycle 3 and cycle 4

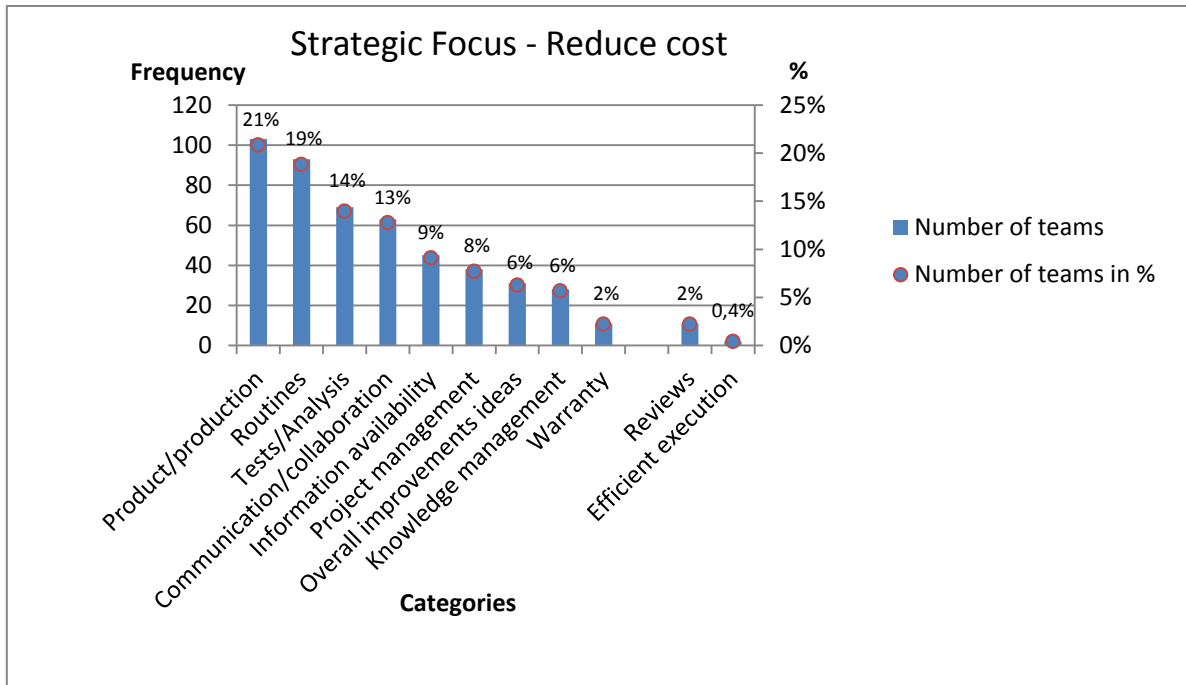
For cycle 3 and cycle 4 the strategic focus was to “Reduce lead-time”. The distribution of improvements performed by the different teams is shown in Figure 6.3. The figure shows the number of teams per category in both frequency and in percentage. The category “Overall improvements” to the right in the chart is separated since it was not common for both cycle 3 and cycle 4.



**Figure 6.3** Distribution of improvement areas for “Reduce lead time”

#### 6.3.3 Distribution of comments for cycle 5 and cycle 6

For cycle 5 and cycle 6 the strategic focus was to “Reduce cost” by improving collaboration. The distribution of improvements performed by the different teams is shown in Figure 6.4. The figure shows the number of teams per category in both frequency and in percentage. The two categories to the right in the chart are separated since the categories were not common for both cycle 5 and cycle 6.



**Figure 6.4** Distribution of improvement areas for “Reduce cost”

### Warranty

The warranty procedure was a focus for improvement for some teams in these cycles. Investigation of why warranty costs are high and how they could be improved has been performed by the teams. Working with detecting faults early before they become warranty problems and ensuring that the company is working with the right suppliers were examples of improvement areas included in this category.

#### 6.3.4 Summary

In table 6.2 a summary of the distributions for the categories per strategic focus can be seen. The table is separated by strategic focus to see the differences in the areas chosen when the strategic focus is changed. The table only shows the distribution of the categories mentioned above in the top ten categories chart in Figure 6.1 which explains why the total percentage is not 100 percent.

**Table 6.2** Summary of the distribution for the top ten categories per strategic focus

<b>Category \ Strategic Focus</b>	<b>REDUCE WASTE</b>		<b>REDUCE LEAD-TIME</b>		<b>REDUCE COST</b>	
	<b>(Teams)</b>	<b>(%)</b>	<b>(Teams)</b>	<b>(%)</b>	<b>(Teams)</b>	<b>(%)</b>
Routines	62	18%	116	25%	93	19%
Information availability	74	22%	56	12%	45	9%
Tests/analysis	35	10%	46	10%	69	14%
Communication/collaboration	40	12%	40	8%	63	13%
Product/production	0	0%	31	7%	103	21%
Project management	29	9%	39	8%	38	8%
Knowledge management	22	7%	50	11%	28	6%
Quality/Reviews	17	5%	41	9%	11	2%
Overall improvement ideas	14	4%	11	2%	31	6%
Efficient execution	36	11%	13	3%	2	0,4%

What can be concluded from the table is that the distribution of the top ten categories for the different strategic focuses is quite similar. However, there are four categories that stand out more than the others. When the strategic focus changes to “Reduce cost” the category of “Product/production” highly increases. It can also be seen that the categories “Information availability” and “Efficient execution” decrease constantly over time and that the category “Routines” is constantly a common chosen area among the OD-teams despite the shifts in strategic focus. Except from these four exceptions there were no other radical shifts in the improvement areas chosen by the teams when the strategic focus was changed. Based on these categories it was of interest to see to what extent they are sustained. Therefore the created follow-up tool described in chapter 5 was tested at the site in Braås and the results are presented below.

#### **6.4 Results from improvement work at Braås**

The site Braås was selected as a first site to collect information with the follow-up tool from regarding performed and sustained improvements. For all six cycles, 109 improvement initiatives had been performed in Braås as could be seen in Table 6.1 above and based on the data collected from the Internal Consultants (ICs) information was gathered from 49 improvements. The result from these 49 improvement initiatives can be seen in Table 6.3.

**Table 6.3** Results from improvement work at VCE Braås

Not implemented	Exists today	Exists today <i>and</i> Continuously used	Exists today <i>and</i> Continuously used <i>and</i> Further developed
8	-	-	-
Implemented	Exists today	Exists today <i>and</i> Continuously used	Exists today <i>and</i> Continuously used <i>and</i> Further developed
41	19	11	11

Out of these 49 improvements investigated the result shows that eight improvements have not been implemented while 41 have been implemented. Out of the 41 implemented improvements, 19 still exists today but are not frequently used. Eleven of the 41 implemented improvements are continuously used and another eleven have also been further developed after the cycle's end.

It seems as most of the improvements that have been implemented still exist in the organization, but in different ways. Some exist but not utilized that much while others are used and also further developed. As the compiled table from the follow-up tool is long and extensive it can be seen in Appendix C. However, a summarized table showing the distribution of sustained improvements connected to each category can be seen in Table 6.4 below that shows the result from the investigation of the improvements.

**Table 6.4** Results from OD-improvements at Braås according to the follow-up tool

	Number of investigated improvements	Implemented	Exists today	Exists today <i>and</i> Continuously used	Exists today <i>and</i> Continuously used <i>and</i> Further developed
<b>Routines</b>	12	9	7	1	1
<b>Information availability</b>	7	7	4	-	3
<b>Tests/analysis</b>	2	1	-	1	-
<b>Communication/collaboration</b>	8	8	2	-	6
<b>Product/production</b>	6	4	-	4	-
<b>Project management</b>	5	5	3	1	1
<b>Knowledge management</b>	3	2	1	1	-
<b>Quality/reviews</b>	2	1	1	-	-
<b>Overall ideas</b>	1	1	-	1	-
<b>Efficient execution</b>	3	3	1	2	-

What can be seen is that for the category of “Routines” twelve improvements performed within this category were investigated and nine were implemented. Out of these nine implemented improvements, seven still exist in the organization today but only one is also continuously used and another one has also been further developed. This tells us that routines such as processes, guidelines and checklists have been created but seven of them are not really used within the company.

It can be seen that some improvements that get implemented lack in the sections of being continuously used and/or further developed. The categories “Routines”, “Information availability” and “Project management” are examples. Some more sustained improvement work can be seen for the category of “Communication/collaboration” where most of the improvements are continuously used today and also further developed. Another one is improvements within the category of “Product/production” where all of the implemented improvements are continuously used within the company.

It can be concluded that a difference in number of sustained improvements and type of sustainability can be seen in the categories. This raises questions regarding why some improvements are created, for example routines or databases, but no longer in use? Based on some interviewees a reason could be that an improvement that has been made is no longer relevant to use in the organization. For example, if the way of working is changed a created routine might not be of use anymore.

The follow-up tool also allowed for adding free-text comments regarding what positive impacts the improvement led to as well as adding comments and clarifications regarding for example reason for not being implemented or sustained. The results can be seen in Appendix C. Regarding what positive impacts and effects that were gained from the improvement work mostly comments regarding soft aspects such as better communication and collaboration between departments and within the organization was stated. Some positive impacts also considered financial impacts, however not stating how much. Among the comments considering clarifications regarding not implemented improvements were that the staff turnover was high during the specific cycle which affected the OD-improvement work. Other comments were high work load and reorganizations within the company that affected the improvement’s implementation.

## **6.5 Factors affecting sustained improvements at VCE**

In the following sub-sections the results from the 20 interviews with Braås and Eskilstuna will be presented. The focus for the interviews was on the work approach of the improvement teams to understand contributing factors to get improvements implemented and sustained in the organization and also to understand how sustained the teams’ improvements were. The outcomes from the interviews were divided into sustained improvements and non-sustained improvements. The distribution of sustained and non-sustained improvements based on these interviews can be seen in Table 6.5.

**Table 6.5** Results from Sustained improvements and Non-sustained improvements

<b>Sustained improvements</b>		<b>Number of improvements</b>
A	Improvements that have been implemented and still exist today but not continuously used	0
B	Improvements that have been implemented, still exists today and are continuously used	3
C	Improvements that have been implemented, still exist today, are continuously used and are further developed after the cycle's end	11
<b>Non-sustained improvements</b>		
D	Improvements that have not been implemented	4
E	Improvements that have been implemented, but do not exist today. I.e. the improvements have regressed or do not exist any longer	2

As can be seen from Table 6.5 above, 14 improvements were considered sustained improvements and six improvements were considered non-sustained improvements. This distribution is based on interviews with OD-team leaders from VCE's sites in Braås and Eskilstuna and the researchers' interpretation regarding how sustained the improvements are.

To understand factors affecting sustainability of improvements the teams' ways of working was investigated through semi-structured interviews with team leaders and the results from the interviews are presented in the sections below. The sections below start by describing the way of working for the teams with sustained improvements followed by the teams with the non-sustained improvements, if not stated otherwise in the text.

#### **6.5.1 Need for improvement area**

For the sustained improvements it could be understood that a strong need and a sense of urgency for the improvement both among the team and for the organization existed. It was stated by the interviewees that when the improvement had been important for the daily work and when there was a strong need in the organization, it was successfully implemented and sustained. The strong need lead to high motivation for the improvement effort and assured it being carefully created as stated by some interviewees. What was also mentioned in the interviews was that when the improvement work resulted in good outcomes it would be used and developed when needed.

For the non-sustained improvements it could be seen that some teams also had a strong and common need for the selected improvement area for some cases. However there were also

cases where the need for the specific improvement was not perceived in the same way by the whole team.

#### **6.5.2 Interest for improvement area**

A joint factor for the sustained improvements investigated was a common interest in the entire team when selecting improvement areas to focus on during the OD-cycle. The common interest was critical to create motivation for working together towards the teams' goals as stated by interviewees. A common interest for the chosen area leads to a large amount of effort being put to create and establish a good improvement together as mentioned by the interviewees. Improvement work related to the daily work and having a personal connection to the selected improvement area was stated by the interviewees to be important for their motivation.

For the non-sustainable improvements the teams' improvement areas to focus on were sometimes chosen together in the teams and in line with their daily work and common interests. There were cases where not all of the team members were interested in the selected improvement areas. Which could lead to lower motivation for the team's improvement work as stated in the interviews and could be related to failure for implementing and sustaining improvements.

#### **6.5.3 Stakeholder involvement**

Among the sustained improvements it was clear that the teams have worked strongly with assuring quality while creating and implementing the improvements. It was mentioned by one interviewee among others that the team decided to involve persons from other departments affected by the improvement to assure good quality of the improvement. In the interviews it was mentioned that involving others in the creation of improvements secured that important aspects were being considered. Another interviewee mentioned the importance of involving the people with the control over the implementation process, the decision making power, right from the beginning. Depending on what was chosen to be improved, the own department, another department or the higher management might be responsible for the actual implementation process by having the decision making position.

According to the interviewees from the non-sustained improvements the teams did not involve stakeholders to a high extent. These improvement efforts lacked involvement of others and the teams seemed to work more separately with their improvements.

#### **6.5.4 Teamwork structure**

The OD-team minutes report is a living document which should be updated by the teams during the improvement work. These reports include information regarding improvement area, goals, team members and also an action list that states what is to be done. For the reports belonging to the strategic focus of "Reduce cost" the reports also included a section to fill in the financial cost savings. All reports include a section for feedback where teams

can reflect on their meetings to understand what could be improved for following meetings. Both for the sustained and non-sustained improvements the teams had partly followed the structure of the OD-team minutes. The largest focus seemed to be put on stating improvement area and the action list stating what was to be done and by whom. Common for both sustained and non-sustained was that the feedback section was not filled in based on the documents stored in the common database investigated by the researchers.

Based on the interviewees most of the teams for the sustained improvements adjusted the teamwork depending on how the teams could achieve efficiency and good results. Meeting times had been extended when needed and some teams also used the actual meeting times to work together towards the improvement goals during the meetings instead of using them as only reporting occasions. Adapting the way of working to be suitable for the team created motivation and willingness to work together towards goals as mentioned by one interviewee.

The way of working in the teams for the non-sustained improvements also varied according to the interviews. Therefore any major differences could not be seen. However, the results from the interviews showed that there were generally not any clear goals set for these teams which could lead to a lack of coherence in the work being done.

#### **6.5.5 Measuring results**

There seems as there was a lack of performing actual measurements connected to the strategic focuses made for the improvements investigated for both sustained and non-sustained improvements. Based on the interviews most of the measurements that were connected to the strategic focuses and reported to top management were often estimated figures and estimates could sometimes be difficult to make. It was also mentioned that it was difficult to follow up on something roughly estimated when not knowing how to measure it accurately. However it was said that the calculated estimates were based on expert knowledge and therefore should be credible and some assumptions were based on predefined measurement values by calculating the engineering costs per hour for example. For the strategic focus of “Reduce lead-time”, the teams thought it was difficult to know or measure the time for all possible steps in a process that affected the lead-time. Considering the strategic focus of “Reduce cost” the feelings were that it often was difficult to put a cost saving on some types of improvement results. As stated in the interviews, some improvement outcomes were related to soft savings such as better teamwork, good communication, and efficiency that could be difficult to transform into actual cost savings for financial measurements. Therefore estimates were sometimes reported and documented in the OD-team minutes reports, but not really followed up on and evaluated.

However, what could be said for the sustained improvements is that some teams found other measurements than only those connected to the strategic focuses to base their improvement work on to understand the effects of their work. As an example, some teams

measured the level of satisfaction by surveys among the persons affected by the teams' improvement work before and after its implementation to base conclusions on the difference. Another example was measuring the number of people with access to a created database. All teams with sustained improvements did not measure, however it could be said that measuring and evaluating outcomes could provide tendencies of sustained results as the effects could be evaluated and visible.

#### **6.5.6 Standardization**

Among the sustained improvements standardization to some extent was evident. As a way of standardization the improvements included in the category "Routines" were mentioned to be standardized by being written down as processes or guidelines. These were then included in company or department handbooks or placed in common databases for easy access. By publishing the routines in common places it gave the team members the possibility to access it but also develop it whenever needed, as mentioned in the interviews. The standardization process also included informing affected persons of the improvement to spread or implement the new way of working. However there were cases where any standardization processes were not seen as necessary and where the new way of working was not integrated among all intended persons. Therefore it was a mix of if the teams secured that everyone knew where to find the improvements or had access to the improvements in the categories of "Routines" and "Information availability". It was mentioned by one of the interviewees that this affected the level of usage as it was not possible to control whether or not a standardized way of working was assured.

For the non-sustained improvements there were no clear signs of any standardization processes seen from the interviews. Overall there was a lack of documentation of the created improvements such as "Routines". Considering databases created for the category "Information availability", the created databases were not user-friendly and for these reason they were not fully integrated in new ways of working, as mentioned by an interviewee.

#### **6.5.7 Management involvement**

Management in this study was consisting of OD coaches, Internal Consultants (ICs), line managers and department managers. For the sustained improvements it was evident that the management was involved in the different teams' improvement work during the cycles. Coaches had been present during OD meetings and ICs had occasionally attended the teams' OD meetings. It was mentioned by the interviewees that the engagement from the management's side created motivation among the team members as it gave a feeling of that OD is important. It also mediated the feeling of that the managers were interested in the improvement efforts and results. From the interviews it was clear that management involvement in the form of being supportive as supportively asking for results and providing help when needed created motivation among the team members. Management involvement by strictly controlling and pressuring the teams were not desired as was said by one interviewee.

Regarding the non-sustained improvements the results from the interviews showed that the management had not been particularly involved during the OD teamwork. It was stated by the interviewees that the management was only present for brief check-up sometimes and did not get involved in the work or showed enough interest. This in turns led to lower energy and engagement of the teams which might have had an impact on the improvement work, as stated in the interviews.

#### **6.5.8 Learnings**

According to all interviews the learnings and results from the improvement initiatives are shared on the seminars after each cycle. These seminars are called Half Year Follow Up seminars (HYFU) where the teams get the opportunity to present what has been achieved. HYFU is structured as an exhibition and is supposed to be a forum where best practices can be shared and where teams can learn from each other. At the seminars the OD-teams are placed in booths and present at different occasions during one day and other teams can select what teams to get a presentation from.

For the sustained improvements some teams learned about the importance of involving others and managing teamwork during the OD improvement work. Mentioned by the interviews were also that when the teams achieved good results that led to implemented improvements the understanding of OD's importance was increased.

The interviewees for the non-sustained improvements mentioned that learnings from failure have been brought on to following cycles. As mentioned by one interviewee, the team learned that the improvement goals they had been trying to achieve could not be done within the frames of OD. This was an important conclusion as the team could move on and select other areas to work with instead of continuing with the same area in following cycles. Another interviewee stated that the team improved their way of working in OD and learned how to work better together to reach successful results in following cycles. Hence even if some teams did not achieve the goals, the improvement efforts to some extent led to benefits for following cycles.

#### **6.5.9 Obstacles**

Both for the sustained improvements and non-sustained improvements the teams had experienced obstacles in their OD work. One was that the implementation of improvement work took time and it could also be difficult when the teams were not responsible or had the decision making position of the implementation process. Therefore some teams have continued working with the same improvement in following cycles. The interviewees also mentioned that not being able to set clear and reachable goals were obstacles for the OD-work. Setting too high goals or aiming for results that were not possible to achieve within the specific OD cycle hindered the completion and implementation of improvements.

Some specific barriers to the OD improvement work were mentioned by the teams for non-sustained improvements. Previous experiences such as failure to meet goals during former cycles were an example. For some teams negative experiences were brought on to following cycles by some team members and led to lower motivation and energy within the team. Other obstacles mentioned that stood out for the non-sustained improvements were lack of thorough pre studies and preparations for the selected improvement focus. There were cases where teams could not achieve goals at all due to lack of information and resources accessible for the team. It was also mentioned that due to high workload in the daily work, the OD work could sometimes be lower prioritized.

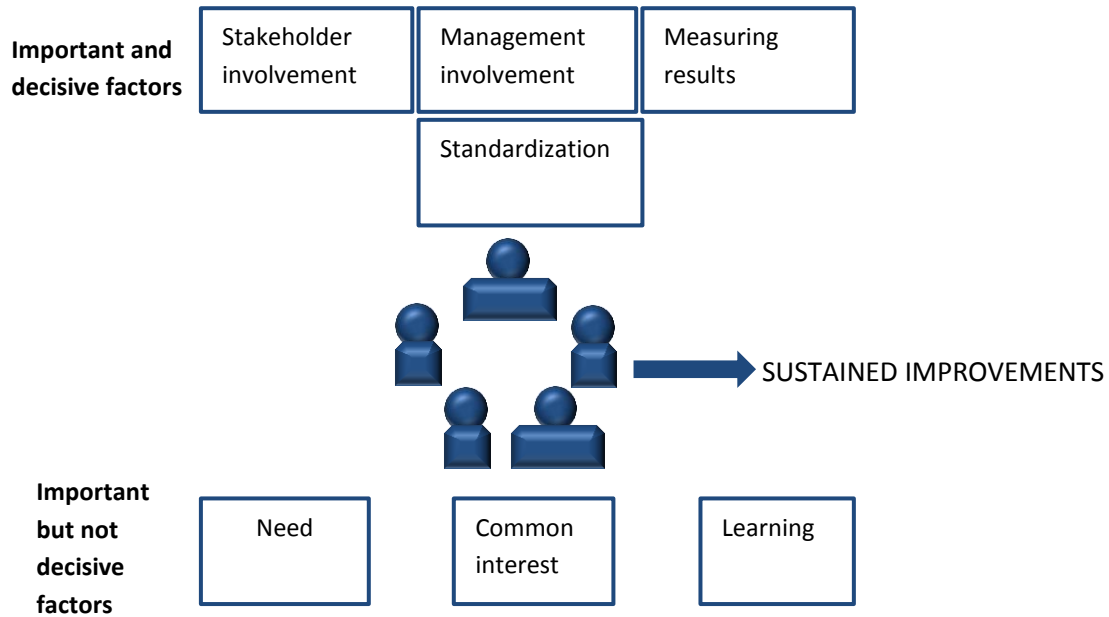
#### 6.5.10 Summary

A short summary of what has been presented above for the sustained and non-sustained improvements can be seen in Table 6.6 below.

**Table 6.6** Summary of results regarding OD-teams improvement work

	Need	Common interest	Teamwork structure	Stakeholder involvement
<b>Sustained improvements</b>	Yes	Yes	Partly OD-structure and adapting	Yes
<b>Non-sustained improvements</b>	Partly	Partly	Partly OD-structure and adapting	No
	Standardization	Measuring results	Management involvement	Learnings
<b>Sustained improvements</b>	Partly	Partly	High	Yes
<b>Non-sustained improvements</b>	No	No	Low	Yes

Most of these factors seem to be interrelated and affected by each other. Some of the outcomes in Table 6.6 above have been divided into different types of factors affecting improvement work depending on how the factors were evident for the sustained and non-sustained improvements. The different types of factors can be said to be either *Important but not decisive* or *Important and decisive* factors for sustaining improvements. The division can be seen in Figure 6.5. This division is based on the information and results from this specific empirical study and it should be understood that other empirical data could provide different results.



**Figure 6.5** Important and decisive factors for sustaining

Our results show that there are some factors that seem to be important for improvement work but not decisive for sustained improvements. It seems to be of importance to feel a need for the improvement area as well as having a common interest within the improvement team. This also applies for the factor learning. However, it could be said that these important but not decisive factors might not be enough by themselves to assure sustained improvements as there were cases with non-sustained improvements that also had need, common interest and learning. However, lacking in these factors could perhaps lead to failure regarding improvement work.

When comparing the sustained and non-sustained improvements it could be seen that systems view and stakeholder involvement, management involvement, measuring results, and standardization were evident for the sustained but not for the non-sustained improvements. This could indicate that these factors could be seen as both important and decisive factors for sustainable improvements based on this study.

This is the outcome from this study therefore other factors that are not included can perhaps also affect sustained improvements and the factors could be different if the study was focused on other types of improvements. In reality there might be a lot of factors that are interrelated but based on our study it all interrelations are not evident. This is a limitation for our study as we can see some indications of what factors that can affect sustainability of improvements but cannot draw conclusions on the interconnections of the factors and how much each specific factor affects sustained outcomes.

## **6.6 OD structure**

The 20 semi-structured interviews with team leaders also led to insights to the OD process and the improvement structure. By listening to some persons engaged in the process, valuable information about the process and its structure could be obtained which is summarized below.

### **6.6.1 OD integration**

As the OD structure looks today, it is stated by the interviewees that much time is put on administration and meetings. There is a feeling among the interviewees that the time and resources put into the OD structure such as administration work, leader seminars, Half Year Follow Up seminars and support group meetings might not be utilized good enough. As mentioned by one interviewee, much of this time could be put on the actual improvement work instead. All administration and long full day seminars can sometimes feel unnecessary and too separated from the daily work according to the interviewees. Therefore OD feels like a parallel organization to the company since it is too separated from the daily work, as mentioned in the interviews.

### **6.6.2 Support group function**

The OD structure consists of a support group function where support group meetings are held. In these meetings team leaders get together and share experiences with each other. This kind of sharing is meant as a way to reach solutions for problems and learn from each other. In the interviews it was said that the part of actually sharing problems and solutions with each other is sometimes lacking. Currently there is a feeling that problems are talked away instead of actually sharing them and reaching solutions together. Based on the interviews, there seems to be a tendency where people do not want to share flaws in the OD work. Therefore it is a desire from some interviewees to improve the support group meetings and utilize them more instead of having them as pure reporting meetings. In support group meetings the soft sides of OD work could take more place such as how to be better leaders, how to create motivation in the teams, and how to achieve good team work as mentioned by one interviewee. It is however stated that the support group meetings can vary from site to site where some sites have reached a good level on the meetings and some have not.

### **6.6.3 Management and employee receptiveness of OD**

As mentioned by some interviewees there is still a feeling that the importance of OD could be communicated better to create motivation and stronger willingness to work with the OD process. It is mentioned that both managers and OD participants sometimes mock the OD process which could lead to negative feelings about the process and could decrease the team member's motivation for the OD improvement work. Some sites have the problem of leaders, line managers, or top management not showing enough interest into the OD process and improvements.

#### **6.6.4 Strategic focus and strategic reasoning**

As the result from the categorization of the different improvement areas performed during the six cycles showed similar patterns for improvement areas based on the Strategic Focus (SF) it was interesting to hear the interviewees view regarding SFs' effect. SF is intended to be communicated in a clear way to help the OD-teams in the selection and prioritization of improvement areas to work with during the cycle. However, most of the interviewees referred to that SF were not actually guiding the teams in the selection of improvement area. It was mentioned that the different focuses have been broad and related to the same areas and therefore it was easy to choose any kind of improvement area and then shift it towards the specific cycle's SF.

The strategic focus is often clearly communicated but there is a feeling among the team leaders that it is often the same type of Strategic Reasoning (SR) to the SF that is communicated each year. It is said that the SR does not create that much motivation for OD any longer. The SF and SR are communicated on a high and vague level that it can be difficult to feel any personal connection towards it, as mentioned by one interviewee. There is a feeling among the interviewees that SF could be developed and broken down even further and communicated better to create more motivation and commitment among the OD participants.

## **7 Discussion**

In this chapter the follow-up tool and the empirical findings will be analyzed, discussed and also compared to theory. The first part of the analysis considers the follow-up tool created by the researchers. This is followed by an analysis and discussion regarding the different categories of improvement areas selected by the OD-teams and a discussion regarding the results from the follow-up tool is given. In section 7.3 the factors affecting sustained improvements based on the empirical findings will be compared to literature and further developed and discussed to understand how organizations could work to sustain improvements. Furthermore, in section 7.4 other factors related to a continuous improvement strategy that can affect improvement work within a company will be discussed.

### **7.1 The follow-up tool**

Following up on continuous improvements performed within a company can be difficult. The analysis and measurement of sustainability of the improvements depends on the organization's situation and what the intentions are (Buchanan et al. 2005). Buchanan et al. (2005) also highlight two different perspectives to take into account, a static and dynamic perspective as mentioned earlier in Chapter 5 Follow-up tool. In the follow-up tool created for this study these two definitions by Buchanan et al. (2005) are taken into considerations by dividing the second section regarding sustained improvements into three columns as can be seen in Figure 5.1. The first two columns take into account improvements that have been statically sustained which refers to pure sustaining of implemented changes. These columns therefore include improvements that have been implemented and exist in the company and also improvements that have been implemented and are continuously used. The third column considers the dynamic perspective where improvements also have been further developed. These perspectives are of importance to take into account as the analysis depends on the situation. Rapidly changing environments and highly competitive environments might benefit more from the dynamic perspective while a more stable environment could allow for pure sustaining of the improvement (Buchanan et al. 2005).

Based on this study it could be seen that having a good documentation system is beneficial for analysis of sustained continuous improvements. For this study the documented improvements allowed the researchers to perform a categorization of all improvements performed within the continuous improvement strategy OD. This gave an understanding of the improvements performed within the organization and could also be used when creating the follow-up tool. To investigate sustainability of improvements performed in an organization the type of data that were found to be beneficial was; the contact persons responsible for the improvement work; what the improvement work consisted of; what the improvement work resulted in; and the when the improvement work and implementation took place. By including a time aspect it could give an indication of how long-term the

results have been. The improvements should not have regressed to the old state or old performance level a while after its implementation (NHS Modernisation Agency, 2002).

Many improvement initiatives are performed within organizations and it could be very time consuming and complicated to collect information retrospectively regarding all improvements that have been performed. The experience of the researchers in this study is that some people tend to forget about performed improvements and its outcomes. Therefore collecting this type of data simultaneously as the improvement work takes place can be beneficial when analyzing sustainability of improvements.

In *Section 3* and *Section 4* of the follow-up tool opportunities were given to fill in positive impacts, overall comments and clarifications. However, these were not filled in for all investigated improvements. This might depend on how the ICs interpreted what should be included when asking the questions or that it was difficult for the team leaders to remember impacts gained. Other possible reasons could be that the ICs did not have had the time to ask for this information or that the team leaders did not have to find information to answer the question. The positive impacts reported were mainly concerning soft benefits such as better communication and better processes. The intention was that positive impacts should include both soft and hard aspects but since reporting of hard aspects were lacking to some extent from the pilot investigation there might be a need to stress this more if the follow-up tool is to be used in other sites.

The outcomes resulted from the follow-up tool can also depend on if variation still existed between the ICs and how they interpreted how to fill in the tool. Variation can be difficult to avoid (Hall and Hallgrímsson, 2005). And variation in interpretation when different persons collect the same type of data can be difficult to avoid completely (Bryman and Bell, 2011) and therefore it could be of importance to highlight and clarify the questions and sections in the tool further.

## **7.2 Improvements at VCE**

The results from the categorization of improvements performed at VCE will be further analyzed and discussed below. This section also includes a discussion regarding sustained and non-sustained improvements collected from the follow-up tool.

### **7.2.1 Connection between strategic focus and improvement areas**

As mentioned earlier in this study the researchers did a categorization of the improvements that have been made in the OD process during a three year period (six cycles). The result from this categorization created a base for the follow-up tool and the researchers sees it as beneficial to create a systematic overview of what improvements that have been performed before starting to investigate sustainability of improvements. The categorization could lie as a foundation for investigating if there are tendencies in types of improvements that are sustained and not.

The result from the categorization was presented in the empirical findings in Table 6.2 in section 6.3.4. The table gives a picture of the tendencies in areas chosen by the OD-teams and are divided per strategic focuses. It was seen that some categories were quite constant over time while others increased or decreased. One that stood out was the category “Routines” that constantly was a major improvement area for all the cycles and strategic focuses. For the Strategic focus (SF) “Reduce waste” it was 18 percent of the teams that focused on this category, 25 percent in “Reduce lead-time” and 19 percent in “Reduce cost”. It could also be seen that the category of “Product/production” tripled for the SF “Reduce cost”, from seven percent to 21 percent. A reason for this major increase for “Product/production” could be that product and production improvements might be more directly relatable to cost reductions and can perhaps be measured to a higher extent than other categories. This might motivate the teams to select this type of improvement area.

It was also seen that the selected areas of categories did not vary that much depending on the different SF. Based on the literature by Liker (2009) it is seen that the strategic focuses are related to common lean principles. These lean principles are interrelated and reducing lead-time is a reduction of waste that could lead to a reduction of costs (Liker and Meier, 2006). Therefore when taking this into account for the OD-teams it seems quite natural that the areas chosen for the different focuses are similar. The similarities of the categories for the SFs could also be compared to how Motorola worked with team improvements in the 1990s, as described by Alänge (1992). In the case of Motorola the management had set five key initiatives<sup>1</sup> that the problem solving teams should work towards. No matter what improvement initiative the teams chose to focus on the management would understand that it would contribute to a better business and the organization’s vision because of the interrelation between the key initiatives (Alänge, 1992). Based on this it could be discussed if changing the focus every other cycle has led to the maneuverability effects that are intended by the OD process. As seen now the maneuverability is mostly only visible to some extent for the strategic focus of “Reduce cost”.

From the interviews it was said that what type of improvement to focus on in the teams was often determined by the needs and interests of the OD-teams and the departments. The interviewees also stated that the strategic focus was not helping to a high extent when selecting improvement area. A reason was that the selected improvement area could often be shifted towards the different SF, which raises some questions regarding if the SF generate the effect on the OD-participants that is wanted in the OD process.

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<sup>1</sup> The five key initiatives for Motorola was: the six sigma goal of defect reduction, total cycle time reduction, product and manufacturing leadership, profit improvement, and participative management (Alänge, 1992).

### **7.2.2 Sustained and non-sustained improvements according to the follow-up tool**

The results from the follow-up tool that was created and tested in this study can be seen in Table 6.4 presented earlier in the empirical findings. In this study there are not enough data collected to be able to draw concrete conclusions on all improvements that have been made globally within OD. Therefore discussions and conclusions are only based on the outcomes and the data that was collected in the study from the Braås site. In the table it could be seen that regarding the investigated improvement efforts, several improvements are being made and implemented in the organization but not all of them are implemented or necessarily continuously used or further developed. The categories that stands out the most are “Routines”, ”Information availability”, “Communication/collaboration” and “Project management”.

Regarding the category “Routines” it has earlier been shown that this is a category that teams often tend to focus on which was seen in Table 6.2 in the empirical findings. From the results of the follow-up tool it was concluded that out of 12 investigated improvements nine were implemented, which mean that three were not. It could although be discussed that even if a routine was not implemented the creation process could be of value and generate soft aspects for the teams. For instance the creation process could create benefits such as clarifications of roles and responsibilities as well as identification of critical steps which could lead to improved communication and collaboration.

Out of the nine implemented routines it could be seen that seven routines still exist in the organization but are not in use, one is continuously used and another one also further developed. There might be several reasons behind this outcome and one could be that it is a fast changing industry which might change the needs and processes of an organization. It could also be difficult to integrate and standardize a new routine or process within an organization. However, standardization is of importance to increase the likelihood that new routines are utilized (Liker, 2009; Bergman and Klefsjö 2010). For standardization to occur, new routines and processes must be integrated into the organization and be set as new ways of working which is connected to a behavior change and the behavior change is often a challenge for companies (Liker, 2009). To achieve this, an organization that supports standardized work is required (Liker and Meier, 2010).

From Table 6.2 it could also be seen that in the categories ”Information availability”, “Communication/collaboration” and “Project management” all the investigated improvement have been implemented and several have also been continuously used and/or further developed. There can be various underlying reasons for the different tendencies in these categories. However if there exists any reasons for if different categories are easier or more difficult to implement and sustain have not been discovered in this study but some discussions regarding the category “Routines” was given above.

It can be said that a lot of improvement work is done but the question is if and how they are sustained and how they generate value to the organization. It is difficult to say that one type of improvement is better than another. There should be an understanding that different improvement effort could generate both hard and soft benefits for the organization and the result might depend on the specific situation. Example of some hard benefits could be financial and measurable results while soft benefits could be more difficult to measure such as improving a way of working or communication within the organization as stated by Aruleswan (2009). As stated by Kaye and Anderson (1999) the important positive effects are also related to organizational, individual and team performance and other benefits gained from the work.

### **7.3 Success factors for implementing and sustaining improvements**

In this section the factors affecting the improvement work and the sustainability of the OD-teams improvements will be further discussed. It could be seen that the full potential of success factors were not utilized within VCE. Based on the literature some important aspects regarding what affects sustainability have been found and will be compared to the empirical findings. What can be said is that factors for implementing improvements and achieving sustainability of them are closely connected.

#### **7.3.1 Timing and importance of improvement**

Buchanan et al. (2005) highlights the fact that the timing and importance of an improvement or change affect if the improvements are sustained or not. It is connected to the process of change and the process determines the outcomes of the improvement work (Buchanan et al. 2005).

In the case of the OD-teams' improvement work it could be seen from the interviews that having a strong need for the improvement among the team members was an important factor for improvements but not decisive for sustaining improvements by itself. The perceived importance of the team's selected improvement area affected the motivation level of the team members and could lead to good amount of energy for the improvement work. This can be related to Upton (1996, p.8) that state that a critical factor for continuous improvements are "Compelling motivation and energy" where it is highlighted that if there is a low motivation and understanding towards the improvement it can have a negative effect on the improvement work. For improvements that were sustained in the empirical findings it could be seen that the need could affect the receptiveness towards it. As also stated by Buchanan et al. (2005) and Upton (1996) selecting improvement initiatives close to the daily work can increase the importance and sense of personal connection to the improvement and lead to increasing the employees' and organization's motivation and receptiveness towards the change.

What could be concluded is therefore that the need for an improvement could be related to timing and importance of change. If there is a strong need for an improvement it could lead

to a strong need for sustaining the improvement. This should be combined with a good process of change to reach sustained improvement initiatives highlighted by Buchanan et al. (2005).

### **7.3.2 Common interest and setting goals**

Having clear goals and a common understanding of the improvement initiative are stated as important factors for successful improvement initiatives and implementations (Upton, 1996). With clear goals one can know with certainty when the goals are achieved and by having a common interest of what is to be achieved in a change, the chance of successful implementations increases (George et al. 2005; Upton, 1996).

The importance of having clear goals is highlighted in theory but from the empirical findings it was not fully evident how clear the goals for the OD-teams have been. However, it could be seen that the non-sustained improvement initiatives did not have clear goals. Stating clear goals can create a unified target of what to obtain with the improvement (Upton, 1996). Setting right goals is a learning process and can be compared to single loop learning by Argyris and Schön (1997). Based on outcomes smaller corrective changes can be made to have better goals for following cycles. Understanding the actual problem could also be a help in the process of setting right goals, which therefore could benefit from doing a root cause analysis. This is highlighted by Shiba and Walden (2001) and Bergman and Klefsjö (2010) who discuss that root cause analysis can lead to detecting the systems and root cause(s) to problems in a systematic way which also can create a common understanding within the teams. Since clear goals did not exist within all teams the OD process could benefit from highlighting the importance of clear goal statements to create a unified improvement work and to know what to strive for.

It was said from the interviewees that not being able to set clear and reachable goals were seen as obstacles for the OD-work and could hinder the completion and implementation of improvements. One reason for the goals not being clear for all teams might also be because some teams did not have a common interest or understanding for the improvement area. This is emphasized by Kaye and Anderson (1999) that states that common interest among the employees is an important factor to achieve successful improvements. Having a shared interest towards the improvement area was more evident for the sustained improvement initiatives than the non-sustained improvements. As stated by Fazl Mashhadi et al. (2012) feeling a sense of ownership to the change or improvement can create motivation and lead to successful and sustained change work. To base the chosen areas on a common interest among the individuals was seen as an important factor for successful improvements but not decisive in its own to make them sustained since it was present for both sustained and non-sustained improvements in the empirical findings.

### **7.3.3 Systems thinking and stakeholder involvement**

Involving other perspectives in change and improvement work and also understanding how some efforts can affect other parameters or persons within the organization is related to systems thinking mentioned by Rodgers (2008). Utilizing a systems thinking and involving others in the improvement work could reduce the risk of sub-optimization as more perspectives are being considered (Rodgers, 2008).

Involving stakeholders and other perspectives when dealing with continuous improvements could be seen to have a positive effect on the implementation and sustaining of the improvement efforts performed in the OD process. This was concluded as an important and decisive factor for sustained improvements and can be connected to Buchanan et al. (2005) stating that for sustainability depends on the change process. For the sustained improvements it was seen that stakeholders and affected parties were included in the improvement process as a way to assure high quality of the outcome. This is connected to creating possibilities for participation that could lead to better motivation, communication, and decisions as stated by Nadler and Tushman (1997). Some OD-teams also included persons with the decision making power and the importance of getting support from key power groups for successful change management is emphasized by Nadler and Tushman (1997). Involving others early in the improvement process could prepare them for the upcoming change and discussed by Buchanan et al. (2005) sharing information and receiving feedback are ways to involve others which can increase the receptiveness towards an improvement or change.

In the case study there were teams among the non-sustained improvements that did not include others in the improvement work. To increase the likelihood of successful and sustained improvements having a systems perspective and involving stakeholders to a higher extent could be beneficial to integrate for all of the improvement teams within the OD process. However the extent needed might depend on what type of improvement that is dealt with and the amount of persons affected by it.

### **7.3.4 Importance of management involvement**

Management involvement is important for successful implementations of continuous improvement initiatives as stated by Janee Ali et al. (2013). Leaders should demonstrate and lead the ways as the behavior of the employees are influenced by the behavior of the management. Demonstrating good leadership is important to support change processes and can be done by providing support and resources as well as eliminating hinders (Nadler and Tushman, 1997).

The criticality of management involvement was evident in the empirical findings as it was considered an important and decisive factor for sustaining improvements. Regarding the sustained improvements the managers showed more interest and were more involved in meetings and the actual work performed in the groups. Management involvement is seen

from the findings to create a higher motivation in the teams and could be connected to Spitzer (2007) and Jane Ali et al. (2013) stating that to enable sustainable improvements within an organization it is important for the management to be involved in the changes that are being made. The management involvement and interest is reflected on the employees' motivation and behavior (Spitzer, 2007; Nadler and Tushman, 1997). By getting the employees more motivated and involved in a change it can create a feeling of ownership towards it that can affect the improvement process and its outcome (Fazl Mashhadi et al. 2012; Nadler and Tushman, 1997).

How managers are involved in the improvement work is important according to both the literature and the interviewees. Interviewees state that the involvement should be in a supportive way instead of controlling and steering the work too much. Providing support by allowing resources or removing obstacles is emphasized by Nadler and Tushman (1997) and support in improvement work can create motivation. Fazl Mashhadi et al. (2012) state that creating motivation for improvements and understanding of the importance of sustaining them can be achieved not only through words but also through actions. For the teams where the management was only present for short checkups and similar it could be seen from the empirical findings leading to less motivation in the work. When managers do not show enough interest or do not show that the work that is being performed is important it could reflect on the team's perception and motivation (Fazl Mashhadi et al. 2012). It could also be discussed that the behaviors and actions of the team leaders within the OD process also could influence the behavior of the rest of the team.

The discussion above emphasizes the responsibilities that lie on the managers and leaders. It could therefore be of importance to be aware of how behavior and actions can influence employees to value the importance of sustained improvements.

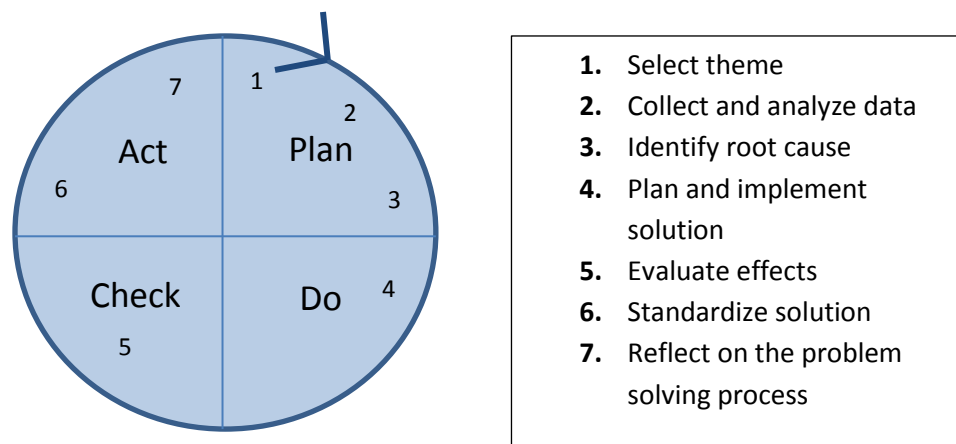
### **7.3.5 Systematic work approach – PDCA-cycle**

A systematic work approach was not considered as important and decisive factor for the improvement work based only on the empirical findings. Stated by Shiba and Walden (2001) having a systematic way of working as a foundation and guidance for improvement work is critical therefore it has been investigated further.

Working in smaller teams can enhance the motivation and commitment towards improvement work (Bergman and Klefsjö, 2010). The way a team structures meetings and improvement work is important for sustainable improvements (Kotter and Cohen, 2002). In OD the improvements are made in smaller teams and this can be related to Quality Control Circles which are improvement teams that originates from Japan as mentioned by Bergman and Klefsjö (2010) and Asai (1987). The difference between the quality control circles and OD-teams considers the integration of a full PDCA-cycle (Plan-Do-Check-Act) in the improvement work. For the quality circles a full PDCA-cycle was integrated as a systematic way of working for all the teams and improvement projects (Bergman and Klefsjö, 2010).

Imai (1986, s.60) emphasize the importance of the PDCA-cycle for good and sustained improvement initiatives and mentions that also Japanese executives stressed the importance of the PDCA-cycle “to be applied in all phases and situations”.

The way improvement work is coordinated could determine if positive or negative outcomes are obtained (Kotter and Cohen, 2002). It is a learning process to understand how teamwork could be coordinated efficiently. Therefore it is beneficial to include the systematic work approach as a foundation and guidance for improvement work to secure sustained improvements (Shiba and Walden, 2001; Bergman and Klefsjö, 2010). Figure 7.1 shows the systematic work approach of the PDCA-cycle, a learning and improvement cycle that should be integrated in improvement work to enhance successful and sustained improvements (Shiba et al. 1993).



**Figure 7.1** PDCA-cycle and the critical steps (Shiba et al. 1993)

PDCA allows for thorough plan, do, check and act phases where the different phases with the including steps are mentioned in Figure 7.1 above. In improvement work and problem solving there is often a risk of jumping to conclusions and starting directly with the “Do”-phase by stating actions and working with solutions right away. However the parts of the “Plan”-phase including selecting the theme, collecting data and identifying the actual problems by performing root cause analysis could determine if the right problem is solved and if long-term results will be obtained. The four first steps seen in the figure could help in how the improvement process could be executed to achieve good results (Shiba and Walden, 2001) as the change process is a critical factor for sustainability (Buchanan et al. 2005). In the “Check” -phase” the change process and its effects could be checked to investigate if intended outcomes were obtained. Based on the results from the “Check”-phase the team can in the “Act”-phase decide how the improvement will be fully integrated and sustained in the organization. As is seen in the Figure 7.1 above PDCA includes reflection of the problem solving process where the team could reflect and learn from the

improvement work and the different phases. This learning can be utilized in other improvement cycles (Shiba and Walden, 2001; Deming, 1986; Bergman and Klefsjö, 2010).

For the OD-teams it could not be concluded that a systematic work approach as a full PDCA-cycle lays as a common foundation for all the teams' improvement work. Some steps might exist for some of the teams as some teams did collect information before starting the improvement work. But based on the OD-team minute reports the meetings and improvement work seem to be mostly focused on action lists that can be connected to the "Do-phase". The result from VCE also showed that the teams mostly adapted their way of working according to what fits them the best. Therefore no specific way of working other than creating action lists within the teams and attending meetings could be seen. Some teams did not use meetings as only reporting meetings but actually extended the time for the meeting to enable collaborative work and. But a thorough following of all the different steps in the PDCA-cycle was not seen. Shiba and Walden (2001) emphasize that all the steps are critical for improvements. How the OD-structure might lack in some steps of the PDCA-cycle will be further discussed below.

### **7.3.6 Importance of measuring results – "Check"-phase**

To increase sustained improvement initiatives, measurements should be a part of the improvement work and the criticality of measurements should be underlined and incorporated into the organization's culture (Aruleswan, 2009). Spitzer (2007) also argues that the interrelated factors measurements and results are closely connected to sustainability. By measuring the improvements the achieved results can be highlighted and the performance is recognized in better ways by the organization. Clarifying actual performances when good results have been achieved can lead to increasing employees' motivation and encouraging for further improvements (Spitzer, 2007).

As seen from the empirical findings, taking actual measurements of improvement results are not utilized to a high extent in the case of VCE. Some teams with sustained improvements developed some figures of measurements to base their improvement work on and this could be considered as an important and decisive factor for sustained improvements. But most often results of improvements have been presented by making assumptions of reduced lead-time and costs. Despite that, some improvements have still succeeded. The question that could be asked is how sure are the OD-teams that the stated goals have been met through making assumptions of the improvement results?

Based on the interviewees it can be difficult to make measurements and one complicated aspect could be to transform the measurements into cost savings that are often asked for in the OD process. This is also emphasized by Kaye and Anderson (1999) and Aruleswan (2009) stating that financial results can be complicated to calculate and should sometimes be avoided when evaluating improvement results. George et al. (2005) and Shiba et al.

(1993) highlight the importance of finding measurement to base the improvement results on to understand what the improvement or change has achieved and resulted in, and what is required to be done to achieve stated goals. Measured results can form a base for improvement results, for further development and also function as an indication to understand when deviations occur (George et al. 2005). As some improvements are based on assumptions some reported savings within the OD process might not be accurate as they are not thoroughly followed up on. It could thereby be questioned if the reported results from the OD-teams could be misleading results. This could be of interest to investigate for VCE as Imai (1986) also highlights that the focus should not always be result-oriented in terms of financial results and profits. Measurements could benefit from being more process-oriented instead of being too result-oriented. By using more process-oriented indices and measures to investigate the efforts and outcomes it can be easier to find measurements more suitable for all types of improvements, such as measuring behavioral changes for new routines. By measuring in other ways than only financial results which might not be suitable for all improvements managers can be less critical towards results and in that sense more supportive (Imai, 1986).

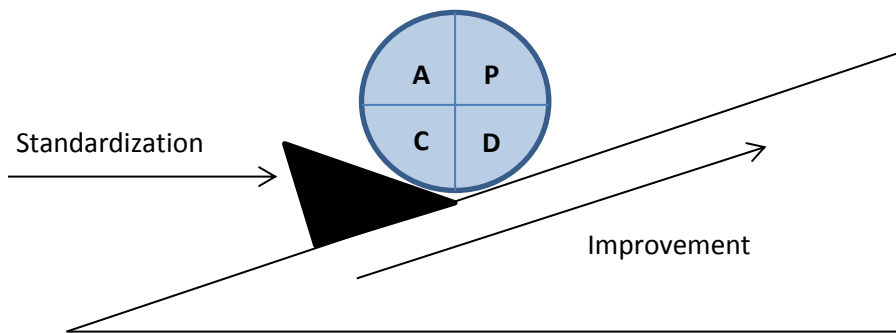
According to the empirical findings and the discussion above some OD-teams seem to lack to some extent in the “Check”-phase of PDCA. The PDCA-cycle supports the culture of measuring results where the phase gives the opportunity to evaluate effects from the improvement and *assure* that intended improvements have been achieved (Shiba and Walden, 2001). Finding a sort of measurement for the improvement work that can be followed up on is a way to assure sustained changes and improvements (George et al. 2005). Stated by Shiba et al. (1993) is of importance to early define how the improvement will be evaluated and can be done already in the “Do”-phase.

### **7.3.7 Standardization – “Act”-phase**

Depending on how an improvement or change is integrated within an organization it could affect to what extent it will be sustained (Liker, 2009). In the case of the OD-teams’ improvement efforts, standardization was evident to some extent for the sustained improvements. Therefore standardization was considered as an important and decisive factor for sustained improvements. Some improvements included in the category “Routines” were standardized by documentation and included in handbooks or published in common databases. These are common ways that can lead to standardization. However, the critical part is to assure that the organization also supports standardized work to assure the behavior change to work according to the new ways and diffusing the new way of working (Liker, 2009).

Where standardization and putting the improvements to use was evident it led to sustained improvements. It is of importance to assure that the improvement initiatives performed by the various OD-teams are integrated and assured within the organization. As stated by Liker

(2009) the competitive advantages for the company will be obtained when improvements are built on each other, rather than when improvements are made but then lost or regressed after some time. To assure that new outcomes and new ways of working are not lost or regressed structures that hinder backsliding should exist (Upton, 1996; Liker, 2009). This kind of thinking of sustaining of improvements is visualized in Figure 7.2.



**Figure 7.2** Standardization of improvements

Some improvement initiatives from the empirical findings lacked standardization processes and the interviews also showed that among the non-sustained improvements standardization was not evident. Standardization and integration of the improvement could be seen to be an important and decisive factor for implemented and sustained improvements based on the outcomes from this study. It could therefore be of value to consider how standardization and integration processes could be better incorporated within OD.

As mentioned the PDCA-cycle can beneficially be used for improvement work where the “Act”-phase allows for integrating and standardizing the improvement results (Deming, 1986; Shiba and Walden, 2001). The tool can be a way of assuring integration and standardization of improvements within the organization and OD teamwork.

### **7.3.8 Learning – “Act”-phase**

Fazl Mashhadi et al. (2012) state that learning is of importance for improvements to be successful and sustained. The way an organization enables learning affects to what extent the organization actually use them (Johnson et al. 2008; Janee Ali et al. 2013). In the OD process learning is seen from the empirical findings to be enabled in the Half Year Follow Up seminars (HYFU). At the seminars the teams can present and discuss their improvements with other teams which therefore create good opportunities to also learn from others. The importance of this is highlighted by Fazl Mashhadi et al. (2014) that state that sharing knowledge is fundamental for a learning organization.

From the empirical findings, learning is considered as an important but not decisive factor for sustained improvements. The interviewees discuss learning from the teams’ specific improvement work regarding both success and failure which is in line with Fazl Mashhadi

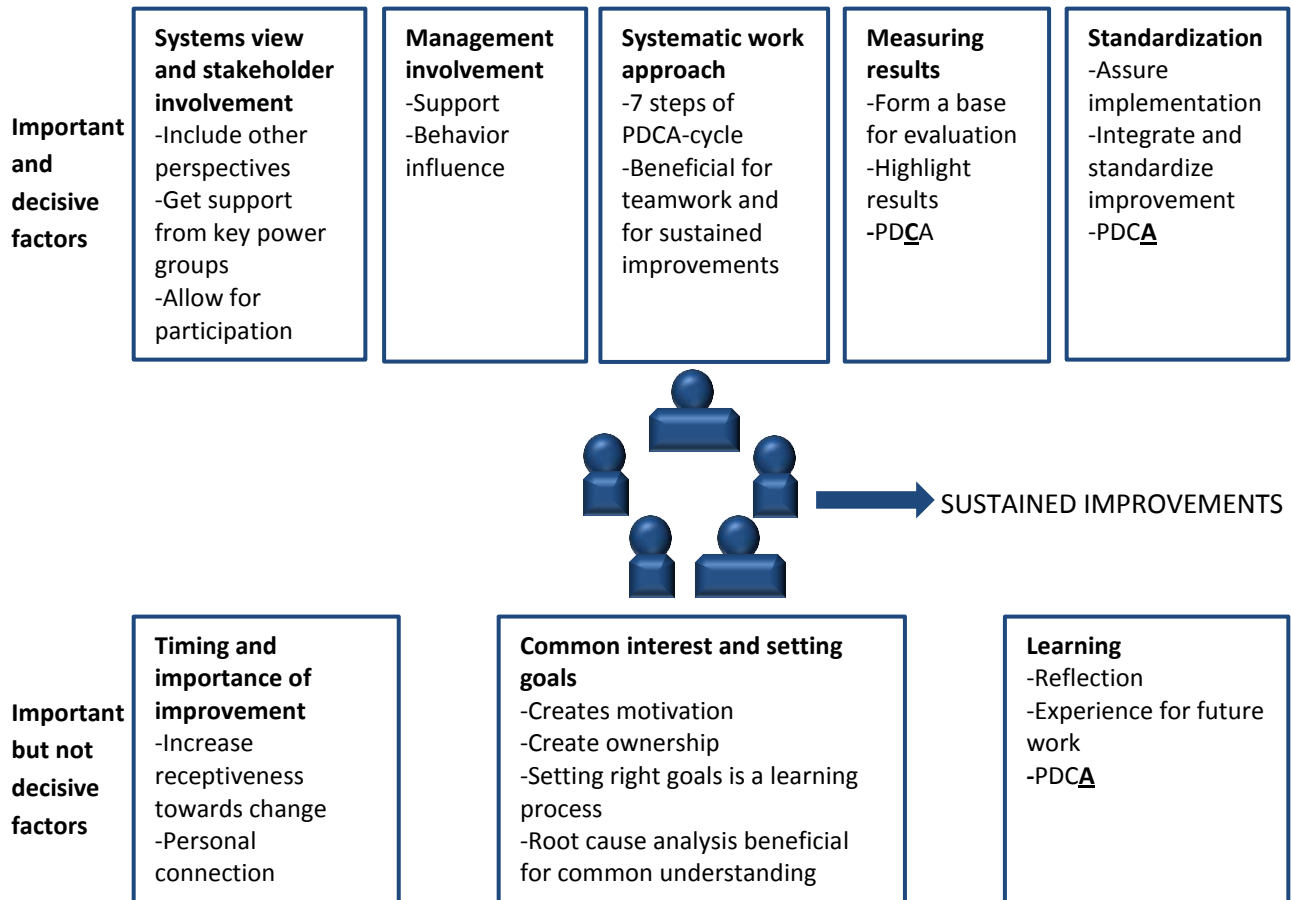
et al. (2012) who argue that learning should include both sharing positive and negative experiences. Learning from success is related to the first type of learning when there is a match between outcome and desire as discussed by Argyris (1999). As mentioned, the teams also learned from mistakes, which are related to the second type of learning that occurs when there is a mismatch between the intentions and outcomes (Argyris, 1999). However, it should be noted that the actual learning occurs when lessons learned have been put into use as emphasized by Argyris (1999).

In the OD process the OD-team minute reports include a feedback section to reflect upon each specific OD-team meeting. However, not all of the teams fill these out and it could be discussed if it could be more beneficial to have an extensive feedback session after the improvement work is finalized to reflect and learn from the entire work instead only focusing on meetings. In the PDCA-cycle the “Act”-phase allows for reflecting upon the improvement work and to bring learnings to upcoming improvement cycles (Shiba and Walden, 2001), which could be seen as beneficial to integrate more for the OD process. In Figure 7.1 standardization is written before learning but as the PDCA-cycle is a learning cycle it is not actually always certain that standardization is present before learning in the “Act”-phase. Learning could occur before standardization. Based on the effects evaluated in the “Check”-phase, learnings can be obtained and changes can be made before standardization and integration of an improvement occurs (Shiba et al. 1993). It could also be discussed that learning actually should occur for all phases of the PDCA-cycle for further development of systematic improvement work. The OD-teams learn during the work from both positive and negative experiences but as learning is strongly emphasized it could be integrated more extensively for all teams to assure learning and reflection at all times both during and after the improvement work.

It could also be discussed if learning should be among the important and decisive factors for improvement work since it is closely connected to PDCA and systematic work approach that was considered as important and decisive. However, based on our empirical data learning was among the important but not decisive factors but it is clear that learning is closely interrelated to some of the important and decisive factors.

#### **7.3.9 Summary**

In conclusion from analyzing the *important but not decisive* and *important and decisive* factors for sustaining improvements based on both empirical findings and literature it resulted in Figure 7.3. The figure shows the different key factors and significant aspects to take into consideration for successful and sustained improvements. Based on theory the figure from the empirical findings could be further extended and important parts within the factors could be included.



**Figure 7.3** Revised figure of important and decisive factors for sustained improvements

As could be seen in Figure 7.3 there are several factors based on our study that are important for improvement work but do not seem to assure sustained improvements. There are also some factors that are important AND decisive to consider for reaching sustained improvement within the improvement teams. The figure above also shows how the PDCA-cycle can support and be integrated in some of these factors. Apart from these it could also be discussed if there are factors in a continuous improvement structure that could have an effect on improvement work and this will be further discussed in section 7.4.

## 7.4 Continuous improvement structure

From the empirical findings there were opinions brought up regarding specific parts of the OD structure. It is therefore interesting to discuss whether there are any factors in a structure of an improvement strategy that could affect the improvement work performed in teams.

Integrating a continuous improvement strategy into the organization is of importance for improvements to be sustained (Jane Ali et al. 2013; Kaye and Anderson, 1999). From the interviews it can be seen that the integration of an improvement strategy could have an effect on the employees' motivation. High amount of administration, seminars and

meetings as well as separating the process too much from the daily tasks can lead to that the improvement strategy feels like a parallel organization which could be seen in the empirical findings. Stated by Dale et al. (1997) sustaining a process of organizational development requires integration into the company and it can take years until the principles are incorporated fully. The level of integration of a continuous improvement strategy can affect the amount of successful and sustained improvements (Kaye and Anderson, 1999) and therefore the strategy should be closely connected and incorporated to the daily work of an organization.

How well an improvement strategy is integrated within the company might also affect the behaviors and actions of its members. From the empirical findings it could be seen that sometimes managers and employees could have a negative perception of the OD process. This could affect the rest of the organizations' motivation and receptiveness towards the OD process which also could affect the understanding of the importance of creating sustained improvements. Stated by Nadler and Tushman (1997) the actions and behaviors of employees are influenced by management behavior and therefore it is important that the management figures as a role model and sets a good example.

It has previously been understood that learning is important for improvement work as discussed above. From the empirical findings in this study it can be seen that when sharing experiences with others during the support group meetings of OD the problems are not always addressed but instead talked away. Argyris and Schön (1997) discuss the fact that learning for future work is dependent of reflection of results and experiences. This is also brought up by Fazl Mashhadi et al. (2012) that state that it is important to learn for future work by sharing both positive and negative experiences within the company. It might be difficult to share flaws but it could improve future improvement effort (Fazl Mashhadi et al. 2012).

## 8 Conclusions

The purpose of this study was to investigate how continuous improvements are sustained within an organization by finding a way to follow them up as well as understanding how improvements can be sustained. Sustaining of changes and improvements is an area of challenge for many companies (Drew, 2004) and how to investigate sustained improvements is an area literature has not been focused on. To answer the research questions of the study a case study was performed at Volvo Construction Equipment (VCE). VCE has an improvement strategy named Operational Development (OD) where improvement teams within the company perform improvements based on a strategic focus given from top management. Improvements performed within OD has been documented and stored in a common database that has been used for this study.

A categorization of the improvements performed within the OD process at VCE was performed and resulted in top ten categories of the most commonly chosen improvement areas. In the order from most to least commonly chosen the categories found in this study were; *Routines, Information availability, Test/Analysis, Communication/Collaboration, Product/Production, Project management, Knowledge management, Quality/Reviews, Overall improvement ideas* and *Efficient execution*.

With the categorization as a base followed a creation of a tool for a systematic way of following up and analyzing the amount of sustained improvements per category. The created tool can be seen in section 5.2 where a detailed explanation of the tool is given. The tool is created as an Excel-file and shows if an improvement has been implemented or not, how it has been sustained and what positive impacts the improvement has led to. To investigate the sustainability it includes different criteria of sustainability to give an indication of to what extent and how the improvements have been sustained. The different criteria for sustainability has in this study been if an improvement still exists in the organization, if an improvement is being continuously used and/or if it has been further developed after the implementation of the improvement. This tool was tested at one of VCE's sites during the study to evaluate its capacity. It could be concluded that evaluating and following up on if improvements are sustained can be difficult as the definition and measuring of sustainability depends on the actual situation and intention with the improvement. It is also of importance to consider the static and dynamic perspective regarding sustainability mentioned by Buchanan et al. (2005) and what perspective is most suitable depending on an organization's competitive environment. A static perspective of purely sustaining the improvement as it was could be beneficial for a more stable environment. While if the organization's environment depends on a rapidly changing market the improvements might need to be sustained in a dynamic perspective by being further developed (Buchanan et al. 2005).

The result from this study showed that within the OD process several improvements are implemented and exists today but not all of them are continuously used or further developed in the organization. From the empirical findings it could be concluded that out of 49 investigated improvements for the site studied, 41 improvements had been implemented in the organization. Out of these 41 implemented improvements 19 existed today but did not seem to be utilized frequently or fully as they were intended depending on what category of improvement it was. From the 41 implemented improvements eleven of them were continuously used within the organization and were considered sustained statically and utilized within the organization. The remaining eleven improvements had also been further developed after its implementation and were considered as dynamically sustained and utilized within the organization.

To investigate if improvements are sustained or not it was concluded from this study that it is of importance to have a documentation system where the right type of data regarding the improvements exist. Seen from the study valuable information that should be collected is the contact persons responsible for the improvement work; what the improvement work consisted of; what the improvement work resulted in; and the when the improvement work and implementation took place. As many improvements are performed in organizations this type of information should be collected continuously as the improvements are performed and implemented as it could be difficult and complicated to collect information retrospectively.

To answer the second research question the focus was to understand the key factors affecting improvement teams to reach sustained improvements. It could be concluded from the empirical findings and discussions that the key success factors are interrelated and could be divided into *important but not decisive* factors and *important and decisive* factors. *Timing and importance* of an improvement, *common interest and clear goals*, and *learning* are concluded as important but not decisive factors for achieving sustained improvements. For the case studied it could be seen that these factors are of importance but do not assure that the improvements are sustained as the factors existed for teams with both sustained and non-sustained improvements. Therefore these three factors are considered as important to have in place but based on the results they might not be enough requirements for sustained improvements. The important and decisive factors were having a *systems view and involving stakeholders*, *management involvement*, *systematic work approach*, *measuring results* and *standardization*. These factors could be seen to have positive effects for the sustained improvements investigated and could be concluded as factors that could determine if improvements are sustained or not. The factors were presented more in detail in sections 7.3 in the report.

An example of a systematic work approach is the PDCA-cycle which could be seen to be closely related to the key factors and could function as guidance for improvement work to assure successful and sustained improvements. The PDCA-cycle is a learning and improvement cycle that includes and highlights important steps to take into consideration for successful and sustained improvements as mentioned by Shiba and Walden (2001).

How well an improvement strategy is integrated into the organization could also affect the improvement outcomes of an organization. How well it is integrated can affect the team's motivation, performance and improvement outcomes. For the case studied, integration is related to the amount of administration, amount of separate activities from the daily work and the receptiveness of an improvement strategy. High amount of administration could affect team's motivation as administration could be seen as non-value adding activities for improvement work. Integration is also related to how separated the improvement strategy is from the daily work. For the case studied it could be seen that the improvement strategy sometimes could feel like a parallel organization. The receptiveness of an improvement strategy also affects how well the strategy is integrated into the organization. Negativity and low motivation from both managers and employees towards a strategy affect the rest of the organization and reflect on the improvement work. It should be highlighted that both negative and positive perceptions of a strategy can reflect on participant's behaviors, actions and outcomes.

### **Future research**

As stated following up on improvements can be difficult and as this was a first attempt in the case company to create a systematic way of investigating sustainability there could be improvement potential for the tool created by the researchers. It could therefore be beneficial to test it even further on other sites and also to see if there are any cultural aspects that might affect the method or any information collected by the tool.

In this study a number of interviews were performed, although it was limited to mainly team leaders. To get another view of the improvements that have been made it could be interesting to interview not only team leaders but also other people involved in the teams and in the OD process as they might have different opinions. Future research could also consider how and in what ways a continuous improvement strategy can change to further improve.

As stated the theory regarding sustainability and how to measure sustained improvements is to some extent lacking and it could therefore be of importance to perform further investigations in this field.

## 9 Recommendations

Continuous improvements are important for organizations to stay competitive in the business today and it is of importance to understand how to sustain improvement work carried out in a company (Jane Ali et al. 2013; Kaye and Anderson, 1999). If improvements are not sustained it could be considered as waste for the company as efforts and resources have been put on them without gaining sustained value. Therefore it is of interest to ensure that improvements are sustained. Based on the outcomes of this study this chapter will include recommendations of what could be of importance for Volvo Construction Equipment to consider for their improvement strategy. The recommendations include to continue the investigation of sustained improvements and to evaluate if the strategic focus gives desired effects. The recommendations also include taking success factors for sustained improvements into account, integrating PDCA to a higher extent in improvement work and to taking into consideration how OD can be better integrated into the organization. These could be of importance when wanting to develop and improve the OD process and to increase the chances of more sustained improvements.

### **Continue to investigate implemented and sustained improvements**

This study has only focused on the site Braås regarding a systematic investigation of sustained improvements within the frames of the OD process. It could be of interest to also investigate the other sites to evaluate the tendencies for sustained improvements and long-term results. The follow-up tool could be utilized for the different sites to get an overview of the specific site's situation regarding implemented and sustained improvements. However, it should be noted that analyzing and sustaining improvements are dependent on the situation, organizational environment and intention with the improvement. Some improvements could be sustained statically by being remained purely as they were implemented. The static perspective could be useful for more stable environments. Sustainability of improvements can also be considered in a dynamic perspective where the implemented improvement has been further developed and this perspective could be useful for unstable environments as rapidly changing and competitive environments. Therefore, depending on the situation some improvements benefit from being statically remained while some should be further developed and improved.

The developed follow-up tool that can be seen in Figure 9.1 allows for an investigation that takes into account three aspects of sustainability that could be of importance to take into consideration. By investigating improvements based on these three aspects it can not only be seen if improvements have been implemented and exist in the organization today but also if they are actually used and/or further developed. The tool also allows for stating positive effects regarding both hard and soft benefits obtained from the improvement investigated. There is also a section to explain why an improvement was not implemented or why it is not sustained. A further explanation of how to use the tool is given in chapter 5 Follow-up tool.

**Name**  
[ ]

**Site**  
[ ]

**Function**  
[ ]

**Team Focus**  
[ ]

**Goal**  
[ ]

**Leader**  
[ ]

**Team**  
[ ]

**Cycle**  
[ ]

**Category**  
[ ]

**Section 1**  
The improvement has been implemented  
[ Y/N ]

**Section 2**  
The implemented improvement exists today  
and  
The implemented improvement is being continuously used in relation to its purpose  
[ X ]

**Section 3**  
What positive impacts has the improvement led to?  
[ Free-text ]

**Section 4**  
Overall comments/clarifications  
[ Free-text ]

**Section 1**  
The improvement has been implemented  
[ Y/N ]

**Section 2**  
The implemented improvement exists today  
and  
The implemented improvement is being continuously used in relation to its purpose  
[ X ]

**Section 3**  
What positive impacts has the improvement led to?  
[ Free-text ]

**Section 4**  
Overall comments/clarifications  
[ Free-text ]

**Figure 9.1** Extract from the Follow-up tool

To continue investigating improvement work within the frames of OD in the future it is of importance to continue keeping data of the improvement initiatives performed within the OD process. Performing a categorization of the improvements can give an overview of what type of improvements the organization is working with. This can be beneficial to understand the improvement work within OD as a system as well as to understand where the employees feel that improvement and changes are needed in their sites. A categorization could also make it easier to compare improvements performed to the strategic focus set by the top management to analyze any differences and effects of the strategic focuses. The categories made by the researchers in this study can be seen in section 6.2 Top ten categories, could be used to give guidance for future categorization of improvements.

### **Consider if the communicated strategic focus gives desired effects**

The improvements performed globally during six OD-cycles were categorized and resulted in top ten categories (what is included in the categories can be read in section 6.2 Top ten categories). These categories and the distribution per Strategic Focus (SF) can be seen in Table 9.1.

**Table 9.1** Summary of distribution for the top ten categories per strategic focus.

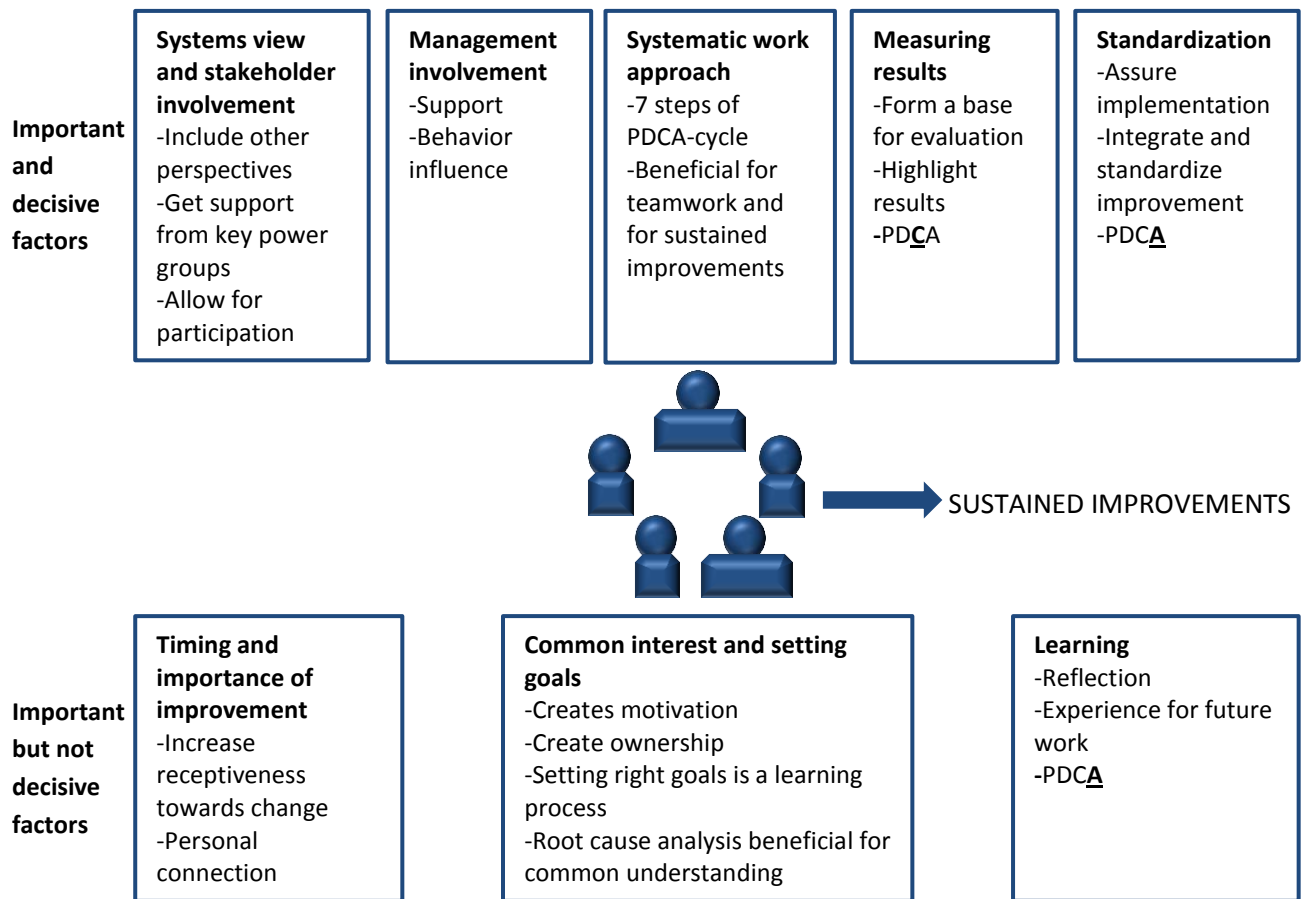
Category \ Strategic Focus	REDUCE WASTE		REDUCE LEAD-TIME		REDUCE COST	
	(Teams)	(%)	(Teams)	(%)	(Teams)	(%)
Routines	62	18%	116	25%	93	19%
Information availability	74	22%	56	12%	45	9%
Tests/analysis	35	10%	46	10%	69	14%
Communication/collaboration	40	12%	40	8%	63	13%
Product/production	0	0%	31	7%	103	21%
Project management	29	9%	39	8%	38	8%
Knowledge management	22	7%	50	11%	28	6%
Quality/Reviews	17	5%	41	9%	11	2%
Overall improvement ideas	14	4%	11	2%	31	6%
Efficient execution	36	11%	13	3%	2	0,4%

The distribution is rather similar for all strategic focuses except for some variations. “Routines” is always a category that the teams tend to focus on and the category “Product/production” has stood for the largest effect of changing the SF as it has increased considerably. Besides that, many more radical variations are not seen. The SF is intended to guide the teams in the selection of improvement areas. But it was mentioned by interviewees that changing the strategic focus did not really affect the selection of improvement area to such a high extent as the SFs are closely connected. Due to the similarities in the distribution of the categories and the interviewees’ comments it could be recommended to investigate if the desired effects are obtained by changing the strategic focus? Does this distribution of categories seen in the table count as the maneuverability effect desired by the OD process?

### **Consider success factors for sustaining improvements**

From the study it could be seen that a lot of improvements are performed in the OD process however not all of them are implemented, used or further developed. It could be seen that there are several factors affecting if improvements are implemented and sustained which can be seen in Figure 9.2.

The *important but not decisive factors* are the ones that are important to be in place for improvement work but based on our study they do not seem to assure sustained results. The *important and decisive factors* are the ones that could be seen to lead to sustained improvements. The eight factors in the figure are interrelated and it could be seen that all of them are not utilized to its fullest potential as some teams were lacking in them. Therefore it could be beneficial for the company to take them into consideration. Further descriptions of empirical findings from investigating OD-teams and the discussion regarding these factors can be read in the sections 6.5 and 7.3 in the report.



**Figure 9.2** Revised figure of important and decisive factors for sustained improvements

<i>Systems view and stakeholder involvement</i>	Involve persons with the decision making power regarding implementation of the improvement from the beginning of the work and involve persons affected by the improvement to take critical aspects into account.
<i>Management involvement</i>	Be aware of how the management and the leaders' behaviors and actions can influence team members' behavior and could affect improvement results, sustainability and perception of OD's importance. Highlight the importance of OD by showing interest for improvement work, provide support and remove obstacles rather than controlling work.
<i>Systematic work approach</i>	It is recommended to not underestimate a systematic work approach as PDCA-cycle (Plan-Do-Check-Act) as a foundation for the teamwork. Full integration of PDCA could affect the outcomes to a high extent and could result in more sustained improvements and better improvement work processes. Currently the focus seems to be mostly on "D-Do". More regarding PDCA is explained below.

*Measuring results*

Only measuring outcomes and results based on financial terms can be difficult and complicated and many reported results within OD are based on assumptions. All possible positive impacts cannot be calculated in financial terms and some teams lack in performing actual measurements and following up on assumptions made as it is difficult to follow up something roughly estimated.

A recommendation is to highlight the importance of measurable outcomes. Process indicators (e.g. process indices indicating change of behavior) could sometimes evaluate the improvements better than pure result-oriented figures as financial results. It should be taken into consideration if a financial result is the best way to evaluate the improvement. It is of importance to know what to measure to know how to in the best way evaluate the outcomes. Measurable figures should form a foundation for evaluation of the results.

Knowing how to measure the effects of an improvement can also increase long-term results as the implemented improvement can be followed up to investigate performance level. It can be measured if it regresses to old performance levels.

*Standardization*

How the improvement is integrated and standardized into an organization affects to what extent it is sustained and generates long-term results. Good integration and standardization of improvements allow for building improvements on each other which leads to competitiveness.

A recommendation is therefore to highlight the importance of integrating and standardizing improvements to reduce risks of regression to old states and to assure full utilization of improvement outcomes.

*Timing and importance of improvement*

The need for the improvement and the perceived importance of it among the team and the organization affect implementation and sustainability of the improvement. Both of these aspects should be taken into account when selecting improvement areas to increase personal connection and receptiveness of an improvement.

*Common interest and setting goals*

Having common interest as well as common and clear goals are of importance for unified teamwork and this could be highlighted to a higher extent within the OD process.

### *Learning*

A recommendation is to integrate reflection and learning from the improvement work and the results even more as it is highly emphasized in theory.

#### **→Integrate PDCA to a higher extent in improvement work**

As the PDCA-cycle is closely connected to the success factors for sustained improvements a recommendation is to utilize the PDCA-cycle more extensively for the improvements performed by the OD-teams. Most of the focus in OD seems to be put on stating actions for creating solutions which is connected to the “Do”-phase of PDCA. More important factors could be taken into consideration by working systematically with the PDCA-cycle as a foundation. For sustained results it is not only the actions and how the solutions are created that are critical. Taking all aspects into consideration before solutions are created leads to more sustained results. It is also of importance to actually measure the results that have been achieved to evaluate the effects and also how these effects can be followed up and measured again to know when deviations occur. Sustained outcomes also depend on how improvements have been integrated and standardized into the organization. These are all included in the PDCA-cycle and as it could be seen that some were lacking in this it could be beneficial to consider how it can be integrated to a higher extent into OD.

The PDCA-cycle is described in section 2.2.3 Plan-Do-Check-Act and in section 7.3.5 Systematic working – PDCA-cycle a discussion regarding PDCA and OD is given.

#### **Consider how to integrate OD in the organization to a higher extent**

It can take a long time to fully implement new programs and structures within organizations and based on the outcomes of this study it was discussed that the structure and integration of OD could affect the improvement work. In the OD process there are several full day seminars in the beginning of each six month cycle and also a lot of administration with meetings and reporting for the people involved in the improvements. It was stated by some interviewees that the OD process could feel like a parallel organization, not fully connected to the daily work. Therefore it is recommended to investigate how OD could be more integrated within the organization to remove this feeling of a parallel organization.

There are also some negative feelings regarding the OD process from both some managers and other employees which might affect the outcomes of the improvement work negatively. Negative feelings might affect to what extent the process is integrated to the organization and received by the organization. As stated by Drew (2004) an organization will change when the behaviors of the people within the organization changes. It is therefore of importance to also understand that behavior is influencing and that all managers and leaders within the organization should lead by good example to increase receptiveness and integration of the OD process.

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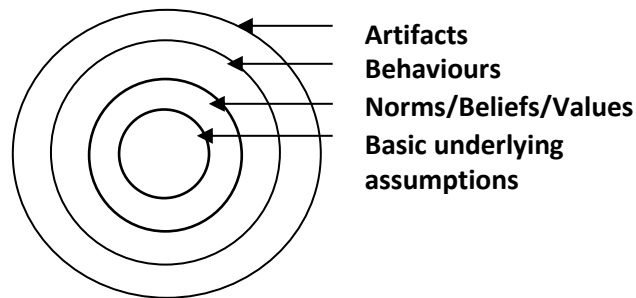
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# 11 Appendix

## Appendix A - Importance of organizational culture

Understanding the effects of culture is of importance for global organizations when trying to implement the same type of working across all the organization's various sites in different nations (Miconnet and Alänge, 1999). Culture exists in different levels as stated by Schein (1992) where the word, level, indicates to which extent the culture is visible to an observer. Culture is divided in basic underlying assumptions, values and artifacts (Schein, 1992). Based on Schein's (1992) underlying principles and model Miconnet and Alänge (1999) adapted a model of culture dividing it into four concepts as can be seen in Figure 11.1 below.



**Figure 11.1** Model of culture (Miconnet and Alänge, 1999 adapted from Schein, 1992)

The outer layer of culture is Artifacts which is the easiest level. Artifacts are the type of things that are visible to an observer and constitute organizational processes and structures or how someone dresses (Schein, 1992). A company logo is also an example of an artifact, and layer of culture that can be modified easily. Behavior is the next level and is connected to individual actions and can be understood by analyzing problem solving techniques or decision making processes of individuals. Depending on what role an individual possesses, for example manager or subordinate, the behavior is expected to be adapted to that certain role. The next level is Norms/Beliefs/Values and the culture itself rarely challenges or questions the layer of norms, beliefs and values which are often the same for individuals with the same culture. This layer often refers to the individuals' philosophy and ideal picture of how people should behave and examples are distinctions between right or wrong and what defines good and evil (Miconnet and Alänge, 1999). For organizations, strategies and goals are also included in this layer. The core of the culture consists of Basic underlying assumptions and this layer is close to impossible to change. Changing basic assumptions requires deeper learning which can be created by both reflection, reexamination and changing a part of the stable assumptions individuals have (Schein, 1992). Double-loop learning is a way of learning by allowing for deep reflections and changing basic assumptions as mentioned by Argyris and Schön (1997), however it is very

difficult as it often leads to instability and anxiety among people. It is of importance to understand this core layer since by understanding the core of the culture, the other layers can more easily be realized (Schein, 1992). Basic underlying assumptions are connected to individual's fundamental aspects of life and some examples are roles of women and men, importance of work, family and self-development and what is natural or unnatural (Schein, 1992; Miconnet and Alänge, 1999). Research performed by Miconnet and Alänge (1999) concludes that the corporate culture only affects artifacts and behaviors, the outer layers of culture. Values and basic assumptions are mostly affected by national culture and this information can be useful for multicultural companies when diffusing organizational best practices, innovations or methods globally. It is essential for managers to understand national cultures and values in order to realize how introduction or diffusion of new practices might be hindered (Miconnet and Alänge, 1999).

## **Appendix B - Interview guide**

Describe the specific OD-cycle and improvement work.

- How was the improvement area chosen?
- Strong personal connection towards chosen improvement area?
- How was it created/Who was involved?
- Who was it created for? (Team, department, functions, organization)
- Was the intended goal/goals achieved?
- What types of obstacles existed in the cycle?

Has it been implemented? How?

How has it been standardized?

To what extent does it exist today?

What structures exist to hinder back-sliding?

How is the quality of the improvement maintained?/How is the improvement monitored?

How has it developed/improved after its implementation?

Was the performed work successful? Why/why not?

How was the result measured?

Has there been any follow-up on the work after the cycle's end?

Describe the teamwork

- Team motivation, dynamic, willingness, acceptance
- Targets, understanding of directions
- Communication

How was the management involved in the improvement project? What kind of support/feedback?

How are learnings from the cycle shared within the organization?

How is the strategic focus helping in prioritizing improvement area?

Is the strategic focus communicated clearly in the beginning of the cycle?

What do you think about the OD process? Any improvement potential?

## Appendix C - Results from follow-up tool

### FOLLOW UP

This activity is performed in order to analyze the impact and sustainability level of improvements made in the OD process.

As a start, it is beneficial to go through and discuss the instructions in group, all ICs together. This is crucial to secure that everyone has the same understanding of the instructions in order to reduce the variation in the assessments made.

#### Instructions

In sheet "BRA", divide the teams between the ICs and thereafter contact the responsible person(s) from the teams in order to fill in the sections to the right of the document. If further information is needed, click on the blue link in the first column to find the specific team's "OD-team minutes". There are four sections to fill in, as can be seen in sheet "BRA". Place the marker in the red corners for further clarification of the sections.

- In **Section 1** and **Section 2** you are asked to write the one alternative that fits your opinion the best. Please write only one alternative for each.
- In **Section 3** you are asked to write comments on your opinion for the question asked, please keep the answer short and concrete. Also have in mind the team's improvement areas, goals, results and reflect upon how it is connected to the specific cycle's strategic focus.
- In **Section 4** you have the opportunity to write comments or clarifications for the answers in section 1 and 2.

#### Strategic focus

Cycle 1 - Reduce waste  
Cycle 2 - Reduce waste  
Cycle 3 - Reduce lead time  
Cycle 4 - Reduce lead time  
Cycle 5 - Reduce cost  
Cycle 6 - Reduce cost  
Cycle 7 - Reduce cost

Figure 11.2 Sheet 1 in Follow-up tool

**Table 11.1** Sheet 2 in Follow up tool and the results from VCE Braås

Cycle	Category	Section 1 The improvement has been implemented	Section 2			Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
		[ Y/N ]	The implemented improvement exists today	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose and The implemented improvement has been further developed after the cycle's end	[ Free-text ]	[ Free-text ]
Cycle 1	Routines	Y	X				
Cycle 1	Routines	Y	X				
Cycle 2	Routines	Y	X				
Cycle 3	Routines	Y	X				
Cycle 3	Routines	Y	X				
Cycle 3	Routines	Y	X				
Cycle 4	Routines	N					Work was stopped due to re-organization and work load (overload)
Cycle 6	Routines	N					
Cycle 6	Routines	Y			X	Better crossfunctional cooperation and efficiency.	
Cycle 6	Routines	Y	X				
Cycle 6	Routines	Y		X			
Cycle 6	Routines	N					
Cycle 1	Information availability	Y	X			Organize library for handling information in the department, focus on work environment, standard parts in PRIME gathered in one place.	
Cycle 2	Information availability	Y			X	Guidelines for SmarTeam, PROST. HV-spec guideline initiated. Finished in cycle 6. Start seeing positive effects in the group - more energy to work on OD.	
Cycle 4	Information availability	Y			X	Better cooperation in the team, time saving.	
Cycle 5	Information availability	Y	X				

Cycle	Category	Section 1 The improvement has been implemented	Section 2			Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
		[ Y/N ]	The implemented improvement exists today	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose and The implemented improvement has been further developed after the cycle's end	[ Free-text ]	[ Free-text ]
Cycle 5	Information availability	Y	X			One clear common improvement area for the entire team. Improved cooperation within department.	One common improvement area
Cycle 6	Information availability	Y	X			One clear common improvement area for the entire team. Improved cooperation within department. Also improved collaboration with other departments.	One common improvement area
Cycle 6	Information availability	Y			X		
Cycle 5	Tests/Analysis	Y		X			
Cycle 6	Tests/Analysis	N					Routine will be implemented in cycle 7 and therefore a living work.
Cycle 1	Communication/Collaboration	Y			X	More efficient prototype ordering	
Cycle 1	Communication/Collaboration	Y			X		
Cycle 2	Communication/Collaboration	Y			X		
Cycle 2	Communication/Collaboration	Y			X	More efficient prototype ordering	
Cycle 3	Communication/Collaboration	Y			X		
Cycle 4	Communication/Collaboration	Y			X		
Cycle 4	Communication/Collaboration	Y	X			Improved personal efficiency	Individual improvement areas within the team, one for each team
Cycle 5	Communication/Collaboration	Y	X				
Cycle 4	Product/Production	Y		X		Easier to compare data in daily work.	

Cycle	Category	Section 1 The improvement has been implemented	Section 2 The implemented improvement exists today The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose			Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
		[ Y/N ]		[ X ]		[ Free-text ]	[ Free-text ]
Cycle 5	Product/Production	N					High turnover of employees (only 2 FTE)
Cycle 5	Product/Production	Y		X			
Cycle 5	Product/Production	Y		X			
Cycle 6	Product/Production	Y		X		Guidelines for searches in SmarTeam, cost workshop on line. Good energy due to focus closely related to daily work. Implementation of cost ideas not yet done due to long lead times. Good participation and group discussions. People starting to take on more tasks, increasing collaboration.	
Cycle 6	Product/Production	N				When implementet, good tool to use in daily work. All engeged, everyone sees the need.	
Cycle 4	Project management	Y		X		Financial knowledge within PO More "stringent" ECN hadnling among projects and PM	
Cycle 4	Project management	Y	X				
Cycle 5	Project management	Y			X	Better "commercial" view of our OD activities. More "streamlined" work within PO and the ECN tea, etc.	
Cycle 6	Project management	Y	X			Financial impact	
Cycle 6	Project management	Y	X				
Cycle 2	Knowledge management	Y	X			Better System knowledge factory master system	

Cycle	Category	Section 1 The improvement has been implemented	Section 2			Section 3 What positive impacts has the improvement led to?	Section 4 Overall comments/clarifications
		[ Y/N ]	The implemented improvement exists today	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose	The implemented improvement exists today and The implemented improvement is being continuously used in relation to its purpose and The implemented improvement has been further developed after the cycle's end	[ Free-text ]	[ Free-text ]
Cycle 3	Knowledge management	Y		X		Less SCORE support	
Cycle 4	Knowledge management	N					High turnover of employees (only 2 FTE)
Cycle 3	Quality/Reviews	N					Team was splitted due to difficulties in finding good
Cycle 4	Quality/Reviews	Y	X				
Cycle 5	Overall ideas	Y		X		Product cost saving potentials identified in workshops. Implementation not during cycle due to long lead times. Process analysis of A-order process to highlight non-functioning process. Good energy due to focus that we clearly can impact. Many take on responsibilities and collaboration has developed, spilled over to cost engineers and purchasing.	
Cycle 3	Execution focus	Y		X		More "stringent" and user adjusted PAP	
Cycle 4	Execution focus	Y	X			Focus on processes, many involved in discussions. Good energy during meetings but difficult reaching results and implementation	
Cycle 5	Execution focus	Y		X			