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Utilization of information generated by Customer Support helpdesk

Tacit knowledge in quality improvement

DEGREE PROGRAMME IN
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ABSTRACT

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The aim of this thesis was to study the case handling process of the CS Helpdesk of Cimcorp Oy and the information that is generated and used in the process. The Helpdesk has the best touch with the customers' user experience and through this, information can be gained for the use of the company's quality improvement.

The study analyzed case data from two clients over a period of more than a year. Half of the data came from issue records for a new international project, and the other half came from an old domestic customer. In addition, five thematic interviews were conducted with helpdesk officers from both domestic and international teams. The results of the study were generated using a multimethod research methodology.

The results showed that most of the cases handled by the Helpdesk fell into three main categories. Based on the data, solutions were proposed to improve the flow of information and tackle the problems. In addition to the main categories, the survey revealed some specific issues for development and the PDCA model for continuous improvement was offered as a tool to handle them.

Key proposals to improve the flow of information included a shift from communication based on personal relationships to common, officially defined communication channels. To make project handovers more extensive, it was proposed that a form of cooperation and information transfer be made through visits by the development functions to support weekly meetings when recurring problems are discussed. It was proposed that a significant way of influencing the guidance of operators would be to improve HMIs usability, which would also increase the quality of the product as its value to the customer increases.

Support's Helpdesk teams were found to be influenced by strong mutual interaction, support and shared expertise, that carry challenging and complex work through storms. The tacit knowledge possessed by Helpdesk employees is the company's intellectual capital, which must be cherished and valued. Sharing it is possible through problem solving and dealing with it.

Keywords: helpdesk, tacit information, quality improvement, information flow

CONTENTS

LIST OF SYMBOLS AND TERMS

AS/RS	Gantry robot
CCOY	Cimcorp Oy
CIMO	The ERP tool for the Cimcorp Group
CFlow	Name of the Cimcorp software application. Contains sub systems such as WES, WCS and Material Flow Control
CS	Customer Support
ERP	Enterprise Resource Planning
HMI	Human-machine interface
NCR	Non-Conformance Report
UI	User interface
QHSE	Quality, health, safety and environment function
WES	Warehouse execution system
WCS	Warehouse control system

1 INTRODUCTION

The thesis is commissioned by the Cimcorp Group QHSE. The business of Cimcorp is to develop and deliver intralogistics systems. As a company Cimcorp is a part of Murata Machinery Ltd., which is one of the world's largest logistics automation suppliers. The sectors Cimcorp is working on are warehouse and distribution, tire industry and success services.

The company is divided into functions such as IT, Risk management & Legas, Customer Support, Engineering, HR, Marketing and communications, Production, Procurement, Project Management, Property Management, QHSE, Sales, Site Operations and Technology development. Now the company is working to develop fluent transferring of information and actions between its departments and to reduce silos between them.

One function that has worked very independently is Customer Support, full of high-level skills and expertise. Services of Customer Support (CS) consist of Uptime services, Lifecycle consulting, Upgrade services and Certified spare parts. This thesis focuses on Uptime services which includes Helpdesk functionalities and project time support.

System Support is working very independently, they are kind of lonely riders of company. They are also the part of the company that is most directly in contact with the customer. Since quality is those things that add value to a product for the customer, support has a direct route to information on issues that add to the quality of a company's products.

Shortly the aim of this thesis is to identify, examine and classify the information and its formation the System Support Helpdesk generates through case handling.

The subject is relevant to the student's field of study in several ways. The content of the research material requires an understanding of mechanics and

mechanical design, robotics, automation, safety and quality requirements, product management and customer success. To understand the flow of company processes, organizational structures and internal information flow, the student must be able to perceive a project organization in which design, production and site functions are combined. The work is commissioned by the company's QHSE Group in collaboration with Customer Support, which requires the student to have knowledge of quality, safety and risk management. (Automation integrator – Cimcorp Oy)

2 THEORETICAL FRAMEWORK

2.1 Tacit information

The levels of knowledge discussed in this study are a conscious level which Michael Polanyi, the father of the term tacit knowledge, calls focal awareness and unconscious level, which Polanyi calls subsidiary awareness. Conscious information, such as beliefs, mental models, read information and so on, can be identified and described verbally by focusing on it. The unconscious is the part of knowledge that we do not recognize and are unable to verbalize. In the words of Polanyi: "We can know more than we can tell" (Gascoigne & Thorton 2013, 191).

Unconscious information includes unconscious and emotional processes, past experiences and motor reactions. The unconscious part of knowledge gives conscious knowledge its personal content and therefore our conscious knowledge is also partly based on a subconscious basis. However, the subconscious part of knowledge is beyond our reach, because when we consciously reach for it, our mind turns to conscious knowledge. Unconscious knowledge is accessible through the problems for which the mind uses it to solve. In solving a problem, the mind identifies the subconscious information it needs, but the articulation of this information always produces a description of

the integration of information that is generated in the process of problem solving. A pure description of unconscious information is therefore impossible (Virtanen 2014, 21-26).

This part of the knowledge is therefore a kind of mystery; it is a subjective, professional knowledge and know-how that resists linguisticisation and can only really be verbalized through practical problems, making it context-bound (Gascoigne & Thorton 2013, 191-192).

Since it has been challenging to create a precise definition or a borderline for the unconscious part of knowledge, the term (tacit information) has, according to Virtanen, over time included almost all kinds of undefined knowledge such as values, expertise, intentionally hidden knowledge, intuition, non-verbal collective knowledge and contextual knowledge (Virtanen 2014, 44-45). Gascoigne & Thorton (2013, 192) formulate tacit knowledge as a combination of diverse adopted knowledge of a subject and good judgement. They argue that sharing it is not necessarily impossible, but its subjective nature makes sharing difficult and may require educational sensitivity and skills on the part of the recipients.

A practical example of this kind of situation is the mission debriefing situation described by former Air Force fighter pilot Heikki Mansikka. In the exercise he describes, tacit knowledge transfer takes place during mission debriefing as novice pilots listen to experienced pilots go through the mission and articulate what and why they based the extremely quick choices they made as the simulation progressed. As novice pilots listened to the descriptions of the old silver foxes, their own expertise also developed (Mansikka, 2024).

Baumard (1999, 103) examines the behavior and effects of tacit knowledge in organizations in terms of the individual or collective nature of knowledge, its longevity and its organizational nature. Again, this study found it very difficult to translate tacit knowledge at the individual level into a form that can be shared collectively. The study also found that companies run the risk of taking for granted their communities of practice, which store and develop the most

critical knowledge for business survival (Baumard 1999, 137-138). However, the common feature of all the cases studied was that the communities of practice produced responses to the problems and uncertainties that companies faced. According to the study, those involved in the situations developed an attitude described as 'tacit contribution', were part of a network of relationships and relied on the collective expertise of their group for their confidence (1999, 200).

The interviews aim to recognize the role of subsidiary awareness in system support's case handling processes.

2.2 Identifying essential information

According to Goncalves, the key for a learning organization is to identify the knowledge and skills it needs and then pursue them in as many ways as possible, not just through traditional training. He cites examples including experimental studies, studies carried out with internal or external resources, simulations, customer surveys, etc. A valuable source for identifying relevant information is provided by contradictory or disturbing data. (Goncalves 2012, 24-25)

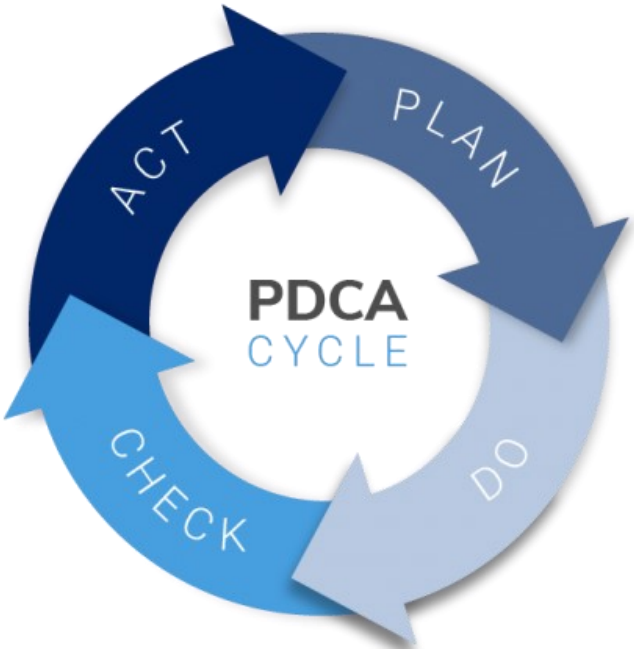
Goncalves (2012, 4) lists the responsibilities of knowledge workers and mentions for example the adoption of advanced practices to improve knowledge creation and sharing and supporting informal learning. Identifying and defining these functions in the practical operation of the unit being examined is one point of view for this thesis work.

As Goncalves states "if you don't have a clear action plan in place, one that can be measured using reliable metrics, you just won't succeed." According to him it is essential to define existing concrete, practical action models that need to be further developed, otherwise the development will remain a vision, and no progress will be made on the ground.

2.3 PDCA

In this thesis the PDCA model is presented as an action plan to respond to the development needs identified through the support.

The PDCA model of continuous improvement is a mindset for quality improvement. It is used for example in problem solving and process optimization. The model is based on Edwards Deming's cycle of continuous improvement and is designed to make development a permanent part of the process rather than a temporary event.



Picture 1. The four-step PDCA model aims to make development a permanent part of an organization's culture (Plexus International).

The PDCA model is divided into four steps (Picture 1.), each of which has different tools available to implement the step. The first step, called PLAN, identifies a development issue and brainstorms ways to improve it. It is essential to define the problem as precisely and clearly as possible, to identify its root causes and to describe the state to be achieved and the metrics that can be used to verify the change. The key is to describe as precisely as possible the processes to which the problem relates and the possible work steps or causes that lead to the problem. Only one change at a time will be considered

and the aim is to describe its causes as accurately as possible by using data. In the words of Edward Deming "Without data you're just another person with an opinion". The data is also needed from the planned pilot. This is why a detailed plan for the pilot should be drawn up, to verify the real effectiveness of the quality improvement change, while ensuring that the planned change works both economically and practically. It is essential to define the resources required for the pilot in relation to the expected results.

Tools in the PLAN Step include the creation of flow charts, brainstorming, Pareto analyses, evaluation matrices and causal diagrams. Methods used in this study include exploring processes through flowcharts and using Pareto. Pareto analysis helps to focus the problem on the essentials using the 80/20 rule. According to this, 20 percent of your activities cause 80 percent of your problems. (Webber & al. 2007, 41 - 44)

In the second Step, called DO, a cautious piloting of the planned change is carried out to identify the consequences of the change. Changes are made carefully and little by little, so that the consequences are as clearly visible as possible. The key content of this step is to collect and record measurement data and observations to inform decisions in future steps.

Tools for DO -step can include work-based learning, testing, training in small groups or conflict resolution in possible interdepartmental encounters. Experimental tests can be used to examine the possible consequences and effectiveness of the change. Smaller scale tests are generally cheaper and more agile to implement. Training teams can ensure that the new skills or knowledge required for the change reach all the necessary people. (Webber & al. 2007, 41 - 44)

The third step, called CHECK, assesses the results of the pilot and whether the change achieved the desired outcome or had undesirable consequences. Data will again be collected to inform the evaluation, so that the evaluation is based on the actual change that resulted from the pilot. The tools used in this step are data collected on the product, data on process variation, key

performance indicators and graphs of changes in the process. Key questions include whether the test achieved the desired change, whether the test improved the process, whether testing should be continued, and whether the tested solution is still economically and practically functional if implemented as a full-scale change. (Webber & al. 2007, 41 - 44)

The final step, ACT, is to act on what the results of the pilot showed. Either the pilot is adopted for the whole process, or it is abandoned. If the pilot is introduced in full, further thought needs to be given to how the impact of the change will be monitored and sustained. It is also worth considering whether the pilot can be used to address other problems and whether other areas for improvement have emerged from this change. The cycle then starts again and the next area for development is tackled. The tools used in this step include updating process descriptions, process standardization and formal training in the use of the new process. Formal training ensures that everyone uses the new process correctly. (Webber & al. 2007, 41 - 44)

The consultancy firm Flovio (2024) lists the risks of failure associated with the use of the PDCA model. As with all development work, management commitment is a key element also in the use of PDCA. Commitment at management level is needed to implement and sustain reforms. Other risks of failure include poor communication, inadequate resources, failure to account for resistance to change, inadequate data collection and monitoring, lack of training and inconsistency.

3 DESCRIPTION OF CASE HANDLING IN HELPDESK

Both PDCA cycle for continuous improvement and Goncalves' criteria for developing a learning community require that existing processes are defined and accurately described. A key process in this study is the case handling of the Support Helpdesk.

The following description of the handling of customer support cases is very sensitive information based on company flowcharts. Because of this, it needed to be filtered and formed very carefully for the public thesis. Through the interviews, it is possible to evaluate whether the flowcharts differ from practice.

3.1 Customer contact

The customer contacts support either by phone, email, chat platform X or SMS. The content of the contact is guided by instructions, which require the following information to be collected before the contact is made

- where the problem occurs (WCS ID),
- how the problem affects the system,
- whether the data corresponds to reality,
- information about the signals associated with the problem,
- the exact times and dates the problem occurred,
- what faults are active in the WCS,
- any active errors from other panels (conveyors, robots, safety software),
- what has happened just before the error occurred
- and how the handling of the problem affects production.

While the problem is being handled, the customer should remain available, deal with support before taking any further action on their own, report any other factors that may emerge related to the problem, complete any actions provided by support, and report when the problem has been resolved and the system is back to normal.

The duty officer will transfer the case to either spare parts, sales, maintenance or support. If the problem is classified as a system support case, a ticket is opened, and a new case is created.

3.2 Case opening

A new case is categorized as either an issue, claim or modification. If the case is an issue, it’s a typical problem to be solved by system support (standard issue). Claim cases are warranty cases and modification cases are minor modifications ordered by the customer and invoiced on an hourly basis.

In cases where the customer does not have an existing contract, the duty officer informs the customer of the invoicing process before the issue is transferred to problem handing.

3.3 Problem handling

Problem handling is started by opening a remote connection to the site. Then the duty officer evaluates the problem and case severity. The duty officer takes ownership of the case and updates the information on the ticket (case: category issue → severity, description).

The case description gives a picture of the original situation of the problem. The severity is either critical, high, medium, low or feedback. At the critical level, the system is not working, and production is at a standstill. At the high level, the system is experiencing significant difficulties and one of the production lines is at a standstill. At the medium level, the system is experiencing problems or difficulties, and some equipment is down or has difficulty operating. At the low level, there is a minor problem or issue that has only a minor impact on production. The feedback option is a general question or feedback.

During problem handling, the duty officer can, if necessary, contact the subcontractor's support service, check whether similar cases have occurred in the past and how they have been resolved, and try to return production to normal by correcting the error alone or with team.

If the problem is not resolved within half an hour, the duty officer will contact the support team's back-up, the person previously involved in the project or a specialist. If production has been down for more than four hours, the System Support Manager is contacted.

If the investigation progresses to a situation requiring a root cause analysis, the case ticket will be updated and placed on hold while the analysis is performed. The analysis is performed by the original project team in collaboration with the System Support team or, depending on the problem, the R&D team. Root cause analysis is only performed at the request of the customer or in a situation where the problem is causing significant loss to production.

During debugging, the duty officer shall brief the customer at least every half hour on the progress of the work.

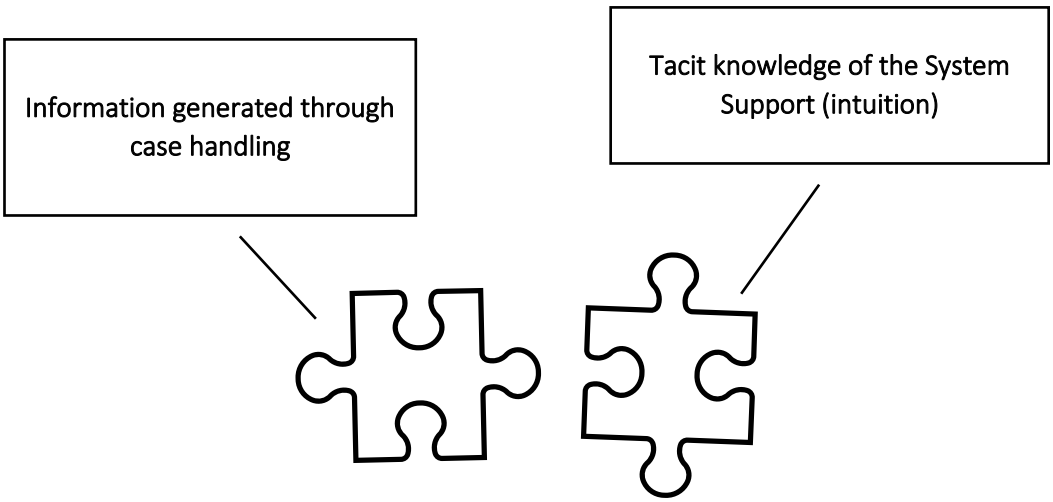
3.4 Case closing

When a case is closed, the duty officer updates the case report with the hours spent, the resolutions and sets the case status to "focus: resolved". The report is then sent to the client. In the case of a repair or warranty, both the invoice check and the case status are closed. If the case was a standard case, the support coordinator checks the correspondence between the time spent and the description of the actions taken and then the case ticket is closed ("focus: closed").

Finally, the information learned from the case, such as instructions, feedback lO-tags, etc., is stored in the knowledge base. This information is also relayed to either sales, spare parts or service, depending on the type of case. The case is now complete.

4 PURPOSE, OBJECTIVES AND RESEARCH QUESTIONS

The aim of this thesis is to identify, examine and classify the information generated by system support Helpdesk case records. And the case handling is partly based on the tacit knowledge of Helpdesk.



Picture 2. The information studied in the thesis is both the tacit knowledge of the helpdesk and the information generated through case handling.

The first step is to go through the descriptions of case solutions recorded by the support system Helpdesk. The data is presented in two parts, the first of which is limited to issue categorized cases from a single customer for a limited period. This data takes the form of an excel matrix printed from the company's ERP system. The second part of the data is an excel matrix of claim-categorized cases for a limited period.

The next step was to perform thematic interviews with system support officers. The interviews were used to refine and deepen the information obtained from the excel data. Student had examined the organization’s process charts and the interviews aimed also to gain further insight into the contents of the support system’s process charts and how they work in practice.

Research questions:

1. What kind of information does the helpdesk generate through case handling? (categories and relations)
2. What interfaces does the helpdesk have with other functions in the company during the case process?
3. How and where to Helpdesk record the information learned from the case? A detailed description of how case articles are recorded in the knowledge base.
4. Ideas on how, where and what information from the helpdesk could flow forward to improve business quality.

5 METHODOLOGICAL CHOICES

This thesis, based on research, is on developing working life and done with an investigative approach. It's a mixture of quantitative and qualitative research. Quantitative analysis about excels matrices, qualitative analysis and classification based on tables and interviews.

The aim is to lay the groundwork for quality development. This is achieved by identifying and classifying information that is sought to circulate within the company. The conclusions also include proposals on how information circulation could be pursued in the future.

6 ASSESSMENT OF ETHICS AND RELIABILITY

One of the challenges of the thesis was researching business-sensitive information. An essential aspect of the work was to secure the confidentiality of the company's business information and to limit the research material printed from the company's ERP by coding it to the public thesis. Similarly, the sensitive information generated through interviews and organizational process flowcharts had to be reported in such a way that the public final paper didn’t contain any information designated as confidential by the company. Therefore, two reports were produced, one for the client and one for the public, which filtered out sensitive information for the company. The public report has generalized terms and information so that there is no risk of publishing sensitive information about the company.

As reporting data collected through interviews, it was important to protect interviewees from being identified and to ensure that the interviewees felt their participation has been confidential. Separate permission was asked from each interviewee to record the interviews.

The available quantitative data for the study is considered sufficiently comprehensive for forming reliable conclusions. Student assessed his own objectivity when he identified his fascination with the data collected through thematic interviews. As the other side of the data was statistical data, it can be concluded that the analysis carried out was sufficiently reliable and objective.

And finally, QHSE and System Support had agreed and planned to collaborate on the study early in 2024.

7 RISK ASSESSMENT

In the beginning of the study student made a risk assessment for the process (Table 1). The purpose of the risk assessment was to ensure that the project would proceed according to plan.

	negligible	minor	moderate	significant	severe
very likely					
likely			unrealistic schedule		
possible		flu	no money → regular employment	competence	scope expand
unlikely		lack of motivation			data lost
very unlikely				family issue	serious illness

Table 1. Risk assessment matrix for thesis project.

The key to project success was to be prepared for high risks. High risks in this project were scope expand, data lost and competence. The actions for that scope won't expand were well defined research questions, limiting the material and good communication with supervisors. Data loss could be avoided by using a cloud environment to store thesis revisions. Student didn't have very much competence for understanding programming. It was therefore important to maintain the basis of the study in the knowledge gained from the expert interviews. A few of the risks implemented during the process. A student did temporary work to earn money and came down with a mild cold. However, thanks to the risk analysis, the student identified the danger in time and managed to reject some of the temporary jobs offered. Finaly none of the risks rose to even a moderate level and the work proceeded as planned.

8 TIMETABLE

September ‘24: Producing Theoretical framework, categorizing and analyzing the excel -matrices, first meeting with CS people, planning of interviews and calendar arrangement for them.

November ‘24: finalizing the theoretical framework, implementing of the interviews and starting to analyze (and littering relevant parts) interviews.

March ‘24: Finalizing the analysis of the interviews, conclusions and suggestions for action to improve the flow of information.

9 OVERVIEW TO THE JOB OF A HELPDESK DUTY OFFICER

Five people working in the company's helpdesk teams were invited for interviews. Three of the interviewees worked in Finnish teams and two abroad. The student approached the candidates by email, presenting the topic of the project and asking for their willingness to participate in the interviews, which would be recorded. The attitude of the support staff towards the development work is reflected in the fact that all the candidates agreed to participate in the interviews and were positively interested in the research. All interviews were conducted during September and October 2024.

9.1 No two days the same

Based on the interviews, the job of a helpdesk officer balances between the glamour and horror of problem solving and can be enjoyed by someone who *enjoys* this wrestling and variety of work.

> No two workdays are the same. There's always some new amazing thing. I like it that I'm starting to solve these kinds of problems.

Original quote: “Täs ei oo kaht samanlaista työpäivää. Ain on joku uus ihmeellinen juttu. Mää tykkään siit, et mä alan selvittää tällasii ongelmii.”

“Best job I ever had”

Original quote used

It's a varied job with plenty of challenges. A little too much in between. I like problems. To a certain point.

Original quote: “Vaihteleva työ ja haasteita piisaa. Välii vähä liikaaki. Tykkään ongelmista. Tiettyyn pisteeseen asti.”

Yes, it's hard sometimes, but not so hard that you can't sleep.

Original quote: “Kyllä, on toisinaan raskasta, mut ei niin ettei sais nukuttua.”

What is one of the biggest goals that has been achieved is sustainability. Because the work is so hard, difficult, demanding and the feedback from the client is not positive.

Original quote: “Mikä on yks isoimmist tavoitteist, mitä on saavutettu on pysyvyys. Et tääl on ollu tosi iso vaihtuvuus, koska työ on niin raskasta, hankalaa, vaativaa ja palaute asiakkaalta ei ole positiivista.”

9.2 Community of hornets, standing up each other's

Customer Support is built on an exceptionally loyal work community. Support survives because it sticks together and there's no leaving a friend behind.

That's why we have experts in many fields here, and this work community is really such that I can actually call anyone, whenever I want, whether it's their shift or not. I always get help from friends.

Original quote: “Sitähän varten meit on täs monen lajin asiantuntijoita ja tää työyhteisö on tosiaan sellanen, et mää voin soittaa oikeastaan kenel vaan, koska vaan, oli ne vuoros tai ei. Mä saan aina apuu kavereilt.”

If I call him at three o'clock in the morning, that there's a situation going on, could you come and check it out. It's less than thirty seconds, and the mouse is already moving. He's a special guy.

Original quote: “Jos mää soitan sille kolmen aikaan yöllä, et tääl on yks tilanne päällä, et viittiks sää tul kattomaan. Ni se on alle kolkyt sekunttia, niin se hiiri liikkuu jo. Hän on aika spesiaali kaveri.”

If you want a quiet place to work, don't put your office near the support, because all we do is yell at each other, because that's how that crowd works.

Original quote: "Jos sää haluut sellasen rauhallisen työpisteen, ni älä pistä toimipistettäs lähel supporttii, koska me ei tehd mitää muuta ku huudellaa keskenään, koska se on miten toi porukka toimii."

"And it [Support] is doing very much because of what we have experience and what we have internal interaction all the time. Because we are such hornets that even if I'm on holiday and a certain kind of robot issue appears, which is my specialty. So, you just believe that if I'm not driving Valmet into a ditch at that moment, I'll come to cover that case and help those guys.

Original quote: "Ja se (Support) pärjää pitkälti sen takii, mikä meil on kokemus ja mikä meil on sisäinen interaktio koko ajan. Koska mehän ollaan sellasii herhiläisii, et vaikka mä oon lomalla ja sielt tulee joku tietynlaine robottikeissi, joka on mun erikoisalaa. Ni uskot vaan, et jos mä en nyt just sattumalt oo ajamas Valmettii ojaa sil hetkel, ni mää tule kattomaan sitä keissii ja auttamaan niit kavereita."

And the working community is amazing. It's really the kind of job that Customer Support does, so if it didn't have such a great working community, you wouldn't necessarily be able to do it.

Original quote: "Ja toi työyhteisö on ihan huikee. Se on oikeesti toi Customer Supportin homma on kyl sellast, et jossei tollast työyhteisöä tossa olis, niin ei sitä kyl välttämättä jaksais"

9.3 Rhythm of work and contact with customers

In Finland, the Helpdesk is always staffed by duty officers in two teams, each with backup operators. The duty operators are on shift for half the week and the backup operators for the whole week. Clients are split between the teams.

When you're the duty officer, you keep the phone close to...

Original quote: "Sillon kun ollaan pääpäivystäjä, niin sillon pidetään puhelin liki..."

When you're on call, you have to be ready to answer the phone 24/7. And even if you are on call 24/7, you still have a normal working day from 8am to 4pm and then you answer the phone after the working day.

Original quote: "Sillon kun on päivystysvuoro niin 24/7 pitää olla valmis vastaamaan puhelimeen. Ja vaikka sul on 24/7 valmius vastata puhelimeen, niin sul on normityöpäivä 8 – 16 siin silti ja sit vastataan puhelimeen työpäivän jälkeen."

Calls are first routed to the main duty officer and if the duty officer does not answer after two alerts, the call is diverted to the backup officer who has had fewer cases. On Mondays and Thursdays, the duty officers rotate and the whole team gathers for a debriefing meeting to review the cases that occurred during the previous shift. In addition to the two Helpdesk teams, Custom Support includes specialists who support the teams in solving cases and participate in rotation meetings.

Due to local working hours regulations, the international offices have built in a slightly different rotation with separate night and day shifts. In this system, there is duty officer on the less hectic night shift, which starts at 6 pm and runs until 8 am the following morning. The night officer's shift rotates on the same half-week system as in Finland. The European office also has its own application of helpdesk working hours due to local working hours regulations. In Europe, there is duty officer who works from 1pm to 8 am in the afternoon and during the rest of the normal working hours there are several officers in their office doing basic support work. European on-call duty shifts run on a weekly rotation.

In Finland, the helpdesk duty officer first works a normal office day between 8 am and 4 pm and then starts on-call time. During the on-call period, they do not check email or chat, but the case is always escalated by a phone call.

> After that, you're at home or wherever you are with your computer, so that you can get online when you need to and answer the phone.
>
> *Original quote: "Sen jälkeen ollaan kotona tai missä ollaankin kone mukana ja siten, että on mahdollista päästä online kun tarvitsee ja vastaillaan puhelimeen."*

Customers have their own pin code when they call, which tells the helpdesk directly which customer it is. Without the pin code, it is not possible to get through and if bills are unpaid, the pin code can also be disabled. After the phone call, depending on the customer, the conversation will be transferred to the chat platform X to continue. Using the chat platform X allows sharing of images, videos, error messages or codes, for example, and frees up the

helpdesk officer to do research. It also serves as a source of information on the case when the shift changes. Some customers, especially in the international offices, prefer to talk in person on the phone, but it is the wish and direction of support to increasingly move to the use of chat platform X.

> Usually, you have to go online and now that we have this chat thing, the chat thing helps a lot, really, with everyone. We should get Finns to join it too. Because the fact that you're talking on the phone at the same time and trying to do something and then you forget half of what the person says, or even that they would have written it down. That really makes it a lot easier. And then you can send pictures to them, and they can send them here.
>
> *Original quote: "Yleensä täytyy men online ja nyt kun on tää chattihomma, niin chattihomma auttaa iha hirveesti, iha oikeesti iha kaikkien kaa. Tarttis suomalaisetki saad siihe. Koska se, et sä puhut puhelimes samaan aikaan ja yrität tehdä jotain ja sit sä unohdat puolet, mitä se sanoo siel, saatikka et se olis kirjottanu sen tohon. Ni se todella paljon helpottaa sitä. Ja sit pystyt lähettää kuvii sin ja ne pystyy lähettää tänne."*
>
> Then when the call comes in, we try to direct the customer to our chat platform, to X.
>
> *Original quote: "Sitten kun puhelu tulee, niin me pyritään ohjaamaan se asiakas sinne meidän chattialustaan, X:än."*
>
> This is really easy to use. You can use it with a web browser or a phone or a computer or anything else that has an internet connection. And you can share all your photos, all your documents...
>
> *Original quote: "Tää on tosi helppo käyttää. Sä voit käyttää sitä webbiselaimella tai puhelimella tai tietokoneella tai ihan millä vaan, mis on nettiyhteys. Ja tänne pystyy jakamaan tosiaan kaikki valokuvat, kaikki dokumentit..."*
>
> We try to highlight the importance of chat platform X from that perspective, so that the data is available to everyone. So if there is a change of shift or something else, it is there and we don't have to search for it and share it.
>
> *Original quote: "Me yritetään painottaa sitä sen chattialusta X:n tärkeyttä silt kannalta, et se data on siel sit saatavilla kaikille. Eli sit jos tulee joku vuoronvaihto tai joku muu, niin se on sit siellä ja sitä ei tarvi niinku hakea ja jakaa."*

The initial information provided by customers varies depending on the customer.

Badly. Well, of course it varies. Some clients tell you fine and well. - - you have to try to be half a psychologist when you talk to them about what has happened. If they've made a mistake, some of them can't say it.

Original quote: "Huonosti. No tietysti vaihtelee. Jokku asiakkaat kertoo hienosti ja hyvin. - - - täytyy sillai puoliks psykologina yrittää jutel heil, et mitä on tapahtunut. Jos he o tehny jonku moka, ni jokku ei pysty sitä sanoo."

It depends entirely on who's calling. Generally, well, but - it varies. Sometimes you get the information, sometimes you have to dig for information.

Original quote: "Riippuu täysin tietty siit kuka soittaa. Pääsääntöisesti hyvin, mutta - vaihtelevasti. Joskus saa tiedot, joskus niitä sit joutuu uteleen."

10 INVESTIGATING OF CASE

10.1 Finding and recording information during investigations

After the customer has called and the initial information has been obtained, the helpdesk will start investigating the case. Usually at this point a remote contact is made to the site. Information is retrieved from old cases, logs of chat platform X, device manuals, knowledege base items, handover documentation, personal notes and from one's own memory.

We have an old and a new system, of which one of our support officers coded some software so that we can retrieve from both databases at the same time from old issues, has this ever happened before, how has it been solved then? Then, of course, there are our own equipment manuals, equipment documentation - - and, finally, we google.

Original quote: "Meil on vanha ja uus järjestelmä, joista meidän yks support officer koodas semmosen ohjelmiston, et me pystytään hakemaan niistä molemmista databaseista samaan aikaan vanhoista keisseistä onko tällasta ollu aikasemmin, millai se on ratkastu sillon? Sitten on tietenki meidän omat laitemanuaalit, laitedokumentointi. - - ja iha viime kädessä googlataan."

The old cases are one channel and the other is our confluence. We have our own support confluence site, where you can find the history of things - - - - each of our desk officers does, if they find something, they usually record it and make it a so-called knowledge base item on that confluence and then it's there for everyone to find.

Original quote: "Vanhat keissit on toinen kanava ja toinen on meidän confluence. Meil on Supportin oma confluence sivusto, mistä löytyy historiaa asioista - - - meidän jokanen päivystäjä tekee, jos he löytää jonkun asian, niin he yleensä kirjaa ja tekee siitä niin sanotun knowledge base itemin tonne confluenceen ja sit se on löydettävis siel kaikille."

The priority is our former tickets. And we have this Cimo. In addition, we have confluences in this knowledge base, which we use. Windchill's documentation and our handover documentation, which is great important - - maybe I even said it's our number one. It's our most important material, because that's where you find the initial information that guides you to a more concrete source of knowledge.

Original quote: "Ensisijainen on meiän entiset tiketit. Ja meillähän on tää Cimo. Sen lisäks meil on confluences tää knowledge base, mitä käytetään. Windchillin dokumentaatio ja meidän handover-dokumentaatio, mikä on eriarvosen tärkee - - - ehkäpä sanosin jopa, et se on se meiän numero yks. Se on se meiän tärkein materiaali, koska sieltä löytyy se ensitieto, joka ohjaa sut tarkemmin konkreettisempaan tietolähteeseen."

From old cases and from my own head and from chat platform X. In chat platform X you can search by channel, i.e. by customer. Use the project number as a search keyword and the problem as the second search keyword. - - in general, it would be worth reading the project information form if you are a little bit sure you don't know, then read the project information form to find out which system this was.

Original quote: "Vanhoist keisseist ja omast pääst ja chattialusta X:stä. Chattialusta X:stä voi hakusanal hakee channel-kohtasesti eli asiakaskohtasesti. Käyttää sitä projektinumeroo hakusanan ja toisen sitä ongelmaa. - - - yleensä kannattais lukee projektitietolomake jos on hiukanki sellanen ettet varmasti tie, niin lukee projektitietolomakkeest mikä systeemi tää oli."

Searching for an answer to the question of where Helpdesk officers look for information to solve problems also answered the research question of where the Helpdesk stores the information learned from cases. The study showed that the lessons learned from a case are extracted by creating a new item in the knowledge base and the assumption based on the flowchart to record lessons learned in the NC report turned out to be wrong.

If the solution is new or potentially benefits another customer, then we should write an article about it in our bank.

Original quote: "Jos se ratkasumalli on uus tai hyödyttää mahdollisesti jotain muuta asiakasta, niin silloin siit pitäs tehdä tollanen artikkeli sinne meiän pankkiin."

In other words, a new item is created in the database when the information learned from the case is considered new or decisive in some way.

10.2 The flow of information relies on personal contacts

Two channels were identified in the interviews for reporting problems identified. The formal channel, the NCR, was seen with doubts and the informal channel, personal contact, was considered more effective. The experience of dealing with the NC report did not encourage the use of this channel for reporting problems, and the possible correction of the report had not been brought to the attention of the person who had made the nonconformity observation.

> ... we go straight to development to ask, have you (noticed this). - - - That (NCR) goes somewhere to the quality group - - - Because I know that it's not an easy fix, even if it needs to be fixed.
>
> *Original quote: "... mennään suoraan devaukseen, et ootteko te (huomanneet tällaisen). - - - Tuo (NCR) menee jonnekin quality-porukalle - - - Koska mä tiedän, että se ei ole mikään ihan helppo korjata, vaikka se täytyisi korjata."*

From a lean perspective, a flow efficiency problem was encountered in the use of the NC report, with frustration arising from skipping one's own issue (Modig N. & Åhlström P. 2017, 56-57). On the other hand, it was felt that it would be good to have a formal communication channel for reporting findings.

> ... Some kind of official development channel could be good. I don't know, maybe there is such a thing...?
>
> *Original quote: "... Semmonen joku virallinen kehityskanava vois olla hyvä. Mä en tiedä, ehkä sellanen joku onkin olemassa..?"*

Contact with the different functions is therefore based on personal relationships. This is done, when necessary, but depending on the person, there may also be a threshold for contact.

> The threshold for them to contact those other functions is really high. Because you don't know the staff, you don't know the people that well, which in Ulvila - - - there's no threshold because you know everybody.

Original quote: “Heidän kynnys ottaa yhteyttä sinne muihin osastoihin on tosi suuri. Johtuen siitä, et ei tunneta henkilöstöä, ei tunneta ihmisiä niin hyvin, mikä sit taas Ulvilas - - - ei oo mitään kynnystä, koska sä tunnet kaikki”

We will contact personally. If we have a problem that requires us to go to product development or the project side, we will contact personally."

Original quote: ”Henkilökohtaisesti kontaktoidaan. Jos meil on joku ongelma, mikä vaatii, että täytyy mennä tuotekehitykseen tai projektin puolelle, niin ollaan henkilökohtaisesti yhteydessä.“

I think we'll talk straight. We don't have any such direct development channel, as far as I'm aware.

Original quote: “Varmaa me jutellaan suoraan. Eihän meil mitään sellasta suoraa kehityskanavaa mun mielest oo.”

Well, we're like NASA at night, so if things go really, really bad, we'll wake up 2000 people to get Bruce Willis back on Earth.

Original quote: ”Siis mehän ollaan vähän niinkun NASA yöllä, et jos homma menee oikeesti tosi huonosti, niin me herätetään se 2000 ihmistä, et me saadaan Bruce Willis takasin maapallol.”

Disappointments in the use of the official nonconformance reporting channel NCR have led to a situation where there is no longer any desire to use NCR on the support side.

The official channel is that if you make an NCR, that this thing is really broken. I've made one. It was there for two years waiting for something to be done with it.

Original quote: “Virallinen kanava on, et jos tekee NCR:n, et tää on oikeesti rikki tää vehje. Mää oon tehny yhden. Se oli kaks vuot tuol, et sil tehtäs jotain. ”

We've kind of given up on the NCR, because we've had some pretty important NCRs - - what they were, five years old and now they've just been dumped, because nobody can do anything with them or has the resources to do anything with them.

Original quote:” Me ollaan vähä luovutettu sen NCR:n kanssa, koska meil on ollu muutama aika tärkeekin NCR - - mitä ne oli, viis vuotta vanhoja ja nyt ne vaan clousattiin pois, koska kukaan ei pysty niille tekemään yhtään mitään tai ei oo resursseja tehdä”

On the other hand, it was felt that due to a lack of resources, not all functions necessarily have people who would be able to take care of the faults found:

> But then if we go to the robot side and to the cell side, we don't have any guys who could influence what we get there in the standard or that we could get there to fix things that we find.
>
> *Original quote: "Mut sit jos mennään tuonne robottipuolelle ja sit ton solupuolelle, niin meil ei ol semmosii kavereita ketkä pystyis vaikuttamaan siihen, mitä me saadaan sinne standardiin ympättyä tai että me saatais sinne korjattua asioita, mitä me löydetään."*

10.3 We just know - tacit information of helpdesk officers

Tacit information of the helpdesk officers appears through problem handling, as described by Polanyi in his theory. Polanyi put it into words "We can know more than we can tell" and in the interviews it was described as follows:

> Our job is to look at it when it's not doing what it's supposed to do. And it's not in the manual. It's completely intuitive after that, that what's the problem with the device - - it comes through experience. Our system developers have been watching our job sometimes and how we approach it. There has been a hypothetical problem, and (we) see pretty quickly, when we look at the problem, that - This sensor is broken and needs to be replaced, and the developers ask us, that - How do you see from the error that there is a problem? We just *know* that it's here. And if you ask almost any support officer, they'll answer in the same way.
>
> *Original quote: "Meidän tehtävä on katsoa sitä, et kun se ei tee sitä, mitä sen pitää tehdä. Ja se ei löydy sieltä käyttöohjeista. Se on ihan täysin intuitiota sen jälkeen, et mikä siellä laitteessa on ongelma. - - - se tulee kokemuksen kautta. Meidän järjestelmän developerit on ollu katsomassa meidän hommaa joskus, miten me lähdetään tekemään. On ollu tämmönen hypoteettinen ongelma, niin (me) nähdään aika nopeesti, kun katotaan tätä ongelmaa, et - Tääl on toi sensori rikki ja täytyy vaihtaa, ja meen developerit kysyy meiltä, et - Mist sää näet tosta virheestä et tos on toi ongelma? Me vaan tiedetään, et se on siin. Ja sää meet kysymään lähes keneltä tahansa support officerilta, niin se sanoo sen saman positin."*

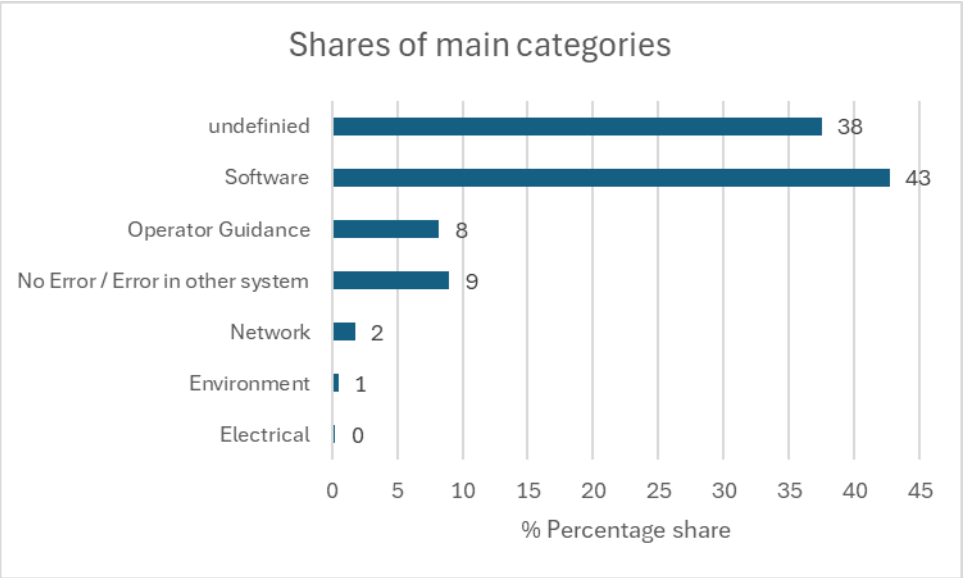
The student recognizes similarities between the Cimcorp helpdesk teams, and the practical communities described by Baumard (1999, 137, 200), which relied on the collective expertise of the group and were said to develop and maintain critical information for company.

11 ANALYSIS OF CS HELPDESK CASES

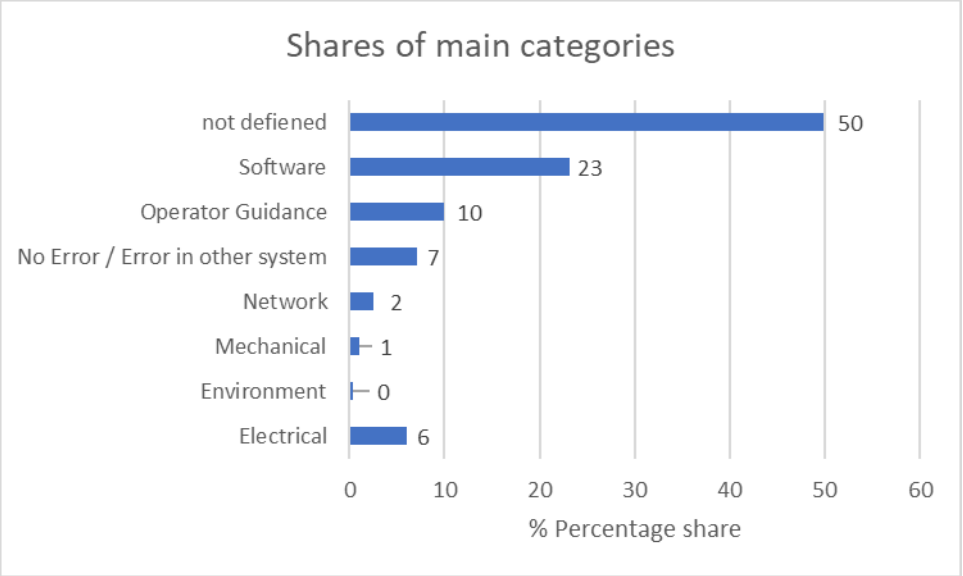
The excel matrices of the research data from the case notes of two clients were examined both quantitatively and qualitatively. The clients represented both Cimcorp's domestic grocery old project (warehouse & distribution) and a new international tire project. The other half of the data consisted of interviews with customer support staff. Five support employees took part in the interviews, three of whom worked in the Finnish CCOY Support department and two in the international teams. Their experience represented the whole life cycle of support, from its very first steps to the current ongoing development work. The interviews were recorded using the microsoft teams recording tool, with a time limit of six months from the time of recording. The interviews were transcribed for essential content.

11.1 Sorting Helpdesk cases by categories

In the statistical analysis, the most significant main categories for both customers were Software and Operator Guidance. However, the largest category for both customers was the undefinied cases (Pictures 3 and 4). The difference in the number of unspecified cases between the two clients in the data may be explained by the time difference between the data and the client history. The data for the international client is closer in time to the transition to FSI-based reporting and the data for the domestic client is similarly dated but closer to the present. In addition, the international customer is a newly commissioned factory, which is still experiencing a wide range and variety of early growing pains, while the domestic customer is a customer who has been receiving support for a long time.



Picture 3. Shares of main categories in domestic customer cases



Picture 4. Shares of main categories in international customer cases

The responses from the interviews were in line with the results of the statistical analysis of the sample data. Software and operator guidance were the main categories mentioned in every interview.

> Software and operator guidance, they are competing quite closely.
>
> *Original quote: "Software ja operator guidance, ne kilpailevat aika tarkkaan keskenään."*

> Operator guidance and WCS.
>
> *Original quote: "Operator guidance ja WCS"*
>
> Operator guidance, I would guess. And Softa/WCS are probably [big ones]. That's the thing that the operators can't influence, the software and the WCS. That's why they're there, because there's only the log where you can find the fault. - - I can easily find it in the log. Or first I try for a while in the UI... - - sometimes you could find it in the UI [UI = user interface]
>
> *"Operator guidance, veikkaisin. Ja Softa/WCS on varmaan [isoja]. Se on asia, mihin operaattorit ei pysty vaikuttamaan se softa ja WCS. Ne on just sen takia, kun siel on vaan se loki mist sää löydät sen vian. - - - määki sen helposti sielt lokista katon. Tai eka mä yritän vähän aikaa siel UI:lta... - - - välillä sen kyl pystyis löytään sielt UI:ltakin " [UI = user interface]*

Based on the interviews, software problems are the most challenging for operators to solve themselves and the operator guidance category increases with operator turnover. This is important feedback for customer training.

> Well, it's (operator guidance). It was very big for one customer, the operator guidance, because they changed operators so often. But unfortunately, I have to say that there are a lot of software problems in those legacy projects...
>
> *Original quote: "No se on (operator guidance). Se oli erittäin iso yhdellä asiakkaalle se operator guidance, koska heillä vaihtui niin usein ne operaattorit. Mutta valitettavasti täytyy sanoa, että noissa legacy projekteissa on paljon softaongelmia..."*
>
> All customers would realize that you should keep those operators and pay them a decent salary, so that they will not change all the time. It is sad when they call us many times and say I have never driven this robot.
>
> *Original quote: "Kaikki asiakkaat tajuaisi sen, et pitäkää ne operaattorit ja maksakaa niille kunnon palkka, ettei ne vaihdu koko ajan. Se on surkeaa, kun meille soitetaan monta kertaa, niin et emmä oo ikin ajanu tätä robottii."*

Based on the interviews, the use of categories differed between Finnish and international teams. In international teams, for example, categorization is used when the customer needs a basis for billing. The interviews in Finland did not reveal the benefits of categorization. Their use was not reported in the interviews, and current format and accuracy of categories does not allow to track down critical items for quality improvement or to be used as a tool to retrieve information from old cases when solving new ones. In this study, the

categorization of Finnish support was seen as a time-wasting element that is not providing benefits in its current form.

> I guess we do not use much at all. It's probably for something then if the bosses want some stats.
>
> *Original quote: "Ei varmaan käytet juuri yhtään. Se on varmaan johonkin sitten jos nyt isot herrat haluaa jotain statseja."*
>
> We have to create reports to justify why we're spending hours on this. Because the customer questions. - - then we are able to make a summary based on the categories that are, that if there is something very strongly suggesting that it is a bug in our system, so maybe that kind of hours we can be transferred to the customer side. But everything that relates to operator guidance and just post-warranty problems that are caused by the customer, so those hours are retained and then billed more.
>
> *Original quote: "Me joudutaan luomaan raportteja, millä me perustellaan, miksi tämä käyttää tunteja. Koska asiakas kyseenalaistaa. - - sitten me pystytään tekemään kooste niiden kategorioiden perusteella mitkä on, että jos siellä on joku erittäin vahvasti siihen viittaava, että kyseessä on meidän järjestelmän bugi, niin ehkä semmosia tunteja me voidaan asiakkaan puolelle siirtää. Mut kaikki, mitkä liittyy operator guidanceen ja ihan niinku takuuajan jälkeisiin ongelmiin, mitkä liittyy et asiakas on itse aiheuttanut, niin ne tunnit säilyy ja sen jälkeen laskutetaan lisää."*
>
> And it's a pretty important categorization in terms of classifying and counting and doing studies for the customer and for us, we want to know how many WCS tickets we had, how many PLC tickets we had, how many operator guidance tickets we had.
>
> *Original quote: "Ja se on aika tärkee kategoriointi sen suhteen, et luokitellaan ja lasketaan ja tehdään asiakkaalle ja ihan itsellekin tutkimukset, halutaan tietää kuin paljo meil oli WCS -tikettei, kuin paljo meil oli PLC-tikettei, kuin paljo operator guidance -tikettejä."*
>
> In our internal meetings like this, for example quarterly meetings, when we check how many cases we have had and, on that basis, we may need to pay attention to some things.
>
> *Original quote: "Tämmösissä meidän sisäisissä, esimerkiksi kvartaalistatus tällasissa palavereissa, kun tsekataan et paljoks meil nyt on ollu tällasii keissei ja sen perusteel pitää ehkä kiinnittää huomiota johonki asioihin."*

The category fields have nowadays been changed to mandatory fields, which means that it is no longer possible to take a case for itself without defining a category and the case would remain undefined. This change partly explains the higher proportion of undefined cases in the older data. Other issues

regarding the development of categories were also identified and the move to Cimo has brought its own challenges. The use of the categories itself also brings its own challenges. Several issues related to different categories can be solved in the same case and, on the other hand, category correspondence is not always absolute.

> Then in some cases there may be many problems, so you tag them [categories] from there. It's not always simple.
>
> *Original quote: "Sit jossain keississä voi ol monta ongelmaa, niin sit sää tägäilet niitä [kategorioita] sieltä. Se ei oo aina yksiselitteistä tää."*

> I use [subcategories] all the time - - there are still too few. They could be more specific. You need to place the case somewhere, a little bit in that direction.
>
> *Original quote: "Käytän koko ajan [alakategorioita]. ... - niitä on edelleen liian vähän. Ne vois olla spesifimpiä. Et niitä joutuu sit pistään johonkin, vähän niinkun sinne päin."*

> We have main categories and subcategories. - - they are mandatory fields, which means you can't even get a case approved without at least adding a main category, and we use that category in our casedata analyses, so we try to emphasise that it has to be right.
>
> *Original quote: "Meillä on pääkategoriat ja subkategoria. - - nehän on mandatory fields eli et saa keissiä edes itsellesi hyväksyttyä ilman että sä laitat vähintään mainkategorian ja me käytetään sitä ihan meidän keissidata-analyyseissäkin sitä kategoriaa, et sitä koitetaan painottaa, et se täytys olla oikein."*

When looking at the distribution of the largest main category, software, into different subcategories, the largest subcategory in both customers' data was WCS. For the international customer, almost half (49%) of the software cases were listed under the WCS subcategory, and up to 63% of the domestic customer's software cases were listed under the WCS subcategory. In addition, 32% of the domestic customer's cases with no main category were listed under the WCS subcategory. Of all domestic client cases, the WCS subcategory was included in 40% of cases and in 16% of international client cases. However, the interviews suggest that the subcategorization of WCS should be treated with caution.

> You should look at the categories that are there, so sort of, it's not absolute, because we do not have an absolute definition of where everything

> is placed, but they are placed in the best category that is there at the moment.- - there can be a lot of things under WCS, which are not really WCS, but they are the server. And they are two different things.
>
> *Original quote: "Kannattaa katsoa niitä kategorioita mitä siellä on, niin vähän silleen, se ei ole absoluutti, koska meillä ei ole aboluuttista määritelmää, että mihin kaikkeen ne pistetään, vaan ne pistetään sillä hetkellä parhaimpaan kategoriaan, mikä siellä on. - - - siellähän voi olla paljonkin semmosia keissejä WCS:n alla, mitkä ei oikeesti oo WCS:ssää vaan ne on serveriä. Ja ne on kaks eri asiaa."*

11.2 Example of startup pains: In-house application X

The student examined the content of our description -records in the excel data and classified the cases according to the content of the records. In the case of the tire factory, based on the content-based categorization, the largest category was problems with in-house application X. Other a little bit bigger categories were, for example, damaged part, locally fixed problems, guidance, clearing of old orders and matching data and reality. In-house application X was associated with case problems in 9.9 % of all cases (n = 281) in the tire factory data sample. In the interviews, In-house application X problems were described as follows:

> In-house application X, i.e. the X database talks to PLCs. Then if a PLC gets a bogey mark, even one read by a scanner, it pulls the whole plant down with the in-house application X because of that one mark. The whole plant is silent because of that one mark. And you can't find that one mark, because there are a hundred lines of logs per second, and you don't know which mark you're looking for. So you can't find which scanner it comes from or which PLC it comes from. And there were a hell of a lot of them [factory stops].
>
> *Original quote: "Yrityksen sisäisestä sovelluksesta X, eli X tietokanta juttelee PLC:eitten kanssa. Sit jos sieltä PLC:stä tulee joku mörkömerkki, joku vaikka skannerilla luettu, niin se vetää sen koko laitoksen sisäisen sovelluksen X mukana seis sen yhden merkin takia. Koko laitos on hiljaa sen yhden merkin takia. Ja sitä yhtä merkkiä ei meinaa löytää sieltä, koska sieltä tulee sata riviä sekunnissa lokia, etkä sä tiedä, mitä merkkiä sä etsit. Niin sit sä et löydä, mistä skannerilta se tulee tai et miltä PLC:ltä se tulee. Ja niitä (tehtaan pysähdyksiä) tuli ihan hemmetisti."*

Through the interviews, it became clear that as projects move to custom support and in the preliminary stages of plant's lifecycle, problems typically arise that can be both fixed and better managed later. In-house application X

problems were a typical example of the start-up pains that can be expected when a project is transferred to Support. This is again important feedback for customer training and also for the development of user guides.

12 RESULTS

12.1 Typology of problems

As stated in the theoretical framework, a learning community needs to know what information it should be aiming for. The knowledge to be sought is often revealed through contradictory or even embarrassing information (Goncalves 2012, 24 - 25) that the support produces as part of its work. So do not shoot the messenger, they open the door to discovering the development areas that the company needs.

In line with the Pareto principle, three types of problems emerged from the data in this study, under which almost 80% of the cases handled by the helpdesk in the data fell:

1. Startup pains of new plant (in-house application X)
2. Software/WCS
3. Operator Guidance

12.2 Extended handover of new projects

Type 1 problems have a predictable time to occur because they are related to a starting stage in the plant's lifecycle, typically after the new project is transferred to support. Problems with old projects are more likely to be related to old applications or versions and are more likely to be fixed only for that project and they are not necessarily problems that would be reproduced in future projects.

> Always the one problem that was fixed and then moved to the next project standard, then it's removed from the next project.
>
> *Original quote: "Ain se yks korjattu juttu, joka siirtys sit sin seuraavaan, projekti standardiin, ni se on sit taas pois siitä seuraavasta projektista."*

The proposed solution is to continue the handover of the new projects with enhanced official cooperation. A practical way to do this might be for support to invite a representative from development (or another function related to the issue) to attend the weekly meetings where recurring problems are discussed. This cannot work without making it official common policy, because otherwise project staff would feel it's taking resources away from ongoing projects.

> ...we often have situations where a new project is a huge burden. And I understand that if we go to talk to the project side, which has already handed it over to us, that they are already working on the next project, they don't have time to hold our hands or investigate the problems - - and it's not the project worker's job, because he has already been assigned to the next job.
>
> *Original quote: "...meillä on monta kertaa semmoisia tilanteita, että uusi projekti kuormittaa ihan hirveesti. Ja mä ymmärrän sen, että jos me mennään siitä puhumaan projektipuolelle, joka on jo luovuttanut sen meille, että he tekee sillon jo seuraavaa projektia niin, ei heillä ole aikaa siihen, että ne tulee pitään meitä kädestä kiinni tai tutkimaan niitä ongelmia - - - eikä se ole sillon sen projektityöntekijän homma, koska hänet on jo assignettu johonkin seuraavaan hommaan."*

Visiting the weekly meetings would at the same time be the way to share tacit information of support. In those meetings they are verbalizing the problem solving done and as mentioned in theory, this kind of debriefing between professionals is one of the few ways to share tacit information.

12.3 The official communication channel

The second major group of cases that emerged from the data was Software/WCS type cases and the distribution of information on these cases will continue, partly overlapping with the previous proposal. Support needs its own formal communication channel, as at the moment the flow of information is based on personal contacts. NCR in this context cannot deliver this task, it

requires a new introduction where the historical burden and the walls of frustration will be dissolved.

> But we should have some channel where we can put the information and from there it should give some feedback reaction, that okay now someone took care of this. We do have e-mail channels where we can throw it, but... [we don't know if anything will ever happen].
>
> *Original quote: "Mut meil pitäs olla joku kanava, mihin me voidaan tuupata se tieto ja siit pitäs tul joku oikeesti joku äksöni, et okei nyt joku otti tämän asian hoitaakseen. Meil on sähköpostikanavia kyllä, mihin me voidaan heittää niit, mut... [niistä ei tiedä tapahtuuko ikinä mitään]."*

One proposal might be the implementation of a technical solution in Cimo that would allow a ticket (=case) marked by a helpdesk officer to be sent to a selected person with a message. This would work for quick notification of software bugs (as well as mechanical or electrical design errors).

> At the moment we have groupchats if there's a customer that's making a lot of calls, which we've just got. And we usually try to set up a group chat, where there would be people from the project side and then us. And then we can always graft the information there.
>
> *Original quote: "Meil on tällä hetkellä sellasia grouppichatteja jos on semmonen asiakkuus, josta tulee hirveesti soittoja, mikä on meil just siirretty. Ja me yleens pyritään pykäämään semmonen ryhmächatti pystyyn, missä olis sitten niinku ne projektin puolen henkilöt ja sit me. Ja sit me saadaan ain oksentaa se tieto sinne."*

There are certainly many technical applications available to implement the channel. The form of the application is not the most important one, although it should be possible to minimize additional work and be perceived as functional. The key point would be that the channel should be official and mutually accepted and should include acknowledgement of further action taken on the matters forwarded to it.

12.4 Improving quality through usability

The high proportion of Operator Guidance cases is a major consideration for the team responsible for operator training in the company. The interviews

approached the issue from several different angles, both in terms of operator turnover and the usability of their own products.

> Well, it is (operator guidance). It was very big for one customer, the operator guidance, because they changed operators so often.
>
> *Original quote: "No se on (operator guidance). Se oli erittäin iso yhdellä asiakkaalle se operator guidance, koska heillä vaihtui niin usein ne operaattorit."*
>
> All the customers would realise that, keep those operators, and pay them a decent wage, so they do not keep changing all the time.
>
> *Original quote: "Kaikki asiakkaat tajuaisi sen, et pitäkää ne operaattorit ja maksakaa niille kunnon palkka, ettei ne vaihdu koko ajan."*

Operator turnover is a factor in the hands of the customer, but increasing the usability of your own product is in the hands of the company and a clear solution for this was presented.

> We must make the interfaces so that John Doe can use it.
>
> *Original quote: "Mein täytyy käyttöliittymät tehdä silleen, et Matti Meikäläinen osaa käyttää sitä."*
>
> We are a software company that does not directly make products for engineers, but we think a little bit like that. When we should be making products for basic operators.
>
> *Original quote: "Me ollaan softatalo, joka ei nyt ihan suoranaisesti tee tuotteita insinööreille, mut me ajatellaan vähä niin. Kun meidän pitäs tehdä tuotteita ihan perusoperaattoreille."*
>
> The people who come there to work with these devices do not necessarily have any degrees at all. Especially when we go to India, especially when we go to China, Mexico...
>
> *Original quote: "Ne ketä tulee sinne niitten laitteitten kanssa oleen tekemisissä, niil ei välttämättä oo yhtään mitään tutkintoa. Varsinkin kun me mennään Intiaan, varsinkin kun mennään Kiinaan, Meksikoon... "*

In an article by Pažek (2021), Sharma and Khatri criticize Western industry for its one-sided thinking, where "... just way to get turn a profit to apply it to the cost of production to reach the preferred sales price." In this development work, we need to free ourselves from this kind of thinking and see that quality

is equal to something that the consumer is willing to pay for in a product or service. (Pažek 2021, 31)

The functionality of the equipment for operators can be enhanced by investing in the usability of the HMI, that is, the user interface. This development will have a significant impact both in terms of product quality and in terms of savings through reduced operator guidance.

12.5 Topics for the PDCA process

The interviews revealed several development issues that were suitable to be handled by the PDCA model.

12.5.1 Clarifying the problem's initial data

One problem that emerged in the interviews was how difficult it is to get sufficient initial information from the client at the beginning of the case. The next example shows how the PDCA model could be used to improve the initial data for case processing (Table 2). Currently, the work instructions contain questions that the customer should theoretically seek answers to before contacting the helpdesk, but in practice this happens very rarely and much of the helpdesk officer's time in starting a case is spent defining the problem. Based on the research, a change is proposed to add a chatbot to the chat platform X at the beginning of the conversation, which would ask the starting questions even before the actual chat between the support officer and the customer starts. The pre-contact questionnaire described in section 3.1 could be used as a basis for formulating appropriate questions. It is considered feasible to implement this change and its effectiveness could be measured by several different indicators. One measure of impact could be obtained by comparing the resolution time before and after the pilot use of the chatbot.

PLAN *Identifying the problem* • *takes too long time to dig out an initial information about problem* *Identifying root causes* • *customers differ in how well they provide initial information about the problem* *Designing a pilot and data measuring* • *the chatbot collects the initial data of the problem* • *planning measuring, for example, the evolution of the solution time*	***DO*** • *Select the customers/channels to be used for the pilot* • *Appointing responsible persons* • *Using existing tools of chat platform X to build the chatbot* • *Record observations from customers and their experiences, collecting data about resolution times* • *What problems occur?*
CHECK • *Comparing solving time evolution, whether the solution affected the problem* • *Does the experimental setup need to be changed because of the problems encountered? How to change? Is there a need to continue the experiment?*	***ACT*** • *The change will not be implemented* • *OR The change will be implemented for all customers and channels* • *What guidance about the change needs to be provided to customers? To officers?* • *How is the effectiveness of the change assured? Continue to monitor the performance of indicators such as resolution time trends.* • *Agree on thorough documentation of the change and who is responsible for it; what to record and where to record it.*

Table 2. Example of using a PDCA cycle to solve a problem identified by Support.

> This chat platform X is a big actor in its field, and they have all sorts of plug-ins for AI and all these chatbots and stuff and you can add them on the management side.
>
> *Original quote: "Tää chatalusta X on iso toimija alallaan ja heillä on kaikennäköisiä plug-inejä tekoälyyn ja kaikkiin tämmösiin chattibotteihin ja muihin ja et sin pystyy tän hallintapuolel lisäämään."*

12.5.2 Problem with the tool

A big issue that came up in the interviews was the functionality of Cimo as a support tool. The experience was that Cimo is not designed for support and the interviews gave the feeling of painting a house with a watercolour brush. At the same time, it turned out that changes to Cimo are very cumbersome to implement.

> I don't like that Cimo because we have no control over it. Whenever we want to change something or do things in a way that makes sense for our operations, we have to make a request, and it will probably be rejected because it's not profitable.
>
> *Original quote: "Mä en tykkää tosta Cimosta sen takia, et meil ei oo mitään kontrollia siihen. Aina kun me halutaan siihen jotain muuttaa johonkin suuntaan, tai tehdä niitä asioita silleen, et ne olis meidän toiminnan kannalta järkeviä, niin meidän täytyy tehdä siitä request ja se todennäköisesti torpataan sen takia, ettei se ole kannattavaa."*

Based on the interviews, it can be concluded that there is a need for more extensive development cooperation between the company's digitalization team and support to provide support a tool that better fits their work. However, as changes are more likely to be successful when they are implemented in smaller packages, a start could be made by selecting one of the change needs identified in the interviews.

An example of a concrete need for change in this work is to increase the number of characters used to record the solution to a problem.

> The biggest stupidity in Cimo is that the maximum length of a case description is 4000 characters. Believe me, if it takes three days, after a day and a half the 4000 characters will be used up. And after that, the report has no meaning for the customer.
>
> *Original quote: "Suurin typeryys, mikä tuo Cimossa on se, et keissiraportin maksimipituus on 4000 merkkiä. Usko pois, et jos se keissi kestää kolme päivää, niin se on puolentoista päivän jälkeen se 4000 merkkiä käytetty. Ja sen jälkeen sil raportil ei oo enää asiakkaan kannalta minkäänlaista merkitystä."*

12.5.3 Transition to objects

With the current case categorization, it is difficult to identify and target accurately those relevant handled problems, so that they would be easy to catch and pass on. Information current categorization gives remains at a general level. The usefulness of categorization in relation to the work it produces also varied between offices. International offices used categorization, for example, to support invoicing. Further development of the categorization would considerably extend the benefits of its use.

In this study, there are two proposals for improvement. The first one is developing and refining the categorization of Cimo, and the second one is a transition to product-based categorization, allowing for more accurate targeting of problems and historical tracking. The support has a plan on the objects but could use some background support to take the reform forward.

The progress of this update has been slow because it is linked to a major change in the company. In this thesis, it is proposed that the targeting would be performed by filling in (to the case ticket) the product information, where the line, product, versions and possible component level information would be specified from the pull-down menu.

> What am I waiting for now, for the objects to become available. Every single device has an object in the simo and you can link a problem to that object. - - the customer has been promised that there will be a maintenance history and from there you can see what was last done to it and you can look at problems related to the robot. So I think that's something that would help us a lot - - to identify errors and target them better...
>
> *Original quote: ”Mitä mä nyt odotan, että tulisi ne objektit käyttöön. Elikkä joka ikisestä laitteesta on objekti simossa ja sä pystyt keissin liittämään siihen objektiin. - - - on luvattu asiakkaalle, että siellä on sitten huoltohistoria ja sieltä sä katsot, että mitä sinne on viimeksi tehty ja sä voit katsoa siihen robottiin liittyvät ongelmat. Niin se on mun mielestä semmonen, mikä auttaisi meitäkin paljon - - - mitäkin virheitä ja ne kohdentuisi paremmin…”*

The company's ongoing development work is talking about moving to Objects. Here, all information about the product, including maintenance history, is stored in a specific object. The challenge of development is probably the

fragmentation of work across functions, the flow of information on the progress of development and the people responsible. In the case of whole-organization development projects, the overlap between several simultaneous development projects is a challenge. In such cases, the timelines, prioritization, responsibilities and resourcing of development projects should be extremely well defined to ensure that they proceed as planned.

13 SUMMARY AND CONCLUSIONS

Based on the survey data, the three largest categories of cases handled by the Helpdesk were: start-up problems with new projects, software and warehouse control system problems, and operator guidance.

The aim of the study was to provide suggestions on how to improve the flow of information produced by Helpdesk. Based on the cases, the study suggests ways to improve the collaboration between Helpdesk and project teams during project handover. In practical terms, the study suggests visits by a representative of other functions to weekly support meetings where problems found are discussed. Based on the data, the flow of information was largely based on personal contacts and therefore a formal channel of communication should also be established. This channel should allow support to submit as simply and easily as possible information on bugs detected, faults found and fixed or recurring problems and it should also include an acknowledgement function when the submitted problem has been taken up or a correction to the standard has been made.

Solution suggestion for reducing operator guidance cases in helpdesk, was to improve the usability of the user interfaces. This can significantly improve the quality of the product and give a competitive advantage in the market. The study also considers this information to be essential for customer training and the development of user manuals. In addition to these, several other issues

emerged from the data, for which the PDCA model is proposed to be applied. As an example, the work presents the piloting of a new chatbot to help collect initial information for cases.

The data also strongly indicated the company's ERP tool usage and development needs from a Support perspective. The study finds that Support's work is tied to the limitations of the tool, and improving functionality requires more effective collaboration between the digitalization team and Support. It is proposed to start this work in small steps and as a first area for reform, the study proposes to increase the character limit in the description section of case reports, so that the progress of even the most complex cases can be recorded in the report.

The study found that better targeting of identified problems and the search for information to solve new problems would require adding product information, such as which line, product, version or possible component is in question, to the case record from the pull-down menu. It appeared that the company is in the process of reengineering the implementation of new objects to meet this need. However, the progress of the reform seemed to be slow, and the study found that at least the flow of information on the progress of the reform has not reached the whole company. The study was partially successful in its aim to identify and examine the information produced by the Helpdesk. However, a function such as Objects will be needed to identify and target information at a more detailed level. As for the research question where the Helpdesk records and where it looks for information to solve cases, comprehensive answers were found, such as in old case records, logs of chat platform X, confluence data phase, project documents and support's own know-how.

Finally, the study concludes that the Helpdesk generates critical information for the company on where to focus the company's quality improvement activity. According to the study, the Helpdesk has a strong sense of community and is a commune of talents, harboring not only mutual loyalty but also the company's core know-how and collective skills, the value of which the student hopes will be not only recognized but also appreciated by the company.

AFTERWORD

The year 2024 ends on a positive note for me. I have arrived at the crossroads where the process of producing this thesis has helped to bring me. Next, a new engineer will be born. Reflecting on this journey and its outcome, I realize that the change has not erased the humanist in me. This thesis stands as evidence of a metamorphosis, resulting in a humanist-engineer stepping into the professional world with curious eyes.

Unbeknownst to me, the foundations for my thesis had already been laid in early 2024 when Cimcorp's QHSE and Support were planning a joint project as part of the company's larger development projects. This collaboration was the strong undercurrent that ensured the smooth progress of my process. The most important practical factor in the success of the work was the open and participative attitude of the HelpDesk staff, supported by Support management. So at this point I would like to express my warmest thanks to the management of Cimcorp Support, to my supervisor in the company, and to my supervisor on behalf of Satakunta University of Applied Sciences. You made my learning experience smooth and interesting.

One of the challenges and key learning experiences for me in this project was as simple as the language I used. Since the commissioning company’s in-house language was English, the thesis naturally had to be produced in English. I am, however, grateful for stepping out of my comfort zone, as this process gave me greater confidence and extensive practice in using English, which will be an advantage as I begin my new career in industry.

Understanding the matrices of the research material required highly specialized expertise, which presented a clear challenge and potential pitfall in the project. Thanks to the risk assessment demanded by my supervisor at the outset of the process, this risk was identified early and managed through the interplay between the matrices and the research interviews. This interplay

ultimately allowed the research material to form into a cohesive whole, of which I am quite proud.

Compiling the theoretical framework was a challenge for me, and this is partially reflected in the clarity of its presentation. However, the effort paid off when, during the analysis phase, the theory and the material in my mind seemed to spontaneously start “conversing” with each other, allowing me to write the results as a free-flowing narrative.

A significant portion of the factors contributing to the success of this work remains invisible in the final thesis. From my perspective, the work consisted of distinct phases: studying and deconstructing the HelpDesk’s process diagrams, conducting a qualitative and statistical analysis of the matrices printed from the company’s ERP system (Cimo), producing and studying the theoretical section, scheduling and conducting interviews, and finally analyzing and reporting the material in relation to the theory. Both the study of the HelpDesk case process and the analysis of the matrices required significantly more time than the amount of text these sections produced in the final work might suggest. However, these phases greatly expanded my understanding and skills regarding the HelpDesk's work, laying the foundation for my interactions with employees during the research interviews, and thereby contributing to the success of the interviews.

In my view, the project was successful in terms of both the schedule and overall outcome. I am pleased with the cohesive whole formed by the research material and the interaction that emerged between the material and the theory. I have gained a great deal of knowledge, both regarding the HelpDesk’s field of work and from the theoretical perspective on tacit knowledge and continuous improvement models. Even as I write this text, the insights gained have already served as practical tools in job interviews. My thesis has thus not only provided me with practical intellectual capital as I begin my new career in industry but has, I believe, also contributed as a small piece of the commissioning company’s development processes.

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APPENDIX 1: QUESTIONS FOR INTERVIEWS

Are you OK with the interview being recorded? Selected parts of the recordings are transcribed and then destroyed.

1. Can you tell about your work history?
2. Tell about working hours and rhythm as a helpdesk duty officer.

3. Describe the contacts. How widely do customers provide background information on cases, how well the background information is following the guidelines of Cimcorp?

4. Describe by your own words the process of Problem handling
5. How would you correct a student's process table based on the Cimo instructions?
6. **From where is support checking/searching information about earlier cases while they are debugging and investigating problems?** (from descriptions of earlier cases or from knowledge base… or?)
7. During you have the case in hand, in what situations, how often and how do you deal with other functions?
8. **What is the most important information that should at least flow to other functions in your opinion?**
9. If you had to decide on a single instance to which information on cases you selected would automatically be sent, to whom would you open this channel?

10. Tell about categorization (and subcategories) of cases (is it easy to use, does it work functionally, or would it need some improvements…? How would you improve it?)
11. Based on your experience, what is the most common main category of the cases that come to the helpdesk? (What kind of part PLC-questions are playing in the cases?) Do you rotate cases within the team by area of expertise? How do you handle cases together?

12. Describe the documentation to Cimo (Is it smooth and easy to use?). If you could easily make changes to it, what would you improve?
13. Describe what kind of information support will fill in the process point “Filling Lessons Learned” and how: Are they doing some kind Article to the knowledge base or filling NCR?
14. What information is sent to sales, service and parts when you close a case, and how often does this happen? Do you send information outside your own department, for example to R&D Software functions?

15. How do you feel about your job: What is the best thing about your job?
16. How often do you find your work stressful?

17. If you had the authority to change one thing about your job, what would it be?