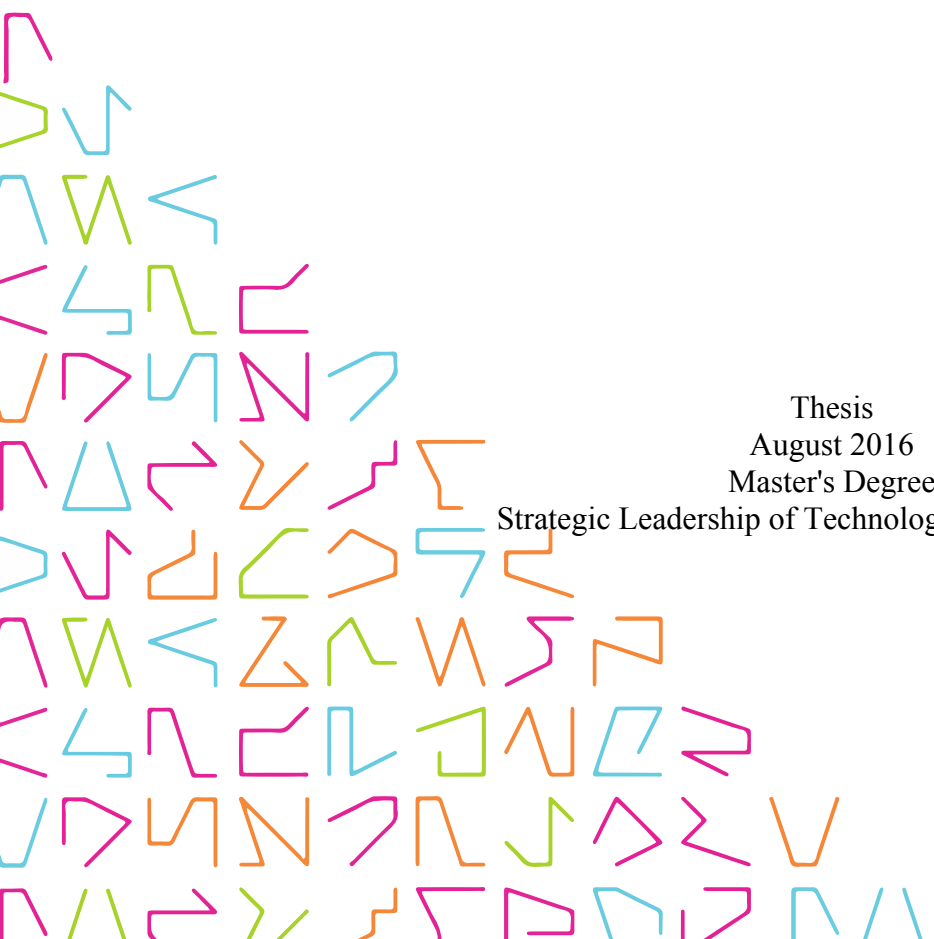
TAMPEREEN
AMMATTIKORKEAKOULU

THE DEVELOPMENT OF THE INFORMATION SHARING PROCESS BY LEAN PHILOSOPHY

Mervi Helminen



Thesis
August 2016
Master's Degree
Strategic Leadership of Technology-Based Business

TIIVISTELMÄ

Tampereen ammattikorkeakoulu
Ylempi ammattikorkeakoulututkinto
Teknologiaosaamisen johtaminen

HELMINEN MERVI:
Tiedon jakamisen prosessin kehittäminen Lean -filosofian avulla

Opinnäytetyö 45 sivua, joista liitteitä 8 sivua
Elokuu 2016

Tämän opinnäytetyön tarkoituksena on selvittää miten tekninen tuki, varaosatuki ja takuuosasto jakavat erityisesti kentältä saatavaa tietoa tuotekehitysosastolle Sandvik Mining and Rock Technology, Surface Drills organisaatiossa. Opinnäytetyön tarkoituksena on selvittää tiedon jakamisen nykytilanne ja luoda uusi toimintamalli Lean–filosofiaan perustuen.

Tutkimusmenetelmäksi valittiin kvalitatiivinen tutkimus, joka toteutettin verkkokyselynä. Kyselyn vastaajiksi valittiin kaksikymmentä henkilöä tuotekehitysorganisaatiosta. Kyselyn avulla selvitettiin tiedon jakamisen nykytila; jaetaanko tietoa tarpeeksi, miten sitä jaetaan ja käytetäänkö olemassa olevia työkaluja tiedon jakamiseen. Lisäksi vastaajilta kysyttiin kehitysehdotuksia tiedon jakamisen parantamiseksi.

Tutkimuksen tuloksena selvisi, ettei tietoa jaeta tarpeeksi ja yksi yhteinen tiedon jakamisen malli puuttuu. Tietoa jaetaan monella eri tavalla organisaation sisällä, mutta sitä ei välttämättä dokumentoida tai tallenneta mitenkään. Lisäksi tieto ei ole avoimesti kaikkien saatavilla. Olemassa olevia tiedon jakamisen työkaluja ei myöskään käytetä suunnitellulla tavalla.

Työn tuloksena luotiin uusi tiedon jakamisen prosessi. Sen tavoitteena on Lean-filosofiaan perustuen luoda organisaatioon jatkuvan tiedon jakamisen malli, jossa käytetään hyväksi visuaalista johtamista. Uuden prosessin kehitystyön taustaksi on tutkittu myös osaamisen johtamisen ja oppivan organisaation teorioita. Uusi prosessi luotiin käytettyjen teorioiden, kyselyn vastausten ja tutkijan omien kokemusten perusteella.

Asiasanat: tiedon jakaminen, lean, visuaalinen johtaminen, osaamisen johtaminen, oppiva organisaatio

ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Master's Degree in Strategic Leadership of Technology-Based Business

HELMINEN MERVI:
The Development of the Information Sharing Process by Lean Philosophy

Master's thesis 45 pages, appendices 8 pages
August 2016

The purpose of this thesis was to find out how the technical support, the parts support and the warranty department of the Surface Drills organization in Sandvik Mining and Rock Technology share field feedback with the product development department. The aim of the thesis was to solve the current state of information sharing and develop the process by lean philosophy.

The study was qualitative in nature, and based on an online survey. The survey was sent to twenty people in the product development organization. The survey was conducted to clarify the current status of information sharing; if the information is shared enough, how it is shared and if the current information sharing tools are used. Respondents were also asked to give the development proposals for information sharing.

The results show that information is not shared enough and one common process is missing. Information is shared in different ways but it is not necessarily documented or stored at all. Also the information is not available for everyone in the organization. Databases which are created to share this kind of information are not used as planned.

As a result of this study a new information sharing process was created. The target was to create a continuous information sharing process by lean philosophy which uses visual management to share the information. Besides lean philosophy knowledge management and learning organization theories were also used in this process development work. New process was created based on the used theories, survey responses and researcher's own experiences.

Key words: information sharing, lean, visual management, knowledge management, learning organization

CONTENTS

1 INTRODUCTION

Efficient information sharing inside the organization increases the knowledge of the entire organization. Usable knowledge is needed to create a profitable value stream and it can be used to create a perfect value to the customer. The idea of lean philosophy in product development is to have the right knowledge in the right place at the right time.

The purpose of this thesis is to show importance of information sharing in the certain part of Surface Drills organization of Sandvik Mining and Rock Technology. The thesis focuses on warranty, technical support and parts support departments, which receive the information from sales companies or customers, and Product development department, to which the information is forwarded. The target is also to help whole organization understand how different departments affect each other.

The target of this thesis is to solve how the current way of information sharing is working and develop more efficient process for future. The research target was to find answers to following research questions:

- How is the current information sharing process working?
- How can the current process be developed by Lean philosophy?

This thesis describes how conclusions and theories can lead to a developed information sharing process. First part of this thesis describes research part of the project. The second part introduces lean philosophy and knowledge management theories. A new kind of model for sharing information is described in the last part of the thesis. The idea is to create a continuous flow of information and use visual management to share easily and continuously available information for everyone in the organization.

2 RESEARCH METHODOLOGY AND IMPLEMENTATION

2.1 Company presentation

Drill rig designing and manufacturing have started in Tampere when the company Tamrock was founded in 1968. Tamrock started co-operation with Sandvik in 1989 and since 2006 company name has been Sandvik Mining and Construction Oy. Sandvik Mining and Construction Oy is part of Sandvik Mining and Rock Technology. Today Sandvik Mining and Rock Technology has around 46 000 employees and about 91 billion SEK sales in more than 150 countries. (Sandvik Intranet 2016.)

Sandvik Mining and Rock Technology is the high-tech and global engineering group offering products and services with world-leading positions in the following areas:

- Tools and tooling systems for advanced industrial metal cutting.
- Equipment and tools, service and technical solutions for the mining and construction industries.
- High value-added products in advanced stainless steels and special alloys as well as products for industrial heating.

Tampere factory designs and manufactures surface and underground drills (Figure 1). These are used in surface and underground mining and construction industries.

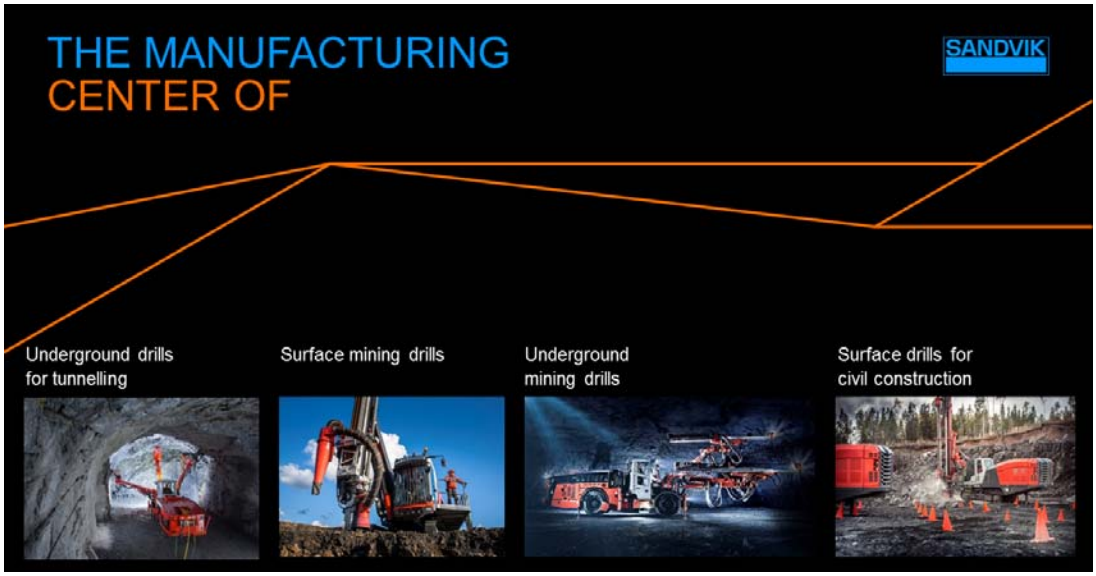


FIGURE 1. Tampere factory (Sandvik Intranet, 2016).

This thesis was commissioned by Sandvik Mining and Rock Technology, the product area Surface Drills and Exploration. This product area designs and manufactures surface top hammer drills and down-the-hole drills for civil construction and quarrying at the Tampere factory. This thesis focuses on the R&D/ Product development, Technical support, Parts support and Warranty organizations at the Tampere factory. The structure of these organizations can be seen in Figure 2.

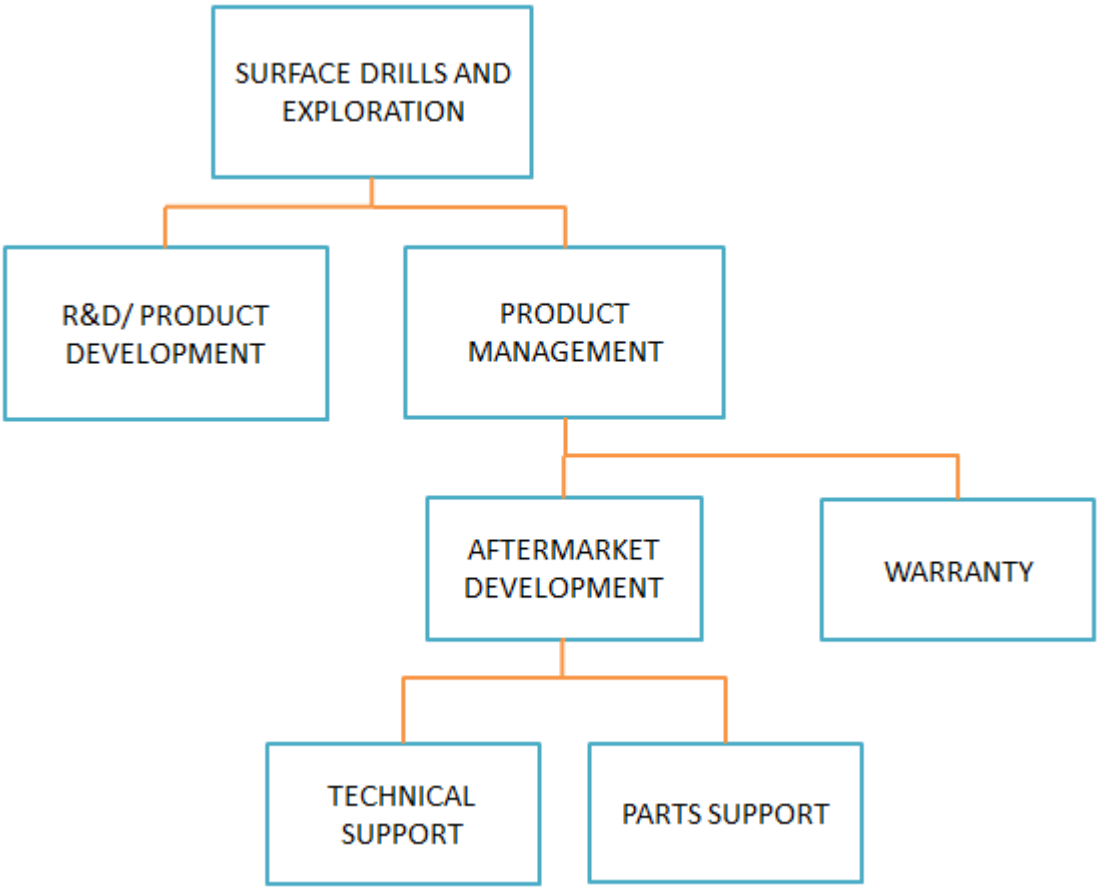


FIGURE 2. Tampere factory Surface Drills organization which thesis focuses on.

2.2 Research backround

Sandvik Mining and Rock Technology has sales companies all over the world. These sales companies are in direct contact with customers or distributors. They receive the customer feedback and forward the information to the product company if needed. The

field feedback process of Sandvik Mining and Rock Technology is described in Figure 3.

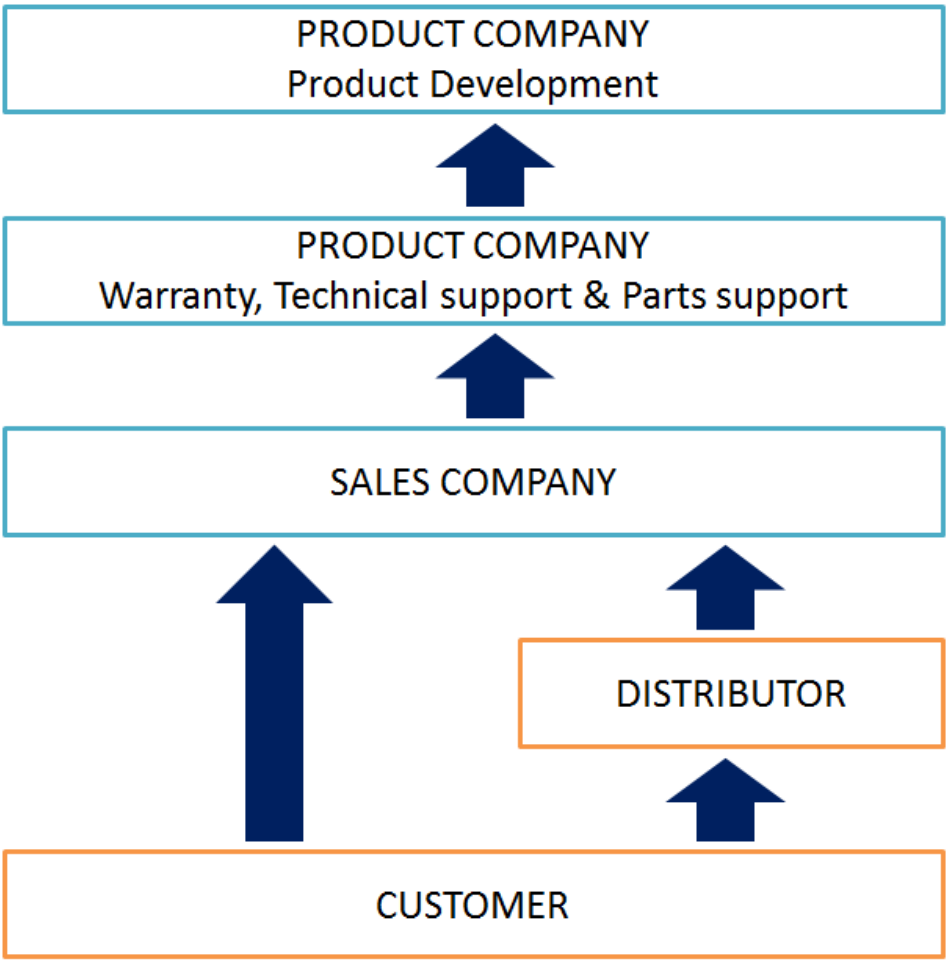


FIGURE 3. Field feedback process of Sandvik Mining and Rock Technology from the customer to the product company.

Besides this process, product company people receive direct feedback when they visit customer sites for example technical support team members in start-ups. A great deal of customer feedback is received by phone or by email. This kind of feedback is not necessarily shared in the organization at all or filed anywhere for future purposes. Many times the feedback is forwarded to some of the product development team by discussion or by email. In this kind of cases there is a risk that all right people does not receive the information. It is also easy to forget discussions or emails so that feedback is not responded a way it should be. People outside these particular discussions or email messages are not aware of feedback or actions it has caused. If feedback causes actions it is

important to be able to follow the status of the case. That is not possible if information is available only in emails or personal notes. To avoid this kind of problems Sandvik Surface Drills has created the Product Improvements –database. This kind of cases can be added and followed in the database. The database was created in 2009 and it was in active use for a few years. Unfortunately the usage of database was slowly reduced and nowadays only part of the organization is using it actively.

In Sandvik Mining and Rock Technology warranty claims are handled through Sales Tools (ST) Warranty –database and all claims are stored there. Based on information in ST Warranty –database it is possible to get a report of most failed parts according to the number or value of claims. This report is shared with Product Development managers regularly.

Sales companies can forward customer feedback to the product company by ST Feedback –database. The technical support department processes every feedback case in this database. They analyze the case and forward it to the product development team if needed. Technical support team members visit customer sites in start-ups or technical support cases. The travel reports about visits often include feedback for Product Development department.

The parts support department sends feedback to the product development team by email. They do not have any specific reports or databases for feedback.

Current databases and reports which are used for collecting and sharing field feedback and other similar of information are shown in Figure 4.

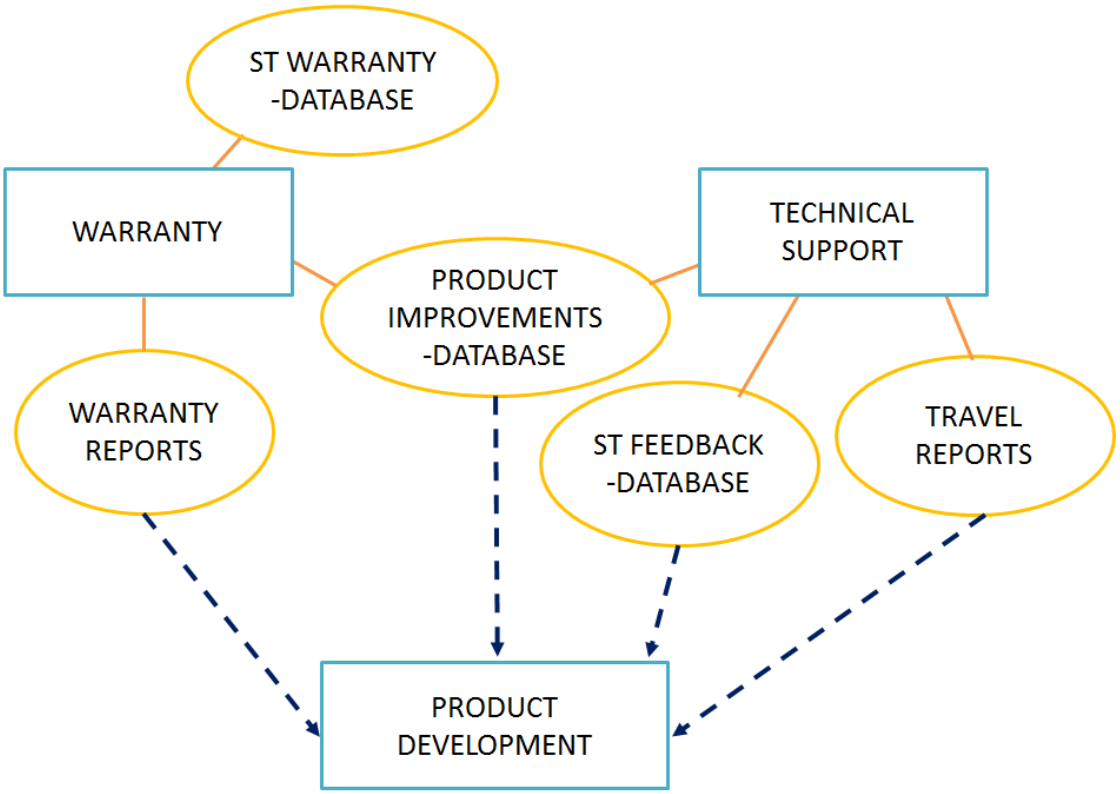


FIGURE 4. Current databases and reports used for forwarding information to the product development team.

Besides sharing information by emails, reports and databases Sandvik Surface Drills organization has continuous product improvement meetings where part of field feedback can be shared. These meetings are mostly kept in a manager level and there is a risk that all needed information is not forwarded to the right people in the organization. This kind of procedure leaves responsibility for the individual manager who should share the information with one's subordinates.

It has been realized that current way of sharing field feedback and other similar information should be improved. One common process is missing and people are using several different ways to share the information. This study tries to find disadvantages in the current way of working and give proposals to develop the process in the future.

2.3 Research target and definition

This thesis clarifies the current status of the information sharing process; how current tools are used and if they are useful. It also clarifies if the front line feedback is shared enough and utilized in the product development department.

The purpose of this thesis is to show the importance of information sharing in the organization and create new tools to develop the information sharing process. Development work is based on lean philosophy which is already used in the product development process. As this kind of information sharing process development is closely related to knowledge and learning this research studies also theories of learning organization and knowledge management. The target is also to help whole organization understand how different departments affect each other. By developing the information sharing process it is possible to increase the knowledge level in the whole organization and it can have a positive influence all the way to the customer experience.

2.4 Research method

The aim of the research is to find the truth (Metsämuuronen 2006, 81). Research method guides researcher's decisions in every stage of the research (Hirsjärvi & Hurme 2015, 16). Research method can be qualitative or quantitative or both. Research can include both of these methods as the research can include different kind of research problems. Qualitative research can bring up examinees' observation about the situation and takes their history and development into account. (Hirsjärvi & Hurme 2015, 27; Alasuutari 2011, 32.)

Qualitative research can be described as a process. A tool for data collection in qualitative research is a researcher himself, so called human instrument. Viewpoint and interpretation of data are developed in researcher's consciousness during the research. Research can also be seen as some sort of learning event. It is characteristic for qualitative research that the research problem is not necessarily clearly defined at the beginning of research but research problem is specified during the research. (Aaltola & Valli 2010, 70-71.)

Many times the qualitative research concentrates on quite small number of cases and the quality of the research data is more important than the quantity. The selected cases are analyzed as well as possible. (Eskola & Suoranta 1998, 18.) Purpose of qualitative data analysis is to clarify the data and so produce new information about the researched issue. With the analysis the researcher condenses the data without losing the information it includes. The aim is to clear the patchy research data and increase the information value. (Eskola & Suoranta 1998, 137.)

Data can be collected in several ways in the qualitative research. The research problem, theoretical context, research target and resources define which practice should be selected. Most used practice to collect data is an interview. Normally interviews are made with the individual person but sometimes pair or group interview is also suitable. Mainly the research interview is used to sort out opinions, attitudes, character and behavior of interviewees'. The research interview can be a form interview, a theme interview or an open interview. The form interview is also known as a structured interview or standardized interview. In the form interviews a form and an order of questions are considered by the researcher beforehand. Because of this, it is essential to emphasize in the response instructions that questions should be answered in the correct order. The assumption is that every answered question affects the next one. A form interview works well if the research problem is not very wide and a target is to describe a well-defined subject. (Vilkka 2015, 122-123; KvantiMOTV 2016b.) Form layout should be clear and it should not be too long to ensure a good response rate. Also questions should be quite simple and a moderate length. (KvantiMOTV 2016a.)

The number of interviewees depends on a purpose of the research. The basic idea is to interview as many people is needed to obtain required information. Typically survey collects information from a group of people who represent a sample of some basic group. Normally the number of interviewees in qualitative research is around 15 persons. Qualitative research uses purposive sampling instead of statistical generalization. The idea is to understand some transactions more deeply, get information about local phenomenon or search new theoretical aspects of transactions or phenomenon. (Hirsjärvi & Hurme 2015, 58-59.) Questions which can be answered *yes* or *no* should be avoid-

ed in qualitative research as it is not possible to survey widely respondents' opinions and experiences with that kind of questions (Vilkka 2015, 128).

This form interview was executed as an online survey, see Appendix 1. It was sent to twenty people in Surface Drills product development team. The respondent group included both experienced and fresh employees from different positions; engineering managers, project managers, team leaders and designers. Online survey included following nine questions:

1. Do you get enough information from technical support, warranty and parts support departments?
2. How do you get information from technical support (field feedback)?
3. How do you get information about warranty issues?
4. How do you get information about spare part consumption?
5. Do you use ST Feedback -database?
6. Is the information in ST Feedback –database useful for you?
7. Do you use Surface Drills Product Improvements –database?
8. Is the information in Surface Drills Product Improvements –database useful for you?
9. What kind of suggestions for improving our information sharing do you have?

For questions 1, 5 and 7 there were a drop down menu (options yes/ no/ don't know) and other questions were answered in writing.

3 LEAN PHILOSOPHY

3.1 What is Lean?

Term *lean production* was introduced in 1988 when John Krafcik compared productivity levels between different car manufacturers. The idea of lean production was extensively introduced in a book called *The Machine that Changed the World* which was published in 1990. The book was written by James P. Womack, Daniel T. Jones and Daniel Roos and it describes how Japanese car manufacturers successfully increased productivity in their factories in the US. Lean philosophy is based on Toyota's production system (TPS), which has been under development for almost 100 years. (Modig & Åhlström 2012, 76-77.)

> The core idea is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources. A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste (What is Lean? 2000).

In a lean organization the ultimate goal is to have a perfect value creation process with zero waste which creates a perfect value to the customer. Because of this it is necessary to change the traditional way of management so that it focuses on optimizing the flow of products and services through the whole value streams. Waste elimination through entire value streams creates a process which needs less human effort, space, capital and time to make products and services. This kind of process is more cost efficient and has fewer defects than a traditional one. (What is Lean? 2000.)

3.2 Lean thinking

As described above the idea of lean thinking is value. Basically the value is what the customer says it is, what he or she considers important, and is willing to pay for (Oppenheim 2011, 14). Modig and Åhlström (2012, 138) have described lean thinking in their book "This is lean" according to Toyota philosophy. It divides lean idea into four

groups: values, principles, methods and tools & activities. Groups can be presented as a four level figure as shown in the figure 5.

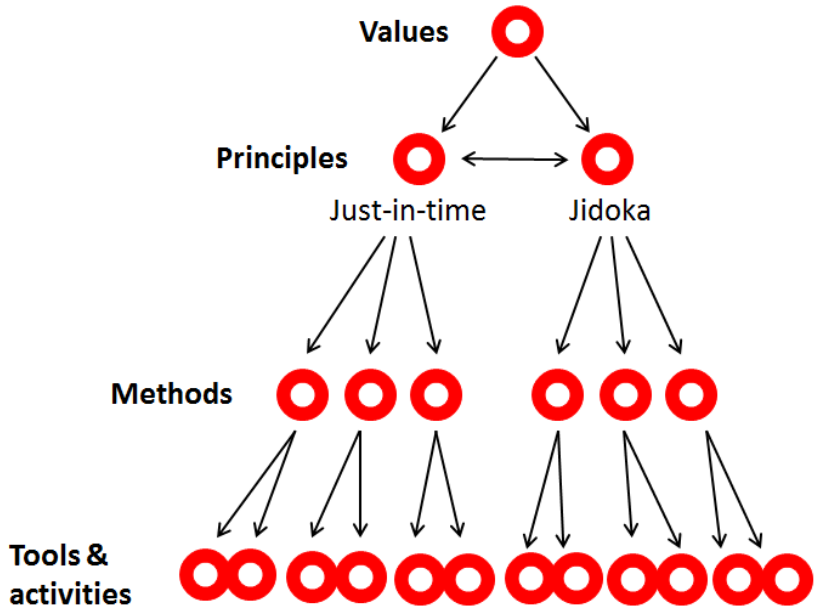


FIGURE 5. Toyota philosophy (Modig & Åhlström 2012, 138).

Values illustrate how an organization should behave. The most important value is the customer value. Principles illustrate how an organization should think. The principles can be divided in two groups; *just-in-time* and *jidoka*. *Just-in-time* means that the act is timely. *Jidoka* means the underlying conditions that balance *just-in-time*. Methods are what an organization should do. Visual planning and standardization are methods to perform different tasks. Tools and activities are something that the organization should have. Tools are something that is needed for example a whiteboard and activities are something that is needed to do to understand a specific method. (Modig & Åhlström 2012, 130-139, 140.)

3.3 Flow efficiency

A traditional form of efficiency is a resource efficiency which focuses on using resources that add value within the organization as efficiently as possible. Modig and Åhlström (2012, 5) introduce a new kind of form of efficiency that is called a flow effi-

ciency. Idea of flow efficiency is to concentrate on the unit which is processed in organization. This unit is called as a *flow unit*. For example in a manufacturing process the flow unit is a product and in services it is often a customer whose needs are to be satisfied with different actions (Modig & Åhlström 2012, 13).

To have a flow efficient process, it needs to be defined from the perspective of the flow unit (Modig & Åhlström 2012, 19). When the organization focuses on the efficiency, flow units pass quickly through the organization and create a continuous flow. This helps everyone to understand the whole process and take responsibility for it. (Modig & Åhlström 2012, 64-65.)

To represent what lean really is Modig and Åhlström have created a visual framework called *efficiency matrix*. It builds on the two forms of efficiency; the resource efficiency and the flow efficiency (Modig & Åhlström 2012, 97-98). Like Figure 6 illustrates, the strategy of Lean is to gain higher resource efficiency and higher flow efficiency. The target is to move to the right and up in the efficiency matrix. This can be reached by focusing on flow efficiency and reducing waste from the process by that. (Modig & Åhlström 2012, 123-125.)

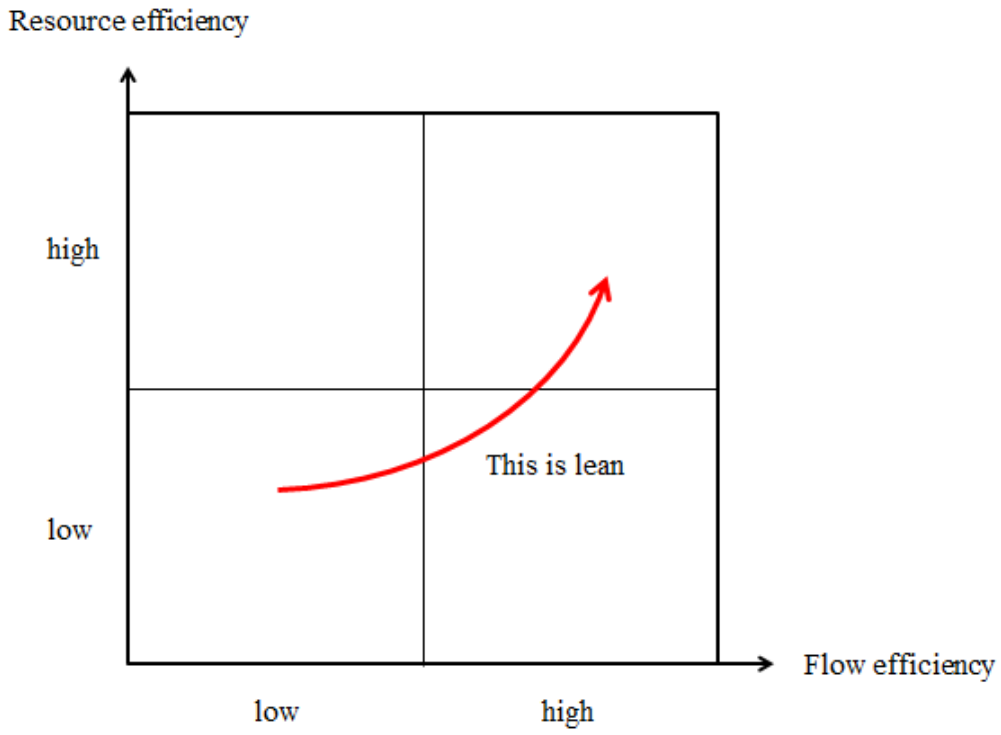


FIGURE 6. Efficiency matrix (Modig & Åhlström 2012, 124).

3.4 Visual management

The aim of lean is to create a transparent organization so that everyone can see everything all the time. That is made possible by visualizing, which is the most effective way of communication. (Torkkola 2015, 49.) Visualized information is shared on the walls so that everyone can see what is happening with just one look. It makes possible a standardized way of working. So the whole organization can be controlled by controlling deviations from the standards. An important thing is to update the visualized information continually. (Modig & Åhlström 2012, 136-137.) In traditional organization the best idea of entity is in management level, because different functions are reported to them. Visualization helps the whole team to get the best possible idea about the situation so that team members can make good decisions fast and independently. (Torkkola 2015, 49.)

Toyota has developed a concept called *oobeya*. Oobeya is Japanese and it means ‘‘a big, open office”. The room itself is not important but the business philosophy and collaboration process that goes on within the oobeya room. The oobeya changes the way products are developed as it changes with whom, when, where, and how information is shared and discussed. The oobeya process brings together different departments of the company including design, engineering, manufacturing, sales, marketing, purchasing, logistics, etc., to focus on development of new products. The idea of oobeya is collaboration and sharing. (Oosterwal 2010, 218-219.)

The visual planning is a tool for information exchange and progress management in a product development. With the oobeya process contents, status and flow of work can be made visible for example with a whiteboard on the wall. The visual management makes targets and progress clearly visible and this information is available for all related team members and departments. The oobeya process encourages open collaboration during product development and open availability of information in a visualized format activates a new form of communication. (Oosterwal 2010, 220, 222.) Visual tools, like whiteboards and charts, are used to satisfy the *“visual management triangle”*, see Figure 7 (Pascal 2010, 52).

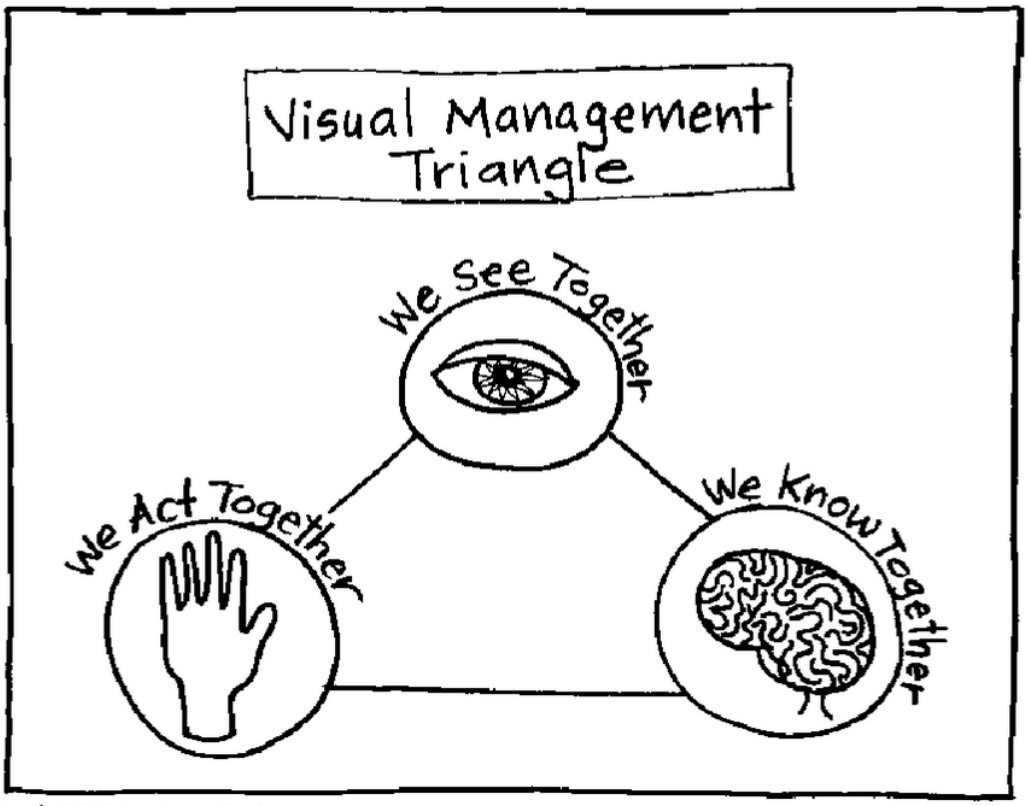


FIGURE 7. Visual management triangle (Pascal 2010, 52).

John Shook proposes to think following three questions to ensure used visual boards are useful and can deliver the intended consequence:

1. What is the purpose?
2. Who is it for?
3. How often do you use and/or respond to indications of abnormality?

He also advises to arrange visualized flow of work so that problems are highlighted as they arise. This enables and encourages individuals and teams to tackle them right away. (Shook 2012.) Continuous and open dealing with problems creates a feeling of security which improves the work satisfaction (Torkkola 2015, 50).

3.5 Lean in product development

The goal of the lean development is to learn fast how to make good products. The development creates operational value streams and with good development systems those

value streams can be profitable. The values that development creates are a manufacturing system and usable knowledge. In lean companies the development is better, more reliable, cheaper and faster. (Ward & Sobek 2014, 14, 21.) Mascitelli (2011, 59) thinks a new product development as a process for transforming knowledge and information into the customer value.

Usable knowledge is the basic value of development as it can prevent defects, excite customers and create profitable value stream. Unsuccessful projects are typically resulting from not having the right knowledge in the right place at the right time. (Ward & Sobek 2014, 31.)

Following three basics of learning create a usable knowledge:

1. **Integration learning** which means learning about customers, suppliers, partners, physical environment where product will be used etc.
2. **Innovation learning** which creates new possible solutions.
3. **Feasibility learning** which enables better decisions in new solutions, avoids project overruns and cost and quality problems. (Ward & Sobek, 2014, 31.)

Lean companies use a large fraction of their product development effort to create knowledge and smaller fraction to create hardware. The main idea of lean development is to focus on a usable knowledge. (Ward & Sobek 2014, 31.) With lean development, the organization creates a new way of thinking and acting. Everyone in organization should have an idea of what they are trying to create. That way the right direction is clear and it is easy to get excited about it. The principle of lean development is that your excitement about what you are trying to create pulls the team forward. (Ward & Sobek 2014, 71.) Besides this new way of thinking and acting, the product development organization must remember to learn from the history and avoid repeating past mistakes (Mynott 2012, 39). Product development teams are naturally reactive and learn from prior steps (Kennedy 2003, 164).

Ronald Mascitelli (2011, x) defines a new product development as most intensely cross-functional and collaborative process. Every function within a company must contribute their knowledge to successfully launch a commercial product. (Mascitelli 2011, x) He also points out that new product ideas can come from any source within a company.

Employees who have direct contact with customers like customer service, sales people, field technicians etc. have perhaps the greatest insight into the hidden needs of the market. They should spread the information among different departments to increase the knowledge and help product development team to understand the customer. (Mascitelli 2011, 2; Mynott 2012, 123.)

4 KNOWLEDGE MANAGEMENT

4.1 Knowledge management

Nowadays knowledge management is part of everyday work and part of the company's management activity. A company's success depends on the knowledge and expertise of its employees. The purpose of knowledge management is to ensure required knowledge to reach a company's goals, now and in future. (Viitala 2005, 38.) The target of knowledge management process is a continuous knowledge development so that the organization can perform its tasks. (Sydänmaanlakka 2012, 131.) Knowledge management concerns everyone in the company, also individual's self-management.

To be able to develop the company it is necessary to recognize what kind of knowledge it has. Like Riitta Viitala (2005, 86-87) explains, it needs to be clarified what knowledge exists, what is needed and what is the current status of knowledge inside the organization. A knowledge development process is described in Figure 8 (Viitala 2005, 86-87).

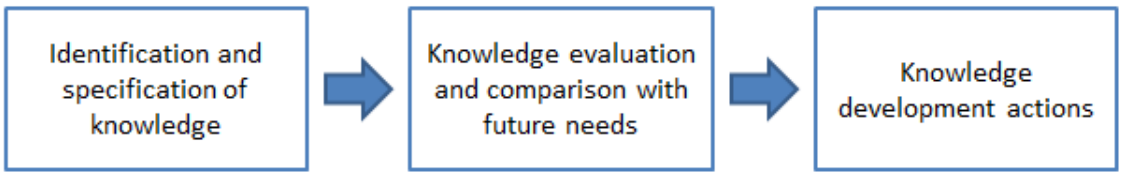


FIGURE 8. Knowledge development process (Viitala 2005, 87), revised.

One of the main themes of knowledge management is the intent of the future. A company must have a clear and shared strategy where it is good at and which direction operation is wanted to be developed. Knowledge should be part of the company strategy and the strategy must be clear in every level of the organization. The strategy creates a starting point and a baseline for knowledge management. The most important aim of knowledge management is to create a bridge between company strategy and individuals' competence. (Viitala 2005, 61, 67.)

4.2 Learning organization

Learning is a process, where an individual person finds new information, skills, attitudes, experiences and contacts. These findings lead to a change in individuals' actions. Nowadays business environment is in continuous change which causes big demands for organizational learning. The organization needs to change faster than its environment and competitors. (Sydänmaanlakka 2012, 23.) Organization knowledge develops only when knowledge is shared and acting teams change it to common knowledge (Tuomi & Sumkin 2012). The product development is basically based on learning and discovery. If the organization wants to control its own destiny, it needs continuously improve its capability to create and innovate (Oosterwal 2010, 46,153).

The entity of knowledge management is a combination of knowledge of individuals and teams (Figure 9). The entity develops when the knowledge of an individual employee develops and refines into a knowledge of a team and furthermore into a knowledge of the organization. (Tuomi & Sumkin 2012.) Organization provides learning opportunities but it is individuals' responsibility to use that opportunity. Individuals will translate knowledge into learning. (Braham 1995, 13.)

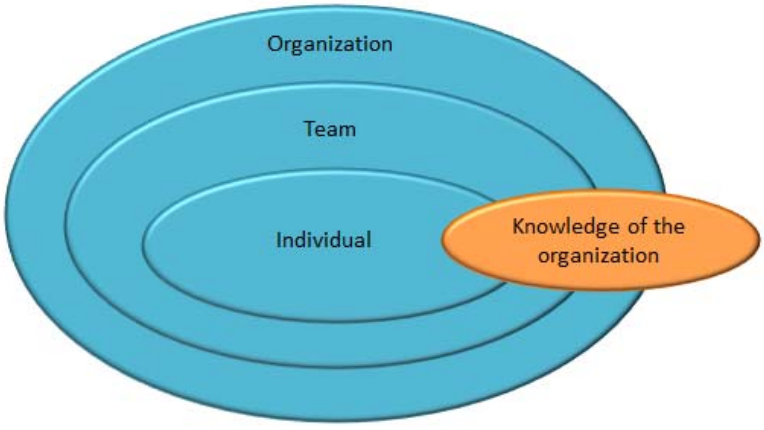


FIGURE 9. The entity of organization knowledge (Tuomi & Sumkin 2012).

The knowledge management of the organization requires adequate and encouraging interaction and communication between individuals, teams and different parts of the organization. Knowledge based environment consists of employees' expertise, individual responsibility, technical leadership and set-based concurrent engineering. (Tuomi &

Sumkin 2012; Kennedy 2003, 228.) The learning organization recognizes motivation as an inherent character in each person. When the organization has a shared vision and everyone is committed to that vision, people will motivate themselves to learn. (Braham 1995, 4.) Efficient expertise sharing is very important as it enables organizational learning. By enabling sharing, organizations can connect employees to one another and boost communication, learning and organizational knowledge. (Ackerman, Pipek & Wulf 2003, xi.)

Oosterwal (2010, 47-48) defines following five key principles which distinguish learning organizations from ordinary organizations:

1. System thinking: The cornerstone for organizational learning which integrates other four disciplines.
2. Personal mastery: Organization learns through individuals who learn, but individual learning does not ensure organizational learning.
3. Mental models: Our behaving is controlled by our beliefs, mental models. Organizational learning requires revealing who we really are so others can understand our way of thinking.
4. Building shared vision: When a genuine shared vision is built, people learn because they want to, not because they are told to. Building a shared vision may take time and it requires patience. A good shared vision which organization takes as its own will take an organization much further than any personal vision.
5. Team learning: In a team learning process a team collectively creates the results the members truly want. Team learning builds an environment of sharing and creating knowledge. Learning in team together is not only organizational benefit, but also individual members grow and develop more rapidly than they would do individually. (Oosterwal 2010, 48-57.)

Learning can be seen as a four-phase process, see Figure 10. Learning starts from unconscious incompetence which means that it is not known what is not known. In the second phase, conscious incompetence, it is known what is needed to be learned. After that it is learned one concept at a time to become conscious competence. Finally when it becomes a second nature, phase unconscious competence will be reached. (Ward & Sobek 2014, 19.)

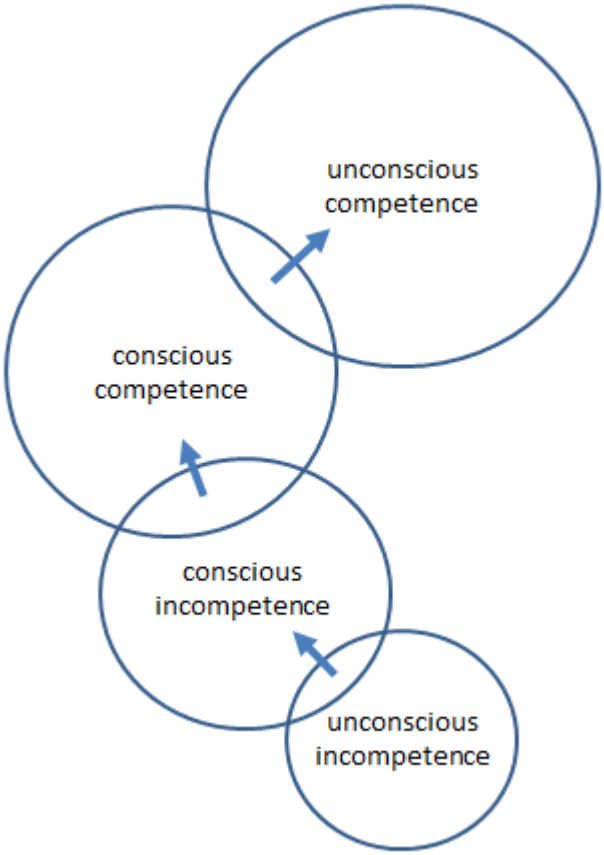


FIGURE 10. Four phases of learning (Ward & Sobek 2014, 19).

5 RESEARCH RESULTS AND IMPLEMENTATION

5.1 Research analysis and results

Before the data can be analyzed it must be moved into a form where it can be analyzed. That can be done by transcribing or deconstructing it selectively for example by themes. The research task and research sample define how accurate transcribing should be done. (Hirsjärvi & Hurme 2015, 138-139; Vilkka 2015, 137.) After the data have been collected and at least some of it have been deconstructed, research stages can be described like in Figure 11 (Hirsjärvi & Hurme 2015, 144).

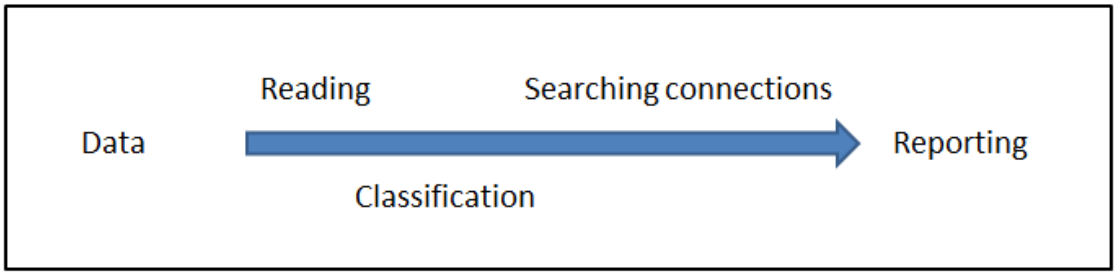


FIGURE 11. Stages of interview data analysis (Hirsjärvi & Hurme 2015, 144).

The aim of qualitative analyzing is to clarify the data and create new information about the matter under research. The target is to increase information value by creating clear and meaningful data from fragmented research data. (Eskola & Suoranta 2000, 137.) Qualitative analyzing and interpretation can be conducted in two ways. It is possible to analyze the data by keeping the focus strictly on the research data or think the data as a base for researchers' interpretation. The most difficult stage of qualitative research is making interpretation because there is not any guidelines how to do it. (Eskola & Suoranta 2000, 145.)

In this research, the interview data were transcribed quite literally. The interview was executed as an online survey and answers were quite short and easy to transcribe. A quality of the research data was good and there were only few answers which were not in accordance with the research problems. Transcribed data is listed in Appendix 2. The data were analyzed by thematizing. The data were analyzed by searching themes to clar-

ify research problems, see Appendix 4 and 5. Thematizing enables a comparison of appearance of certain themes in the research data. Literary data are analyzed to find and separate essential subjects for research problems. (Eskola & Suoranta 2000, 174; Hirsjärvi & Hurme 2015, 173.) Transcribed survey answers were thematizied so that analyzed data can give answers to research problems; how current information sharing process works and how current process can be developed by lean philosophy.

The online survey was sent to twenty people in Surface Drills product development team. Eighteen of them answered to the survey. The respondent group included both experienced and new employees from different positions; engineering managers, project managers, team leaders and designers. The sample group was chosen so that it represented basic group as well as possible.

A response rate for surveys is normally between 10 - 95 %. A response rate is often higher in company's internal surveys and a good response rate level is between 30 – 40 %. (Puumalainen 2016, 33.) The response rate to this survey was very good; 90% of respondents answered.

Half of the respondents felt that they are getting enough information from technical support, warranty and spare part departments. Survey results can be seen in Appendix 3. Results about information sharing ways are described in Appendix 4. Results show that the most of the field feedback information from technical support is received by asking and discussion. The amount of information received by email and travel reports is less that it could have been expected. A very small part of received information comes from ST Feedback- and Product Improvements –databases (PID). This clearly shows that these databases are not used as planned. As the most of the information is shared in verbal communication between people there is a big risk that the information is not stored at all and especially not available for everyone in the organization.

Information which is received from the warranty department comes mostly from warranty reports. The warranty reports are sent to the product development team managers and they should forward the information to their subordinates. This result shows that not all of the respondents receive warranty reports or the information is ignored. Other sig-

nificant ways to share the warranty feedback are emails, meetings and verbal communication. Also in this case Product Improvement –database is not a major factor.

Information about spare part consumption is received only by asking or by email. This shows that there is not any real process to share this kind of information. Based on survey responses, there is a need to receive more information about spare part consumption.

As Figure 13 shows, over half of the respondents are using ST Feedback –database.

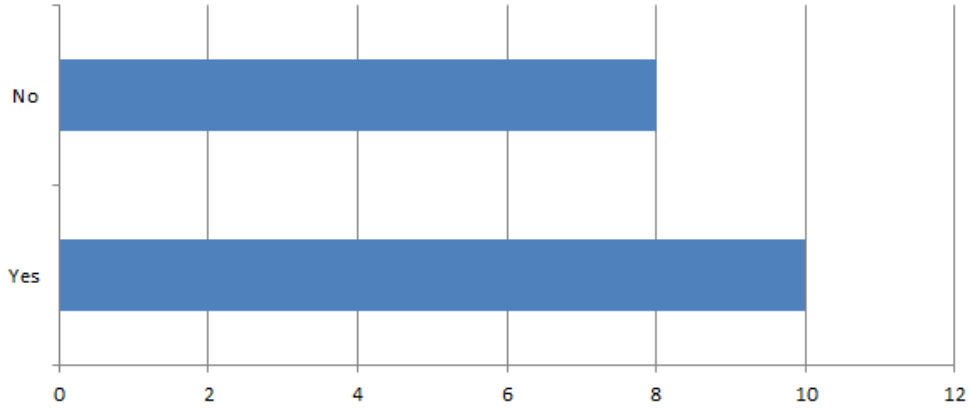


FIGURE 13. Do you use ST Feedback -database?

Ten of them are feeling that the information in the database is useful for them and two feels that it is not useful. One-third of the respondents do not know if the information is useful for them. This can be seen in Figure 14.

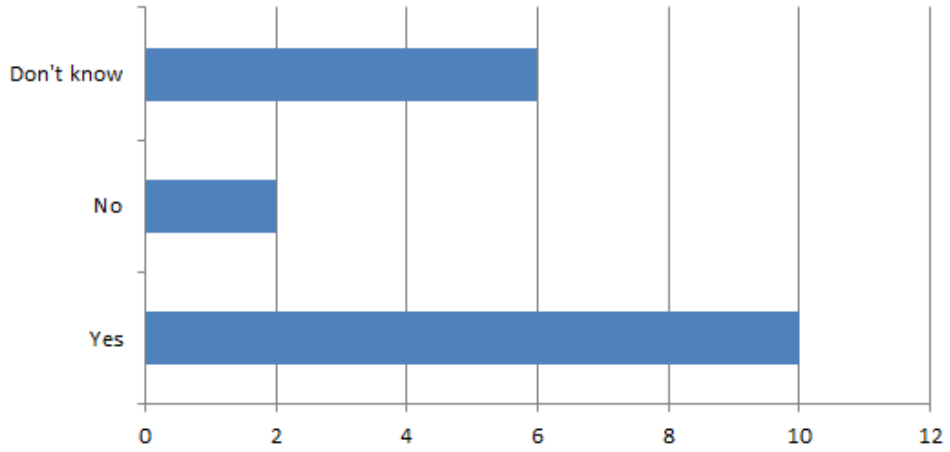


FIGURE 14. Is the information in ST Feedback -database useful for you?

Less than half of the respondents are using Product Improvements –database; only seven of them (Figure 15).

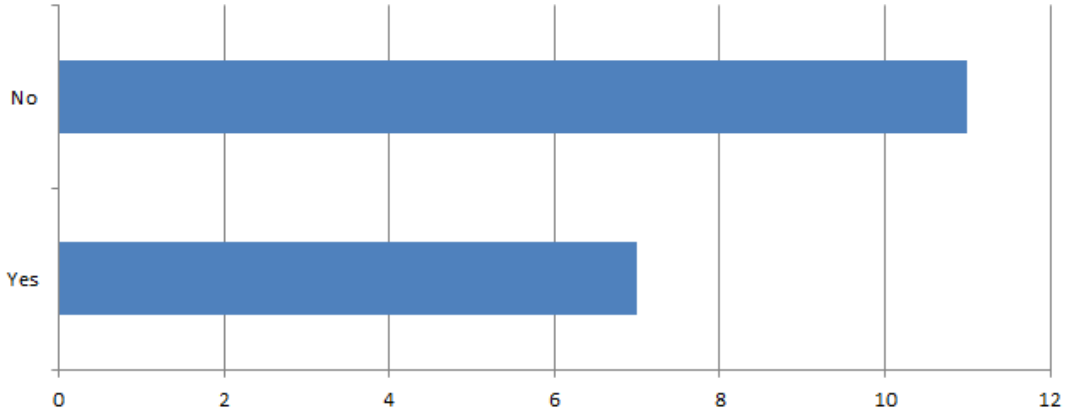


FIGURE 15. Do you use Surface Drills Product Improvements -database?

Over third of the respondents thinks that the information is useful (Figure 16). Most of the respondents don't know if the information in Product Improvement –database is useful or not. This shows clearly that this database is not familiar to everybody in the organization.

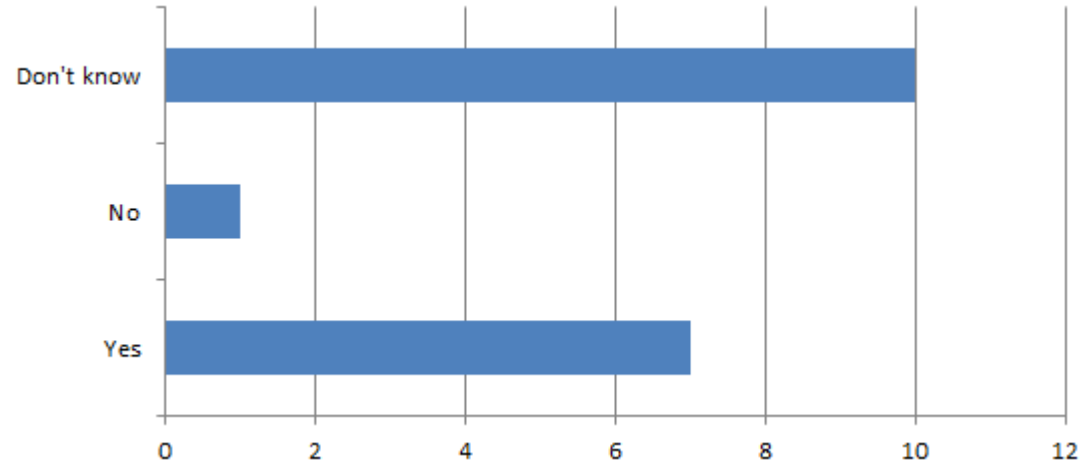


FIGURE 16. Is the information in Surface Drills Product Improvements -database useful for you?

The improvement suggestions given by survey respondents are presented in Appendix 5. Most of the improvement suggestions were related to reports. This shows that people

are willing to receive information and especially in the analyzed form. A few suggestions were related to the databases and especially too low usage of those.

5.2 Research implementation

This research focused on solving how information, especially field feedback, is shared with the product development department and how that process could be developed. Results show that most of the field feedback information is shared in verbal communication between individuals. Databases which are created to share this kind of information are not used as planned. Results also show that a common process for information sharing does not exist.

The first step of implementation is to create a common process for information sharing. The target is to create a flow efficient process. In a flow efficient process units pass quickly through the organization and create a continuous flow. This way everyone can understand the whole process and take responsibility for it. (Modig & Åhlström 2012, 64-65.) In this case product development team can be seen as a flow unit. The identified need is lack of information and that need has to be satisfied. The aim is to create a process which can offer a continuous flow of information. The process will be part of everyday work and it should work without irrelevant bureaucracy or many resources.

The Surface Drills product development team is already executing lean philosophy in their activities. Surface Drills products are divided into three product groups based on product sizes. The Surface Drills product development department has their own project rooms, oobeyas for each product groups. The idea of oobeya is collaboration and sharing and it brings different departments of the company together (Oosterwal 2010, 218-219). Based on this the field feedback information should also be shared in oobeyas. Visual planning is used as a tool for information sharing in the oobeyas. When information is shared like this, it is available for all related departments and team members. To implement this idea, every oobeya will have a whiteboard for sharing field feedback and other related information coming from warranty, technical support and parts support departments. The basic idea of a whiteboard is shown in Figure 17 and in Appendix 6.

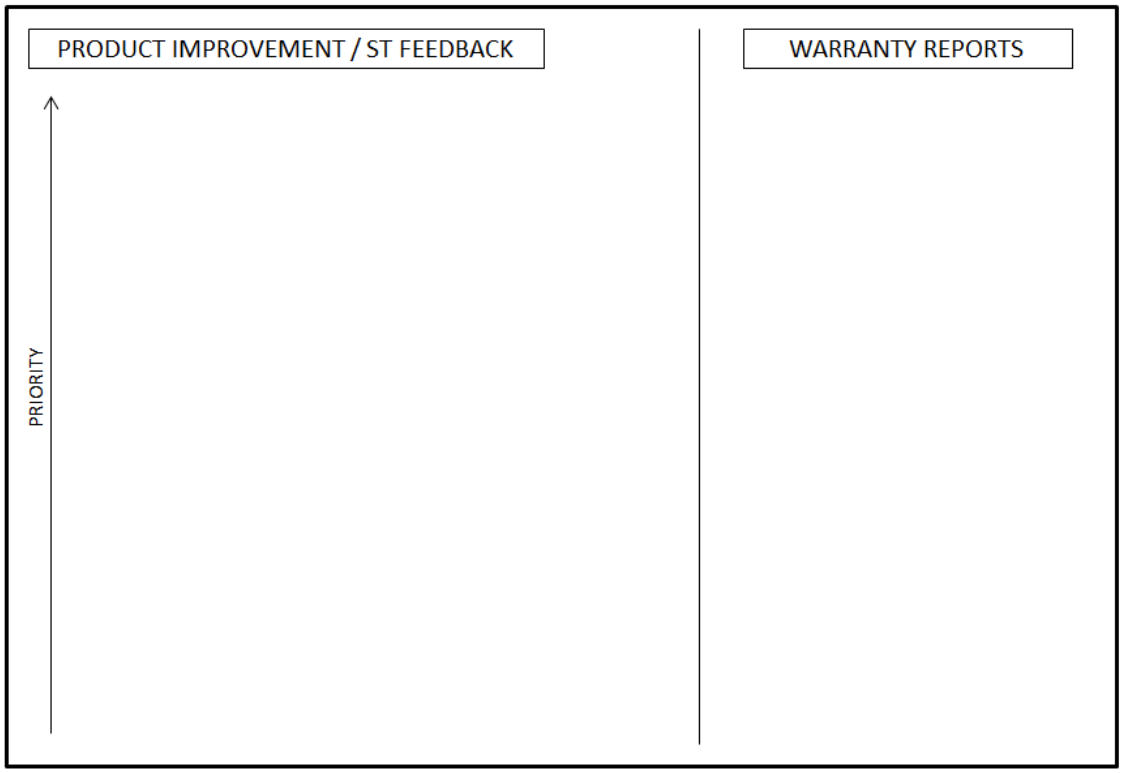


FIGURE 17. Information sharing board.

As a part of a process development it was decided that organizations take Product Improvements and ST Feedback databases back to active use. Because the parts support team does not have any real process to share this kind of information and it would need quite much development work, it was decided that at this point the development process will focus on Warranty and Technical support teams. The new process will work so that when technical support team or warranty team receives a customer feedback they analyze and process the case so that only the real cases are forwarded to the product development team. The processed cases are added into a Product Improvements –database and PostIt –note with case title, normally part number and name, will be put on a whiteboard in a correct product groups' oobeya. The person who has created a case into the PID will prioritize it based on his or her own knowledge. Also monthly warranty reports for every product group will be put on a whiteboard. This is a responsibility of a warranty team. The new process for forwarding information is described in Figure 18. To ensure the process is working well the status of the cases must be continuously followed and updated. Because of the new process and visual boards in oobeyas information will be easily and continuously available for everyone. This can reduce project defects as

now the right knowledge should be available in the right place at the right time (Ward & Sobek 2014, 31).

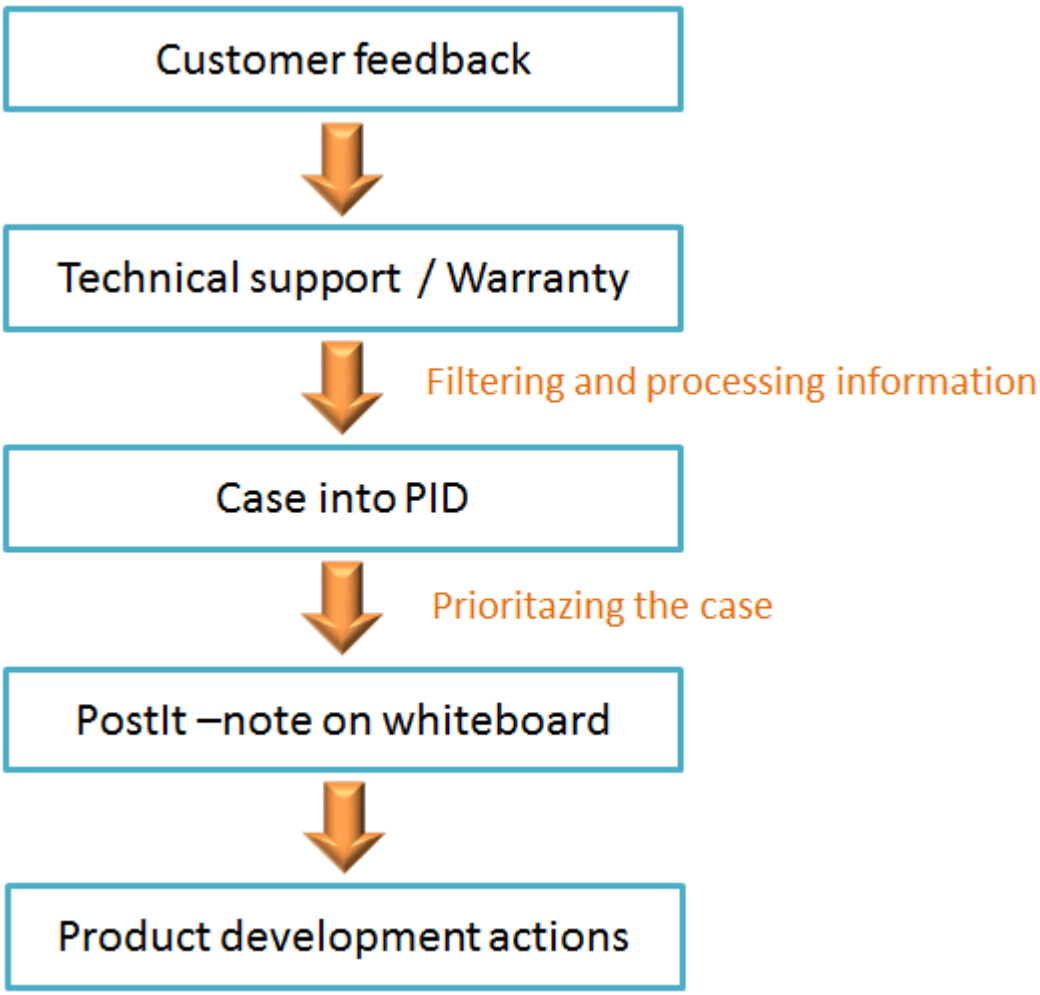


FIGURE 18. The new process for forwarding customer feedback to the product development team.

The goal of lean organization is to understand the customer value and focus continuously increasing it (What is Lean? 2000). Customer focus is one of the core values of Sandvik Mining and Rock Technology. The shared vision of the organization will motivate people to learn (Braham 1995, 4). By developing the information sharing process everyone will be more aware of customer needs and understands the importance of the customer focus.

The target of new information sharing process implementing is to create an organization which works together for a same goal that every member of the organization is committed to. This creates an ownership experience and passion to learn. Learning together in team benefits both the organization and individual members. It increases the knowledge level of the entire organization. (Oosterwal 2010, 48-57.) By enabling expertise sharing, organization can connect employees to one another and boost communication, learning and organizational knowledge (Ackerman, Pipek & Wulf 2003, xi). Idea is that the development of this process will help create a continuously learning organization. It is also worth remembering that people who visit the customers and receive customer feedback have a good vision about the situation in the field. They have perhaps the greatest insight into the hidden needs of the market. (Mascitelli 2011, 2; Mynott 2012, 123.) Even the research focused on forwarding information to the product development can be seen in conclusion that new process will increase information sharing and learning also to another way around, from the product development to warranty and technical support teams.

6 RELIABILITY EVALUATION OF THE RESEARCH

The reliability of qualitative research is improved by exact description about different stages of the research. All essential information for the research such as conditions, places, a self-evaluation of the researcher and time spent on collecting the research data have to be brought into the readers' knowledge. (Hirsjärvi, Remes & Sajavaara 2001, 214.) Different stages of the research are described as exactly as possible focusing on the most important issues so that the reader can understand how the different stages of the research have been executed.

In a qualitative research data analysis and a reliability of the research cannot be strictly separated from each other. Qualitative studies often include researchers' own consideration and are much more personal than quantitative studies. This should be taken into consideration when the reliability of research is evaluated. (Eskola & Suoranta 2005, 208-210.)

The research was performed as a qualitative research using online survey. The answering was done anonymously and survey forms were used only for this research purpose. In this case the researcher was part of the organization which this research concerns and knew all respondents beforehand. Because the survey was answered anonymously the researcher cannot know who the respondents were. The objectivity of the research affects result of the research. Objectivity means that researcher does not mix the own beliefs, attitudes and appreciations into a research target. The researcher should try to recognize his or her own assumptions and appreciations and act so that they will not affect research too much. (Eskola & Suoranta 2005, 17.)

The data were analyzed by thematizing. The conclusion of current information sharing status was made based on the survey responses. The development proposals are comprised of survey responses, the researcher's own experience and theories of the lean philosophy and knowledge management. The Surface Drills product development team executes lean philosophy in their activities and these development processes are integrated into that.

6 SUMMARY

The target of the thesis was to find out how current information sharing process is working in a certain part of the Surface Drills organization of Sandvik Mining and Rock Technology and create a new developed process for it. The target was to increase the knowledge and create a learning organization where the information is available for everyone.

The thesis successfully met the target set in the following research questions:

- How is the current information sharing process working?
- How can the current process be developed by Lean philosophy?

Based on the research results one common process for information sharing is missing and people are using several different ways to share the information. The major role of verbal communication in information sharing lead to the situation where feedback and actions are not necessarily documented at all and information is not available for everyone in the organization. Results also show that databases which have been created to share the information are not used as it was planned. The most important purpose of the thesis was to create one common process for information sharing based on the research results.

The Surface Drills product development team executes lean philosophy in their activities already and the information sharing development process was integrated into that. Especially the visual management wanted to be taken into use also in the information sharing process. That was executed with white boards in the project rooms of each product groups. This very well supports the idea of the continuously available information. The challenge is to get the whole organization to understand the importance of information sharing and start to use the new process actively. But if they do that, communication, learning and knowledge of the organization will all increase.

Based on the research results spare part consumption is the information that is needed but is not currently available. This should be taken into consideration and concentrate

on developing this part of information sharing in the future. The spare part reporting should be part of the same process as field feedback and warranty reports. Reports of spare part consumption can be added on same project room white boards as other feedback.

REFERENCES

Aaltola, J. & Valli, R. 2010. Ikkunoita tutkimusmetodeihin II. Jyväskylä: PS-kustannus.

Ackerman, M., Pipek, V. & Wulf, V. 2003. Sharing expertise: Beyond Knowledge Management. The MIT Press.

Alasuutari, P. 2011. Laadullinen tutkimus 2.0. Tampere: Osuuskunta Vastapaino.

Braham, B. Creating a Learning Organization: Promoting Excellence Through Education. 1995. Crisp Publications Inc.

Eskola, J. & Suoranta, J. 1998. Johdatus laadulliseen tutkimukseen. Tampere: Osuuskunta Vastapaino.

Hirsjärvi, S. & Hurme, H. 2015. Tutkimushaastattelu: Teemahaastattelun teoria ja käytäntö. Gaudeamus.

Hirsjärvi, S., Remes, P. & Sajavaara. P. 2001. Tutki ja kirjoita. Helsinki: Tammi.

Kennedy, M. 2003. Product Development for the Lean Enterprise. The Oaklea Press.

KvantiMOTV. 2010a. Read 2.8.2016.
http://www.fsd.uta.fi/menetelmaopetus/kyselylomake/laatiminen.html

KvantiMOTV. 2010b. Read 2.8.2016.
www.fsd.uta.fi/menetelmaopetus/tutkimus/aineistotyypit.html

Mascitelli, R. 2011. Mastering Lean Product Development. Technology Perspectives.

Metsämuuronen, J. 2006. Laadullisen tutkimuksen käsikirja. Helsinki: International Methelp Ky.

Modig, N. & Åhlström, P. 2012. This is lean – Resolving the efficiency paradox. Rheologica publishing.

Mynott, C. 2012. Lean Product Development, A manager's guide. The Institution of Engineering and Technology, London, United Kingdom

Oosterwal, D.P. 2010. The Lean Machine: How Harley-Davidson Drove Top-Line Growth and Profitability with Revolutionary Lean Product Development. New York: AMACOM.

Oppenheim, B.W. 2011. Lean for Systems Engineering with Lean Enablers for Systems Engineering. Wiley & Sons Inc.

Pascal, D. 2010. The Remedy: Bringing Lean Thinking Out of the Factory to Transform the Entire Organization. Wiley & Sons Inc.

Puumalainen, K. 2016 Kvantitatiiviset luentomenetelmät. Read 23.7.2016. https://noppa.lut.fi/noppa/opintojakso/a130a0350/luennot/luento2.pptx

Sandvik Intranet. 2016. Read 18.7.2016. https://intranet.sandvik.com

Shook, J. 2012. Visual management – The good, the bad, and the ugly. Read 8.8.2016. http://www.lean.org/shook/DisplayObject.cfm?o=2095

Sydänmaanlakka, P. 2012. Älykäs organisaatio. Talentum.

Torkkola, S. 2015. Lean asiantuntijatyön johtamisessa. Talentum pro.

Tuomi, L. & Sumkin, T. 2012. Osaamisen ja työn johtaminen. Talentum.

Viitala, R. 2005. Johda osaamista! Osaamisen johtaminen teoriasta käytäntöön. Inforviestintä.

Ward, A.C. & Sobek II, D.K. 2014. Lean Product and Process Development (2nd edition). Lean Enterprise Institute.

What is Lean? 2000. Read 2.8.2016. http://www.lean.org/WhatsLean/

APPENDICES

Appendix 1. Research survey

Information sharing - Survey

This survey is used to clarify how engineering and project departments receive information from technical support, warranty and parts support departments.
Your response will only be used for survey purposes.

Survey

1. Do you get enough information from technical support, warranty and parts support departments?	yes
2. How do you get information from technical support (field feedback)?	
3. How do you get information about warranty issues?	
4. How do you get information about spare part consumption?	
5. Do you use ST Feedback -database?	yes
6. Is the information in ST Feedback -database useful for you?	yes
7. Do you use Surface Drills Product Improvements -database?	yes
8. Is the information in Surface Drills Product Improvements -database useful for you?	yes
9. What kind of suggestions for improving our information sharing do you have?	

Appendix 2. A list of survey questionnaire answers to open questions. 1 (2)

How do you get information about warranty issues?

- In meetings four times per year.
- By e-mail.
- E-mail, phone, Product Improvement –database, discussions with warranty department.
- Product engineer forwards the information.
- Warranty reports, more detailed reports when asked.
- Top warranty reports.
- By asking.
- When warranty handler asks something.
- I usually hear someone speaking about it.
- Some report coming by e-mail.
- Random reports, individual problems and cases.
- Warranty top 60 -report by e-mail and Top3 –meetings.
- Monthly warranty report.
- Meetings, e-mail.
- From warranty manager.
- By asking and warranty reports.
- By asking.

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How do you get information from technical support (field feedback)?

- Travel reports, discussion with Sandvik people who use rigs.
- By asking.
- E-mail, phone, Product Improvements –database, ST Feedback –database, travel reports, discussions with technical support.
- From my boss or product engineers.
- E-mails about individual cases, face to face discussions.
- By listening technical support manager.
- Asking
- I have to ask if there is something that I need to know
- The best information is got by asking. The issue that I am working with is not involved in any report.
- Visiting customer, hearing coffee table discussions
- Random feedbacks now and then
- By e-mail about some critical cases
- Office rumors.
- Meetings, email.
- From technical support manager.
- By asking.
- By asking.

Appendix 2. A list of survey questionnaire answers to open questions. 2 (2)

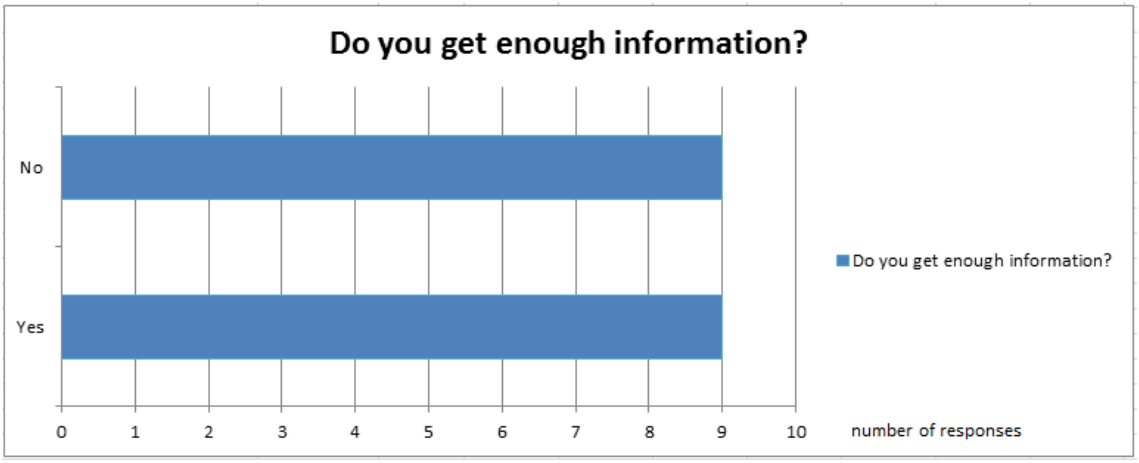
How do you get information about spare part consumption?

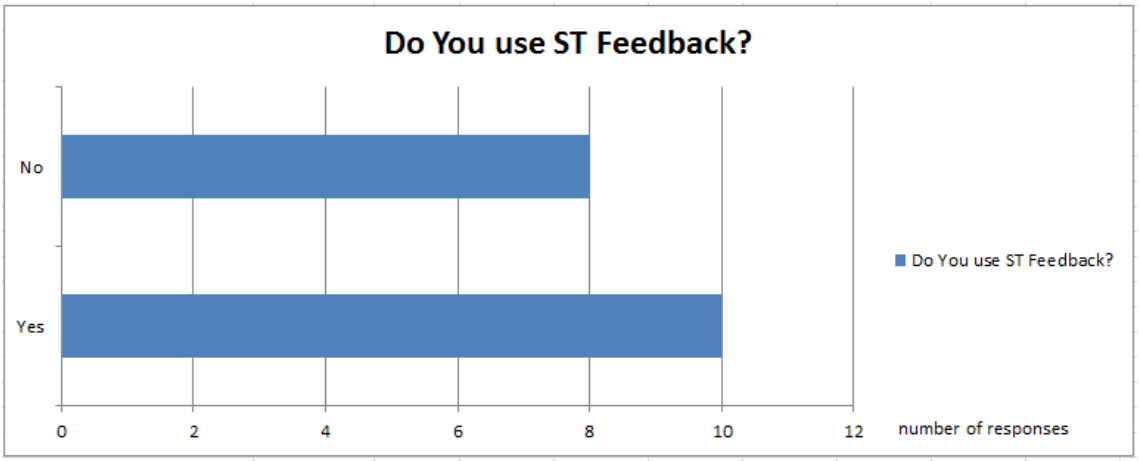
- By asking.
- By e-mail.
- Don't get any information.
- When asked about individual parts.
- I don't.
- By asking.
- I don't.
- I don't get that information. Or maybe I have possibility to get the information but that is useless because there is no interpretation in it.
- We do not get information.
- By asking.
- No information even if I ask.
- From parts support team.
- Don't get information.
- From part support manager.
- By asking.
- By asking.

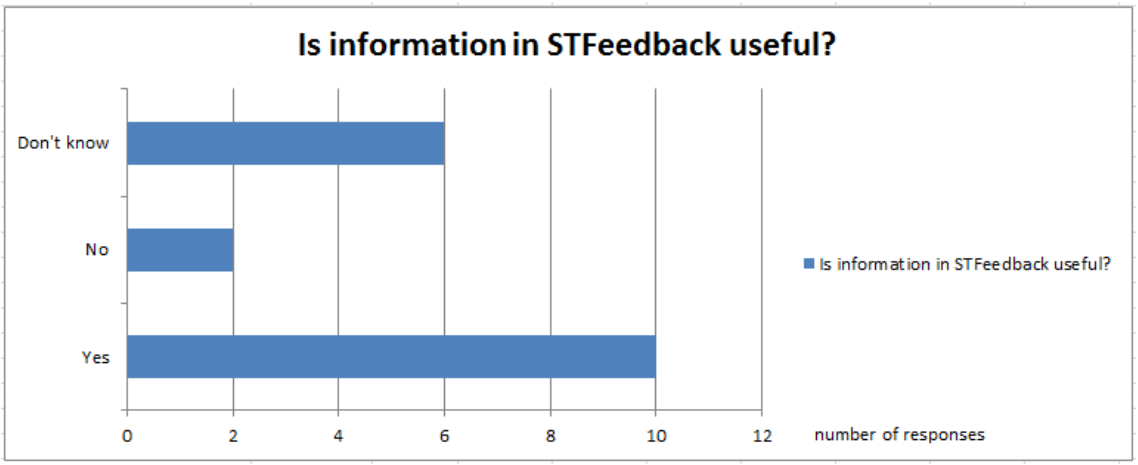
Do you have any suggestions for improving our information sharing?

- Monthly reports: field problems, warranty issues, spare part consumptions.
- Automatic reporting of abnormal spare part consumption, fact based reports of situation in the field, less "everything is shit" more "this part is shit".
- Would be nice there could be a kind of "tweet" or micro blogging system that aftermarket people could use and kind of shout box and ad hoc inform hot issues.
- While someone is travelling, he or she should inspect all the welded structures to find the places the customer has repaired himself.
- Training where to find spare part consumption from Sandvik system. Information meetings few times per year where engineering would be informed about field problems.
- Database use is on too low level, so it does not provide barely any new information
- Warranty records by machine type, top 100 spare part lists, more info from St Feedback and PID.
- If a field feedback is worth to act, it should be added to some database immediately so facts could be easily checked and there would be less rumors at the office.

Appendix 3. Research survey results. 1 (2)







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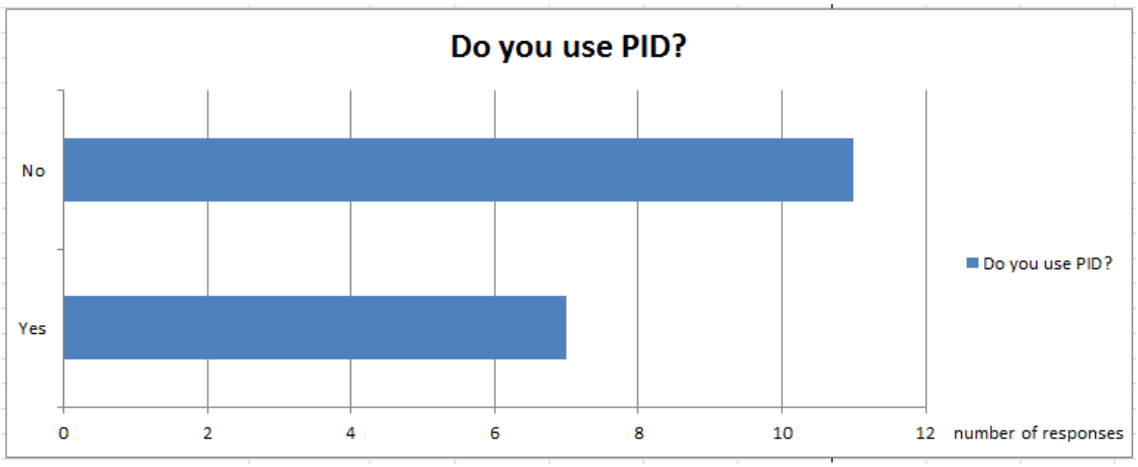
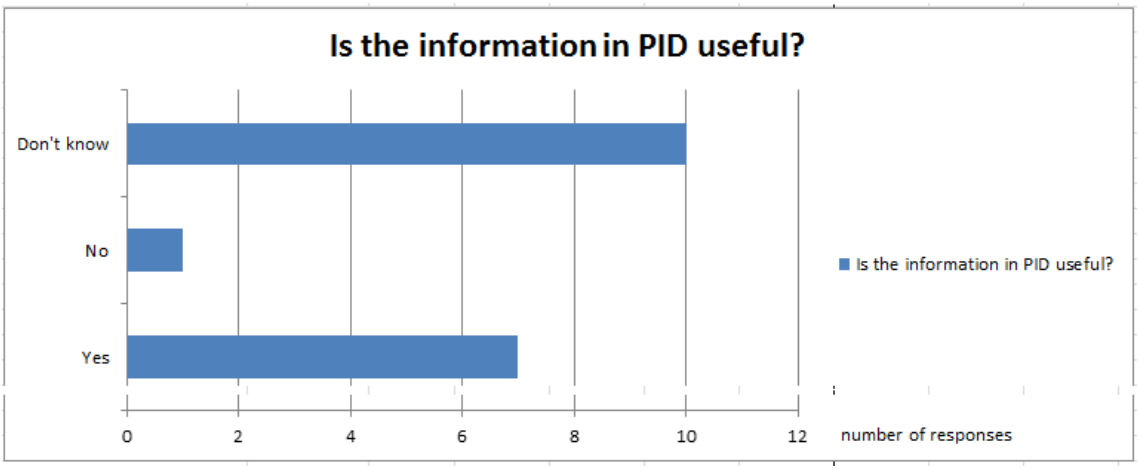
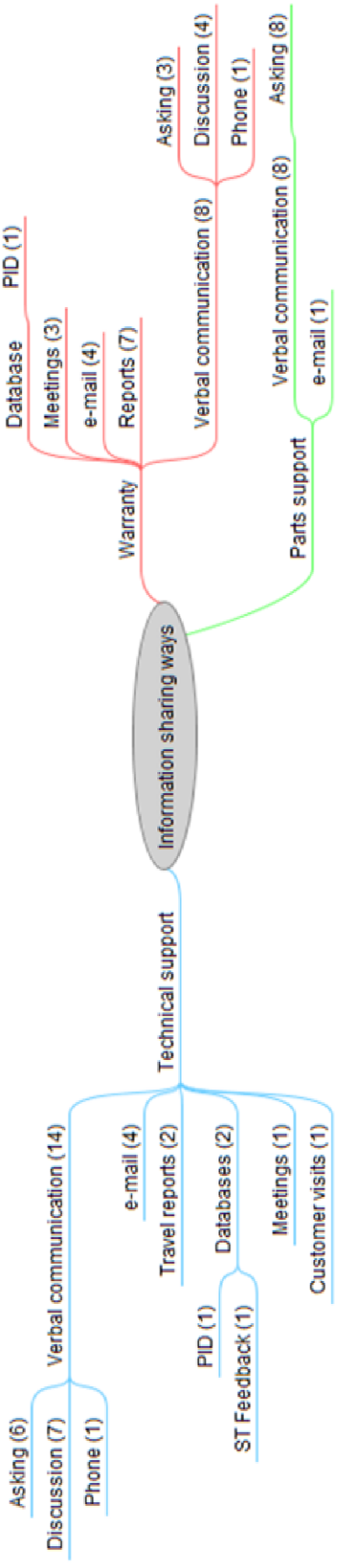
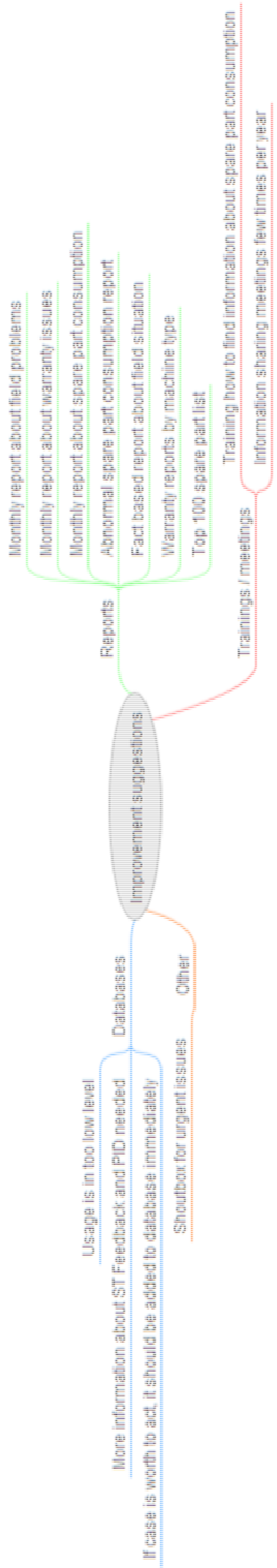




Appendix 4. Survey results analysis / Information sharing ways.



Appendix 5. Survey results analysis / Improvement suggestions.



Appendix 6. Whiteboard in the oobeya-room