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Improvement proposals for speeding up customer delivery projects

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Abstract

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The aim of this research was to identify improvement proposals for speeding up delivery projects. Customer of the research is Company X which is developing healthcare patient info system software product. When new versions are released, the roll-out to the field is taken care by delivery projects. Focus on this research is in these delivery projects.

Research was conducted by using qualitative research methods. Research data was collected via Company X personnel theme interviews. Collected data was processed in brainstorming sessions together with Deployment RTM. Further data refinement contained categorizing all 457 items by formulating first classes for data and then themes and subthemes. In final categorization there were six classes, 13 themes and 44 subthemes.

First key finding was realizing that there cannot be identified one single reason for slow speed of delivery projects. Instead, there are multiple reasons and root causes. Second major finding was comprehension of several implemented improvements before this research started and during it: Company X is following continuous improvement ideology. Thirdly it became clear that there were positive signals from certain theme perspective but also improvement needs within same theme. Process aspect was one theme which had both well-functioning elements but also elements requiring improvement.

As an outcome of this research a set of improvement proposals were given in prioritized order.

Keywords: Delivery project

Contents

1	Introduction	1
1.1	General	1
1.2	Background of problem	1
1.3	Objectives	3
1.4	Stakeholders	4
2	Methods	6
2.1	Data collection methods	6
2.1.1	Selected data collections methods	6
2.1.2	Theory studies: Database search	6
2.1.3	Theme interviews	9
2.1.4	Interview data collection	15
2.1.5	Brainstorming	17
2.1.6	Benchmark case	18
2.2	Data analysis methods	20
2.2.1	Selected data analysis methods	20
2.2.2	Data analysis tools	21
2.2.3	Data analysis and implementation of it	22
3	Current state	28
3.1	Delivery project process in nutshell in Company X	28
3.2	Company X internal	29
3.2.1	Why Waterfall?	29
3.2.2	Scrumwaterban – deployment teams	30
3.2.3	Amount of different versions in production	31
3.2.4	Schedule collisions	31
3.2.5	From manual installation to automation	32
3.3	Customer related activities	33
3.3.1	Sales and budgeting	33
3.3.2	Resourcing – several counterparts and stakeholders	33
3.3.3	Training	33
3.3.4	Testing	34
3.3.5	What about nightly automated deliveries?	35
3.4	Improvements done within past few years	35

3.4.1	Organizational changes	35
3.4.2	Process improvements	36
3.4.3	Technical improvements	37
3.4.4	Summary of current state	37
4	Results	38
4.1	Introduction to results	38
4.2	Functioning well	41
4.3	Already improved proposals but not known	43
4.4	Proposals under improvement	45
4.5	Yet to be improved	47
4.6	Rejected proposals	49
4.7	Not applicable proposals	51
5	Summary	54
5.1	Executive summary	54
5.2	Conclusions	56
5.3	Discussion	59
5.3.1	Researcher's lessons learnt	59
5.3.2	Research closure	61
	References	62
	Appendix	64
	Theme interview questions	64

1 Introduction

1.1 General

Speed is an everyday life factor for a human being; things must happen as fast as possible. We want to get from A to B fast what comes to travelling, grocery shopping, feedback loop for software developer's code or project execution. At home children want their meal to the table now, not after half an hour. In office life when a deadline for a task is being asked, the answer is not "5 days from now" but "today or rather yesterday".

In some businesses the speed is expected but there are factors which are more important than speed: As an example, in healthcare sector patient safety is always number one. But will faster lead-time automatically mean compromising on any other factor? Pessimists tend to use the example of one Finnish movie where lead character is in army and superior is demanding faster written reports. He ends up typing faster, but the result is a report full of spelling mistakes. In real life same mistakes could happen but more speed is not necessarily same as lower quality, less content and endangering patient safety. There should always be room for continuous improvement and improvement activities can directly or indirectly impact on execution speed. Other factors should not be used as excuses for faster speed.

1.2 Background of problem

Research covered in this thesis is conducted for a company having a product for health and social sector. Company is referred in the thesis as Company X. Product of Company X is constantly improved based on national requirements and market needs. Customers get new versions of the product via delivery projects.

In the Company X software development is following agile methodologies, adopting relevant parts of Scaled Agile Framework (SAFe). SAFe is Agile framework for enterprises [1]. Big releases with new products, features and bug fixes are published on yearly basis. On top of yearly releases there are three type of maintenance releases which are published based on need.

Customer deliveries for the software (SW) releases are conducted by following the Waterfall model in delivery projects. Delivering a big SW release to customer has taken in worst case around a year. Fastest delivery's duration has been four calendar months. Smaller maintenance releases' delivery projects are faster but still customers are not getting the latest software fast enough.

Customers are in production in various version baselines which causes overhead to SW maintenance. Part of the releases most of the customers will never get. As the delivery projects are requiring lots of efforts from customer and all subproducts of the main product is not used by all customers, part of the customers don't want all the releases even the SW is not tailored to customers.

From development and more from whole organization point of view slow deliveries are causing waste as releases are delivered to the shelf, the feedback loop is long as the lead-time in getting the release to the field and production is long, lost money as there are unnecessary incidents reported to already fixed bugs and new products sales is not realizing. As smaller maintenance releases are faster to deliver to customer environments, in critical bug case SW development is forced to prepare fix to several branches. Additionally, there is confusion between organization units as the delay from release to delivery is long.

The purpose of this thesis is to find out ways to speed up the customer delivery projects without reducing scope, content, quality, or customer satisfaction. By

speeding up the deliveries customers will have better possibilities for taking the latest available software in use. Latest software is always having the new products and features, which bring value to the daily duties customer's employees have. For SW development the maintenance work amount will decrease if there are less amount of SW versions used in production. From Company X perspective the less maintenance work means more capacity for new development work and less lost money for maintaining various SW code branches. The focus on thesis is to find out a set of improvement ideas with their prioritization and possibly roadmap.

1.3 Objectives

Goal of the research is to create a proposal of ways to speed up the customer delivery projects without reducing scope, content, quality, or customer satisfaction in subunit of Company X dedicated to healthcare patient info system implementation and deliveries. Current state analysis is included shortly but the main focus on thesis is the future: improvement proposals for further actions to speed up delivery project.

Research excludes the implementation phase of improvements and impact analysis of them. Exclusion is done to narrow down the scope and length of the research to fit in timelines for thesis readiness. Along the current state analysis, the thesis includes short analysis of already implemented improvement actions. General project management theory including the methodologies (Agile, Waterfall) are excluded from the thesis as those don't bring additional value for the Company X.

The main research question is:

How to speed up customer delivery projects without reducing scope, content, or quality?

The supportive research questions are:

1. How to reduce time required for customer testing phase?
2. How to reduce time required for end user training?
3. How to increase deployment teams' autonomy to speed up project deliveries?
4. How to increase deployment quality to ensure the project schedule or speed it up?

1.4 Stakeholders

Company X is a corporation having several independent units. Topic of this thesis is involving sub-unit of one of these units. Organization structure as such is not described in detail as it is not under focus of the thesis.

Main stakeholders are directly impacted roles of the problem and thesis in Company X. Other stakeholders have indirect or direct linkage to the delivery projects and who could gain of the faster deliveries.

Main stakeholders are

- Head of operations
- Deployment Release Train Manager
- Project Managers
- Deployment teams.

Other stakeholders are

- Customers
- Product Management
- Continuous Service Managers
- Customer service function
- Sales Managers
- Release Manager
- Solution Program Managers
- Release Train Managers
- SW development teams.

2 Methods

Research was planned to consist of four phases: Theory studies, theme interviews, brainstorming session and comparing to benchmark case.

2.1 Data collection methods

2.1.1 Selected data collections methods

Data was collected in two ways for the different research phases:

- Conducting database search: reading the found sources and references through to get the theory base for thesis. Additionally possible benchmark case is included to database search.
- Conducting theme interview for certain process roles and stakeholders. Brainstorming is conducted based on the interview results.

2.1.2 Theory studies: Database search

With theory studies the aim was to find out if there is any existing literature covering the delivery project's lead-time, examples of eliminating waste and ways to speed up. Literature sources were searched from databases with certain keywords. Databases searched are listed in Table 1.

Table 1. Databases searched for theory references.

Source	Purpose
Finna.fi	From Finna.fi was searched out any Finnish case example to benchmark for the problem
Ebook Central	From Ebook Central was searched international books or studies which deal with Agile SW development and Waterfall customer delivery.
MetCat Finna	From MetCat Finna was searched any books or eBooks which are covering the Agile SW development and Waterfall customer delivery. Additionally general customer delivery project material was searched from MetCat Finna.
Theseus	From Theseus was searched any thesis done on same or related subject. The thesis could have been from completely different field i.e., not even SW delivery project. Project management is universal so there could have been some hints for project management process or to customer related activities. Weight of this search is not the highest.
Google	From Google and Google Scholar was searched any benchmark cases for the thesis subject. Benchmark case could have been from any field of business or even government case. Any related case where there are two different models used hand in hand would have been useful. Most preferable would have been a SW development case where like in Company X the SW is developed with Agile methodologies, SW deliveries to customers are in Waterfall model and number of customers is big.

	<p>Second purpose was to find official reference for most common ways to speed up projects no matter what type the project is and why most obvious ways to speed up (adding resources, reducing quality or scope, overtime working, etc.) are not always the solution for the actual root cause(s).</p> <p>Reliability of the Google search is questionable, but it could have given some direction for thoughts and perspective for actions.</p>
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Keywords used for search were the same for all databases:

- Speeding up project
- Speeding up project delivery
- Speeding up delivery project
- Customer delivery projects
- Customer delivery projects speeding up
- Agile vs Waterfall
- Agile versus Waterfall
- Waterfall delivery project
- Waterfall customer delivery project

As a result of the database search was found several books, couple of articles and seven different degree level thesis works which were based on title and summary at least somewhat matching with the research topic.

Thesis works were browsed through. As a result, seems that there has not been done research on exactly same topic and hence there was none 100% valuable

source found from the research perspective. Some studies have been made nearby the research topic, but they were still too far from context and didn't bring too much value add for this research. In the end one thesis work was selected and it has been referred to in the benchmark category.

There are numerous books of project management as well as from Waterfall and Agile theory. The research topic is not about universal project management or the combination of methodologies in software development. Due this fact the books were rejected as sources and research was decided to be based on the interview data and analysis of it.

2.1.3 Theme interviews

Via interviewing the selected stakeholders, the goal was to find out views and ideas stakeholders have for the research topic. Selected interview method is theme interview. Theme interview suits best from the research goal perspective.

Theme interview is a method for collecting qualitative data. Idea in short is to find out what someone is thinking of some topic. Even though it is called theme interview, the purpose is to have more discussion type of interview where the predefined themes with their questions are supportive and not necessarily to be followed in certain order. Questions are typically not defined in exact question mode, but it is good to have some list of possible topics to be asked in case in the interview the interviewee is not so outspoken, and the answers must be winkled out. In theme interview the themes and questions are for interviewer's help and can be for example in mind map format. In other words, the theme interview doesn't require formal written official-looking interview form. [2]

Most common way to form themes is intuition based. Another way is to use existing literature as a reference for the themes or how they have been formed in other research. A safe way to start the interview is to have easy theme and

questions in the beginning. This will relax the interviewee and pave the path for more challenging questions. It is also good to get themes and questions reviewed with colleague or other relevant person to get second opinion on the chosen themes. A rehearsal interview is one way to ensure the themes and their questions will work in actual interview session. Rehearsal interview also helps in planning realistic schedule for the actual interviews. Some people are more talkative than others, also some theme might be more interesting to one than to another due which the time may run out of covering all the themes in case there is not a preplanned schedule of each theme's duration. [2]

After all the interviews are held the researcher may face depression which is normal. Lots of time has been invested to the interviews and once they are over, there may come feeling of emptiness "was that that" as well as uncertainty "is there enough data". The researcher just must trust that there is enough data and most probably more than enough. The next step is transcribing the interviews to written mode. This is the most laborious phase as transcribing one hour of interview record can take even one working day. Before starting the transcribing, the researcher should have decided data analysis method: it will define in which level the interviews are transcribed. I.e., are the answers written down including all the noises the interviewee made (yawning, coughing, etc.) or is it enough to transcribe only everything the interviewee said. The best way is to do the transcribing quite soon after the interview when everything is in fresh memory. A good guideline is to conduct interview with transcribing in a day or two rather than five interviews in a day. [2]

For this research, the theme and question selections were done based on the earlier identified lengthy phases of delivery projects. Positive aspect was added to gain the knowledge of which topics or practices the interviewees value the most and which should not be changed as per interviewees view. Free speech

section was included to ensure the interviewees have possibility to tell all unless some issue was not mentioned under some specific question.

The first review for themes and questions was done as part of an assignment in the Research methods and skills course. After one interview rehearsal round the themes were kept unchanged but some questions were reiterated. Final theme interview template with themes and questions is in appendix 1. The question set was planned to be kept same for all interviewees by default against the theme interview theory. In literature is stated that instead of predefined exact questions there should be question skeleton for each theme [3, p. 66].

The aim was to get as many views as possible from the selected roles to the themes. It was decided that questions will not be blocked by assuming that certain role representative can't answer certain area's questions even it was known that some of the questions are not the key competence of all the roles taking part of the interviews. Instead, it was told to each interviewee "The questions are same, but you can say if the topic is not relevant for you". In this way the potential information the interviewee has despite of his/her role, would be recorded. A risk of making interviewee feel awkward was identified though: What if there are too many questions to which some interviewee can't answer, will s/he feel like s/he is not a professional and would then not find answers even to questions which are his/her own area? To eliminate this kind of situation and give assurance to the interviewee it was repeated couple of times with different words "You can freely say if some question is not your area of expertise, and we can then skip it."

Along the interviews some questions were skipped even though they were all planned to be covered. Reasons for skipping were:

- Interview slot's time limitation: in some cases, towards the end of the reserved slot somewhat much time was spent already to certain themes and some important ones were still uncovered. Prioritization was done on the fly.
- Question was covered already in answers to some other question so there was no point to ask the same again as it would have given impression "interviewer has not been listening to me". If there was a hunch of some potential answers not yet given, then it was just asked "do you want to add something to this even though you already mentioned about it earlier".
- The question felt unnecessary i.e., the question shouldn't have been there in first place and could have been eliminated if there had been several rehearsal interviews. These feelings realized towards the last interviews: it is also possible that researcher got too used to the question and the question itself was still valid even though researcher had asked it already several times.

It was noticed that starting with the positive aspect was maybe not the best choice. Thinking of what good topics there are and what has already been improved is good basis for listing down the weaknesses and areas to improve. But in reality, the first question was in almost all interviews the hardest and feedback given was "why did you start with difficult question". The warmup questions should have been something else. What may have impacted to the reaction could be the pre-information given to the interviewees: Only the research title was told, not the questions. Most likely the interviewees prepared themselves with the list of improvement ideas but didn't think of positive aspect of what is working well beforehand. If the interviews would start now from the

scratch, the pre-information given would include both what is working well and what would one improve.

The interviewees selected were representatives of key stakeholders of the research problem. At same time interviewees selected are representatives of delivery projects' main contributor areas. One interviewee out from direct project main contributors was selected due the interviewee's fresh special role in one pilot project. By interviewing this role, the expectation was to get somewhat outsider's view to the research topic. Other roles are in the core of the delivery projects even though they have each some or many areas of delivery projects in their scope. The interviewee roles and dates of interviews are defined in the Table 2.

The number of interviewees was one of the concerns during the research planning phase. Sirkka Hirsjärvi and Helena Hurme have stated in their book *Research interview: Theory and practice of theme interview* that the answer to correct amount of interviewees is "interview as many persons as is necessary to collect the necessary information". [3, p. 58]

Table 2. Theme interview schedule and participant roles.

Role	Date	Notes
Deployment RTM	27.09.2021	1 st interview
Deployment RTM	18.02.2022	2 nd interview
Deployment SCM	21.02.2022	
Deployment Project Manager	25.02.2022	
Deployment specialist	24.02.2022	
Development Test Manager	18.03.2022	Not direct main contributor in deliveries, selected as an observer

During initial planning phase there was idea of interviewing two additional roles

- Head of Product operations
- Tech lead from independent product deployment teams.

These two roles were excluded during plan reiteration rounds due lack of time. Latter one might have brought additional viewpoints to the research topic, but the final set of interviewees and their roles is already good coverage for the thesis.

Theme interviews for smaller number of interviewees can be implemented as individual or group interviews. [3, p. 61] Individual interviews were selected for this research as it required less time from the participants. In group interviews the time reservation would have been hours, maybe more than four hours. With individual interviews only a bit over one hour was required from most of the interviewees including agreeing schedule and actual interview. Some interviewees told that they had prepared themselves for the interview so safe assumption is to conclude maximum two-hour reservation per interviewee. With group interview approach minimum would have been with same logic five hours. Group interviews would have also blocked some of the answers as everyone might not have told their opinion. On the other hand, group interviews could have been more conversational and possibly also educative as the information gaps would have been filled during the interview session. After all the biggest challenge for the group interview would have been finding a suitable timeslot for all participants.

Interviews were held via Teams session with audio connection without video. Video was not needed as the researcher and interviewees were all more or less familiar to each other. Teams with audio only is also typical way of working in the Company X in this division so adhering the same for research purpose was

the most natural approach. Adding video might have caused additional stress. Face to face interviews were not possible as all the participants live in various parts of Finland and travelling would have meant extra financial and environmental cost for the Company X. Both aspects are important for researcher personally due which the face-to-face meeting option was not even on thoughts at any point of the planning phase.

Interviews were confidential; this promise was given to each interviewee. In this way the open atmosphere and free speech during the interviews was ensured. It was told that results will be gone through with certain group of people but even then, the names would not be revealed. In case additional information would be needed from any of the interviewee, it would be asked separately by the interviewer. As the research topic is touching everyday office life, it was also be told to the interviewees "This is your chance to impact and tell your opinions as well as observations".

As a conclusion the interview phase went smoothly. All employees planned to be interviewed for the certain roles agreed to be part of the research. During the interview session the interviewees were sharing their thoughts and were open-minded. The amount of data gathered was good from analysis and further processing. Time reserved for the interviews was mostly one hour. For part of the interviews 15 minutes more would have been good addition. With one interviewee couple of hours was spent which was an exception.

2.1.4 Interview data collection

Interview data can be either transcribed to text format or parts of the audio files can be used directly in the research. [3, p. 138] The latter option would have been time consuming, causing huge amount of work and would not have been

useful in brainstorming phase. Hence the transcription was chosen for data collection.

Each interview was recorded separately as a Word document and as an audio file. Word document was not shared with interviewee. Audio file was not shared separately either but was available for interviewee in Teams for certain period. The raw data is only in the possession of the researcher. In further phases of data analysis ie. during the brainstorming phase the modified data and data summary was used.

The word document was a theme interview template which had a separate copy for each interview. During the interview, the researched added as much notes as possible to the document and rest was filled during the transcribing phase. The answers were recorded in a way they didn't include for example the filler words or repetitions.

Summary from individual Word-files was collected to an Excel file. Snapshot of Excel template for answer collection is in Figure 1.

Excel file had a sheet "RawData" in which there are

- Rows
 - Each theme in first row
 - Each question under the theme on second row
- Columns
 - Initials of interviewee in first column
 - All the answers were added to the rows of each question column: there can be one to many rows per interviewee per question depending how many topics the interviewee was raising up
 - N/A if the question was not covered or answered

- Reason for “no answer” was not recorded as it was not reasonable to ask “why you don’t want to answer”

Interviewee / Question	Warm-up			Processes & Tools	
	What is working well right now	What has already been improved	Do you feel the long duration of projects is related to one issue only or are there several?	Is the waterfall model in delivery projects an issue	Could the c to Agile wo

Figure 1. Excel template for collecting answers.

After all the data was collected to RawData sheet a copy of it was taken and named as “ModifiedData”. In this sheet the data was altered so that the names of the interviewees were removed and text in each cell was modified so that it was still understandable as an independent sentence.

2.1.5 Brainstorming

With brainstorming session, the aim was to validate and analyse the theme interview results and include possible additional improvement areas for the research topic. This phase was seen important and needed to eliminate one-sided view only in the result analysis. Brainstorming participants were Deployment RTM and thesis author. Brainstorming was held in two separate sessions. There was heavy amount of data due which with one single session there was a risk of managing the last data loosely without enough concentration.

During the brainstorming phase each thought, and idea raised in the interviews was gone through by validating them. It was concluded case-by-case which proposal has already been taken into action, which are currently under improvement, which should be considered for future improvement items, and which need to be rejected. Additionally, it was considered is there something new what could be developed based on the interviewees' inputs.

For the brainstorming session a mind map was created based on the "ModifiedData" sheet from Excel. The interviewees were not exposed i.e., the data was including only answers, not the identity of interviewee. From presentation perspective mind map seemed most useful. In Excel format the visualization is less adequate even though Excel is the best tool for managing and filtering data.

For each theme interview question there was separate mind map canvas. As the number of given answers per question varied, the size of the mind maps varied too. Part of the mind maps were particularly useful whereas part of them did not even fit to the screen anymore in one single shot. When fit to the screen the font was already so small that it would have required magnifier's magnifier for reading purposes. Splitting of certain mind maps to several ones could have been answer but then the focus would have been lost.

After brainstorming phase was completed the data was transferred back to Excel for further categorizing and analysis.

2.1.6 Benchmark case

With database search additional goal was to find example company or companies which have had similar delivery project length problem and how they have solved it. Purpose was to compare the benchmark case to Company X

and figure out if there are any similarities or any improvements done which could be adopted by tailoring them.

It was decided in the beginning of the research that if benchmark case is not found, then this phase will be removed from the thesis scope.

With similar title but from different industry and for a much smaller company has been authored thesis in Satakunta university of applied science by Tero Viertola. [4].

Research for Viertola's thesis "*Activation and speeding up the machines delivery in a small and medium sized firm*" has been conducted in same way than in this thesis i.e., by interviewing company employees for figuring out the areas for improvement. [4, p. 7]. Viertola's thesis is written in a handbook kind of format. There is short section of additional improvement proposals at the end of thesis. In other words, the research results are not separated in the thesis. It is an interesting viewpoint, which could have been used in this research also if the results would have been available only for the Company X purposes and not for a public thesis. Although the approach would have been possible Company X internally only if there would not be need for any additional work in the form of planning and implementing the changes.

Part of the improved practices in Viertola's thesis can be transformed to universal project management. Viertola is stating for example that sales phase requires information from customer [4, p. 9], delivery contract is made [4, p. 10], project kick-off and ending meetings are held [4, p. 12], importance of specification phase [4, p. 13-15], updating project schedule based on specification [4, p. 17], competence of project personnel [4, p 22] and defining responsible persons for reclamations and maintenance phase [4, p 32, p. 34]. All of these are universal project management or general work arrangement and

management. Very valid topics but not the actual problems in the Company X. Of course, nothing is ever perfect but the focus in this research for Company X is not in same topics as in Viertola's thesis. In this research is tried to find out reasons for project duration via its' phases instead of focusing on actual project management process itself.

As conclusion the thesis is not useful as benchmark for this research due the issues in Viertola's research and this research are different. The field of business is completely different: company in Viertola's case is manufacturing physical devices and SW developing company in this research. Nature of the problems or improvement proposals cannot be generalized or compared to each other. Viertola is stating for example that the surroundings and machine itself must be cleaned after each use to intensify and speed up the work [4, p 19]. For a SW development company this is not a valid scenario.

2.2 Data analysis methods

2.2.1 Selected data analysis methods

Chosen data analysis methods are qualitative analysis and thematic analysis. Qualitative analysis' purpose is to increase knowledge of a topic from people perspective at certain time [5, p. 4-6] [6, p. 172] [7]. Hence qualitative approach is more than valid for this thesis where the interviews are conducted to get the insight to separate roles and stakeholders' views, experiences, and opinions. A layperson might say that opinions do not sound a good basis for professional improvement. Qualitative analysis with inductive approach has been questioned in literature too by saying that new theory can't be formed based on observations [8, p. 80]. Literature states though that the observations are not accepted as such but are reviewed critically against the available pre-information [9, p. 142] From layperson perspective people's experiences can

reveal weaknesses in processes or methods. In case several similar opinions occur, then those most likely are not made out of the blue. Theories support layperson thoughts: collected data is split to pieces for making synthesis and then gathered again for making conclusions [9, p. 142].

As per literature there is no explicit instructions for conducting qualitative analysis and there are very few standardized methods for it [9, p. 141]. It has been stated that qualitative researches are acting like detectives, but on the other hand qualitative research is almost a form of art [9, p. 4]. Having more researcher's freedom and less tight rules for conducting the analysis phase was more than welcome.

Thematic analysis' purpose is to find out categories for research data [10] [11]. In other words, thematic analysis aims to finding patterns from the data which lead to unifying themes [5, p.213]. Categorization is the most critical phase of data analysis. Hence defining themes is time consuming phase as finding out the similarities from data units and classifying them needs to be done carefully. [9, p. 149] This sub-analysis method of qualitative analysis is the best suitable for the thesis topic. Via interview sessions is tried to find out common nominators and pain points. It will help also in planning and implementing the improvement activities.

2.2.2 Data analysis tools

Initially tools for analysis were thought to be either Excel or Power Point and some mind map tool. Atlas.ti was one option too but based on the first view via the introduction video it would be more suitable as first trial for questionnaires having different pre-defined answering options and them having some free text options. Along the second trial of Atlas.ti usage it was found out that tool would cause more work than give actual value for the thesis. Main reason for

conclusion was the needed amount of learning hours. Hence Atlas.ti was removed from tool list and the familiar known tools were kept.

Table 3. Summary of tools used in research.

Tool	Usage
Word	Theme interview plan
	Theme interview questions
	Theme interview results of individual interviews
Excel	Raw data from each interview
	Modified data before moving to Xmind
	Modified data from Xmind
Xmind	Visualization of data for brainstorming sessions

Summary of used tools with their purpose is presented in Table 3. Excel is the selected main tool. The interview specific data is in Word format: there is separate Word document for each interviewee. Third tool used is Xmind for brainstorming session purposes. Two mindmap tools were studied and Xmind was seen more suitable.

2.2.3 Data analysis and implementation of it

Original thought was to collect in Excel under each question the full sentences which interviewees had told. The next phase would have been figuring out categories and sub-categories based on the answers.

After having half of the planned interviews held and data in the Excel file, doubts were raising whether it is reasonable to proceed as planned. During the interviews, the interviewees don't know which questions are yet to come and hence they may tell many questions' contents under one question. Interviewer

let them do that to keep the open spirit during the interview. Also, the nature of theme interviews allows free flow, hence the structured organizing of answers may not be possible: what if some question does not get many answers or no answers at all? Would it be a problem from research perspective? Would it be a problem from data collection and analysis perspective? After some thinking it was concluded that these are not problems: if some topic gains very few answers or none of them, then that's how it is. Either the question in concern is not a problem or the interviewees don't have knowledge of it. On the other hand, it would be unnatural or like winning in lottery if each question would have same amount of answers under it.

Another option under thought was just to collect all the answers no matter what the question was and then figuring out the categories for them. In this case the context of each answer was not possible to be figured out based on the answer. To keep structure and system in place for the data, this option was eliminated quite fast as the end result was thought to be lengthy list of items without any context. Thinking afterwards this might have been better option or should have been implemented in parallel with the first option despite of required extra effort.

First option was selected as final for the data analysis in a way where all answers under their original question were in sheet named as RawData. From this sheet only the filling words and some used dialect was modified or removed.

After all answers were collected to the "RawData" sheet a copy of it was taken. In the new sheet called "ModifiedData" the data was altered so that the detailed answers existed, but the interviewee is not revealed. Almost all of the answers needed to be modified to get the context clear for further analysis. Spoken text is not self-revealing when put to the paper. The answers were formatted so that they were either full understandable sentences or otherwise self-evident

statements: Possible filling was done to get the context even if one particular cell was taken under consideration as an isolated item. This action was necessary to be able to continue in mindmap tool. It was also needed due to fact that the other analysis participants haven't seen or heard the actual interview: the purpose is to engage them to the analysis not to alienate them via "insider secrets" where they don't get the context and will be demotivated.

Next phase was continuing with mind map tool in brainstorming session with Deployment RTM even the initial planning also included another role to be involved. As the time slot was challenging to be arranged, it was mutually agreed that RTM is enough for brainstorming. Brainstorming sessions were arranged via Teams meeting having only audio connection.

Estimated duration of the brainstorming session varied along the way. First it was thought to be one to two working days. Then one to two hours. Reason for estimation variation was the daily normal work: The improvement needs, and ideas are being discussed almost on daily basis as those are part of the responsibilities of the brainstorming session participants. The other reason for variation was efficiency: the thought was "If we are efficient, we can do this in two hours". To get started 2,5 hours session was reserved and it was thought to be enough. Going through the results and having discussion of them took time so only one-third was covered in 2,5 hours due which a second session was needed. Most likely one working day would have been spent if we had been meeting face to face. Selected splitting of sessions ensured full focus and eliminated the possibility losing concentration towards the end of lengthy session.

In the first meeting the Word template of theme interviews was shown as well as the Excel file with the formatted answers via "ModifiedData" sheet. This was done to illustrate where the items have come from to the mind map and to show

the variance of answers: in some topics there were lots of rows for certain question or from certain interviewee whereas in some the answer part was almost empty.

Mind map file included 14 different sheets. Example of one of them is in in Figure 2. Aim was to have one sheet per interview question. It was more reasonable to club some questions together as the answers were pointing to something else than the original question. Or there was already similar category under some other question and it would have made the analysis more complex if the same category in different context was in more than one mind map.

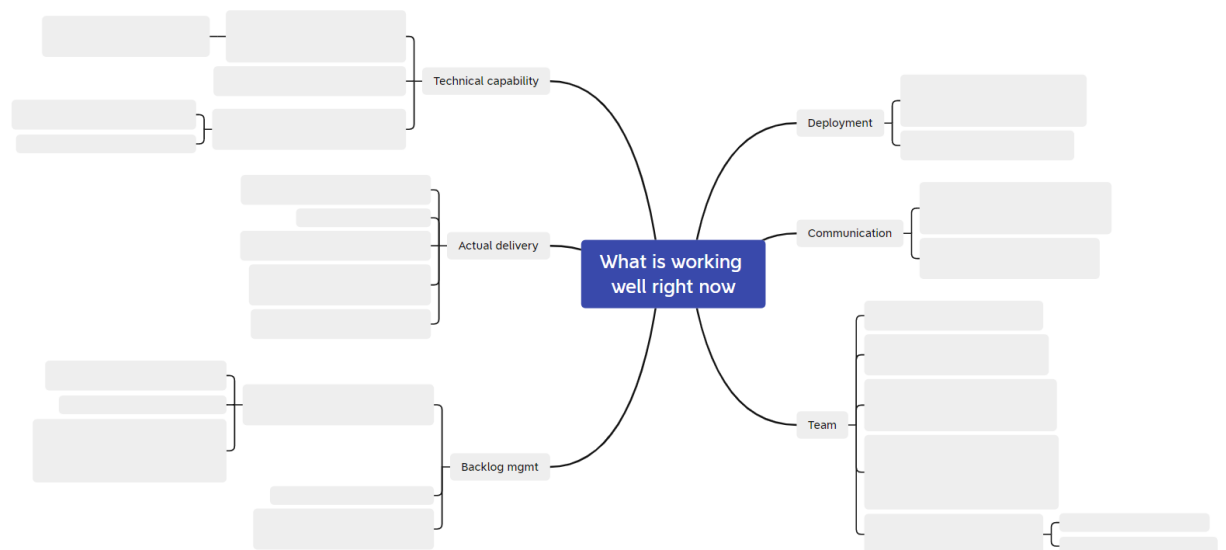


Figure 2 Example of mind map view used in brainstorming phase.

In each of the mind map sheets is one main topic which mainly also is the same than a question in the interview. Under the main topic are the answers from the interviews. In the first phase all the answers were just copy pasted to the mind

map and then clubbed under one or many categories depending on the main topic and the number of answers. For example, sheet “13. Testing” included main topic “Testing” and subtopics i.e., categories “Deployment specialist”, “Deployment application specialist”, “Automation in general” and “Customer”. Floating topics were used in case there were any answers which did not fall under any category or could not be moved to any other mindmap. Number of floating topics under each sheet were from zero to two.

All the mind map sheets were gone through in the brainstorming session. In case there was something new identified, it was added to the sheet during the session. Items which were important or required more attention were highlighted for further ideation and development.

After the brainstorming, the mind map data was brought back to the Excel file. A third sheet was created called “FinalCategorization”. This sheet was used for two purposes: first one was the same as the sheet’s name ie. finding out the final categories. The second purpose was translation: all the interviews were held in Finnish due which all data managed so far was in Finnish. As the thesis language and Company X official language is English hence the data had to be translated. Other way to do this would have been writing down the theme interview answers in English already in interview phase. This approach included a risk of losing or changing some answer to the direction it was not meant to be. Hence the translation was done only at the end of whole data analysis phase.

Categorization was time consuming phase and required couple of iteration rounds. The defined classes remained untouched from beginning to the research end. But setting up data to logical entities as themes was reiterated due there were too many options after first rounds. There were for example entities where were tens of items but also entity having only one item. This could be acceptable based on the results but from the analysis perspective it

does not make sense to have for example 40 high level categories under which one has 100 items and one only two. It meant only incorrect or incomplete categorization. The goal was to have around ten high level categories and around 30 subcategories. With these numerical targets the aim was to have reasonable logical entities for further analysis and finally drawing the improvement proposals.

3 Current state

3.1 Delivery project process in nutshell in Company X

Delivery project process in Company X includes universal project management components. Unit in concern in Company X uses partially general corporate level project management process in high-level but most parts of the process have been tailored for unit's delivery projects' purposes.

Sales organization prepares offer together with delivery organization. In case of big delivery first version of project plan is part of the offer including initial project schedule. Once the project starts, the first phase is to prepare technical study of customer's infra and make plan for possible changes to fulfil the infra requirements the SW release has. As there may be a need to renew some or all servers, the project plan can be finalized only after technical study phase: only after knowing the possible server side work the schedule for the whole project can be confirmed. Project planning is done as in any project: confirming schedule, content, and resources both internally and with customer and third parties. Identifying risks and mitigation actions is an important part of the planning phase. Project plan is prepared together with customer.

Project execution starts with infra specification and later with Test environment delivery and training planning. When test env delivery is completed, the customer's main users are trained. Main user training can be held also in parallel with test env delivery in case customer wants only presentation and not hands-on training with Test environment. Customer executes their workflow test cases in Test environment as per of the changed and new content of release. After testing phase has been approved the end user training is started by customer. Company X's delivery team starts production delivery preparations while customer is testing and training. Production go-live happens when

customer testing is completed and approved in Test environment and end users have been trained. Date for production go-live is agreed in the beginning of the project along the project planning. A back-up date is agreed too just in case any unpredicted issues occur during the project.

Project steering is in Project Manager's hands. Process includes internal project group to which are invited all the employees contributing to the project. External project group is with customer where minimum participant is Company X's Project Manager. Steering groups are held internally and with customer. Steering groups are supporting Project Manager but are also boards which have mandate to approve schedule, content, and budget changes.

Project closure includes final report, lessons learnt and customer satisfaction questionnaire. Typically, final report is prepared together with customer and also lessons learnt are thought over together.

Project management process is seen as working function and is not the main root cause for the long project duration. Naturally, continuous improvement is always needed.

3.2 Company X internal

3.2.1 Why Waterfall?

The customer delivery projects are following waterfall model even though the global trends should be pushing model change towards Agile usage. There are reasons why Waterfall is used. As well there are problems which Waterfall adherence is causing. Yet it is not sure are all the problems identified or are there even practical solutions available for them. Neither can it be yet concluded is the Waterfall problem or not.

Main reason for adhering Waterfall has been number of customers and visibility of what and when will be delivered and to whom. Scheduling of projects must be done for lengthy period in a time, target is to have all the time visibility at least one full year ahead. Scheduling must be done carefully to ensure all needed resources with their competencies from Company X are available during needed time or period.

3.2.2 Scrumwaterban – deployment teams

Company X is adhering Agile in the SW development; Scrum or Kanban depending on development team. Main deployment teams are following scrumwaterban i.e., mix of scrum, waterfall, and Kanban. Scrum comes from having sprint content, dailies etc. practices in place. Waterfall comes for example from long term plans done ready for the teams with their exact target dates. In practice this means teams can't decide whether project x, z or y is included to the sprint, it is decided by management. Kanban part consists of so-called ad hoc work from supporting customers with their current production. This work can include for example incident investigation or hot fix delivery. Deployment teams are not only contributing to delivery projects but also in continuous services. It has been questioned why for example term Sprint is used. Main reason is that there must be some way to timebox the work and enable those timeboxes for project planning. The term sprint could be replaced with any other term or even with Week level planning but since SW development organization uses term Sprint and has certain length defined for them, it is logical for deployment teams to use the same. When whole organization has only one commonly understood term in use, it eliminates confusions and forming silos.

The positive aspect of having long term plans in place is visibility to management and sales but also the predictability in terms of resourcing and

finances. But from team member's perspective the lack of autonomy and means to impact to own work has caused dissatisfaction among employees. Question is would additional autonomy inside teams lead to shorter lifecycle of customer delivery projects. Naturally, this should happen without reducing quality of work. Happy employee is a committed employee.

3.2.3 Amount of different versions in production

As the calendar time required for delivering releases to the customer is long there are several internal impacts. One is maintainability. Long calendar time has led to situation where the amount of versions in the field is too high. If fixing bug x to release y where y would be latest, the customers may refuse taking it in use as that would mean too big leap for them from version to version. Hence same fix has been inherited to several releases causing more unnecessary work for development organization. Eliminating the maintenance of several versions is fixed by stricter correction policy and bug classification. But that is fixing the cause not the root cause. In addition, it's causing time to time customer dissatisfaction.

3.2.4 Schedule collisions

Internal collisions of lengthy delivery projects and SW development schedules happen. For some time, this was also called as Agile vs. Waterfall collision. But in reality, it is more of schedule collision. Development teams live in increment-sprint schedules. For example, maintenance releases are delivered with best possible schedule which in many cases has been in the past the same as increment-sprint schedule. Projects are not living in same cycle. Delivery projects are scheduled as per customer wishes and delivery capacity. These do not have anything common with SW developments increment or sprint schedules. There may be during SW development's increment x zero to several

customer delivery projects' test environment deliveries or production go-lives. Practical level collisions happen when for example maintenance release x is published one week before a certain customer's production go-live date set for a project: then it is too late to even think of including latest release as part of the project scope. On main release level the planning is not an issue but what comes to maintenance releases there is collision between the release schedules versus delivery project schedules to customer. Customers may not get the latest possible SW to the production. Decision of targeted SW level is done together by customer and delivery project manager by analyzing the content of different maintenance releases and weighing the pros and cons.

3.2.5 From manual installation to automation

In SW development organization the automation work was started first via test automation years ago and is nowadays a standard practice in development. Pipeline has been developed from framework perspective and big bang roll-out for all teams happened several years ago. Main technical problems of release installation via pipeline have been tackled. Release delivery via automation also to customers has been technically enabled until certain extend. There are only minor topics left to improve in this area. Nowadays the problem to focus on are other areas in delivery to the customer. The delay from release publishment until all customers have it in production can take even over one year. This is not good situation from customer or from Company X perspective.

One might ask why there couldn't be nightly rolling installations to the customer environments if the pipeline exists. The shortest and fastest answer without further reasoning is Patient safety.

3.3 Customer related activities

3.3.1 Sales and budgeting

From customer perspective the long-term planning is needed as customers are government funded organizations having tight budgeting for each year. If on year x a new software version of patient info system is wanted to take in use, it must be budgeted mostly already a year before. Customer resources for the delivery project must be reserved also well in advance due their normal real work duties perspective.

3.3.2 Resourcing – several counterparts and stakeholders

Another reason for long term planning is several counterparts and many impacted counterparts for delivery projects. The final result of delivery project is production go-live for which the resources from several companies and organizations must be planned carefully. As the releases being delivered to customer are for patient info system the production go-live will endanger patient safety in case the delivery fails, gets delayed over the given maintenance window or some part of it or third party integrated to it will not work after the upgrade. Hence there is need for paying extra attention with planning and resourcing.

Also, during the project execution there are critical phases where customer resourcing must be ensured well in advance due to nature of the business.

3.3.3 Training

Training the customer's organization is one critical resourcing phase: all employees must be trained before new release has production go-live. The

requirement comes from the patient safety and Medical Device Regulation [12] but also from common sense.

No matter who and how conducts the training, somewhat lengthy period is needed for training depending on customer organization size. All nurses, doctors and other relevant personnel must know how to use the system and each application relevant for them. Understandably employees receiving the training have also their normal daily duties to which the training schedules must be adjusted. End users have work schedules done for example three months periods in advance. There is no automation available which would feed the information inside human being's brains. But there could be ways to speed up the training.

3.3.4 Testing

Testing is another critical area from resourcing and naturally from project overall schedule point of view. Some of the customers want to test on their own full release and partially repeat test cases Company X has executed in non-production environment. This happens even in case where some big customer already has had same release in use for quite some time. Some customers are testing less or squeezing it to shorter time period and rely more on what Company X and other customers have tested. Main reason customers want to test full release is varying processes or workflows depending on customer. Product of Company X is allowing many ways to use it which has been good from customer's point of view. From delivery project point of view the varying customer workflows causes testing pressure as all the customer workflows are not known by SW development and hence all possible combinations have not been necessarily tested even the most common ones are along the individual products.

3.3.5 What about nightly automated deliveries?

Based on already above-mentioned facts it is inevitable that there are no capabilities yet for example to scheduled nightly automated deliveries to the customers without any human resources. Nighttime is of course slot to deliver but it requires lots of planning, resourcing, and time. Due to these factors the only way has been waterfall projects and having strict deadlines in strict set of order of conducted tasks.

3.4 Improvements done within past few years

As Company X is developing patient info system there are more ISO standards followed than for example in some online shopping platform SW development. Continuous improvement is part of normal work routines. Additional driver for delivery project related improvements has been the big work amount and due that the long duration of projects which of course is expensive both to customer and Company X.

Within past few years there have been done changes to organization, processes, and technical part of projects all of which have targeted to faster delivery project lead time.

3.4.1 Organizational changes

Organizational changes have included moving SW development background lead level technical employees to delivery side. Aim with this move has been first to share more effectively the competence of automation tools used in installation. Another reason was gain understanding of technical pain points in deliveries and get solutions for them faster to SW development organization's work backlog.

Big deployment teams were split to several teams with the geographical customer base responsibilities. In addition to deployment specialists also project managers are allocated to serve the customer projects of the geographical area. In this model both are constant: team and project managers which enables tighter cooperation and more team-like working mode.

As teams were split to several there was a need for having glue between them. Deployment Release Train was established for ensuring same working practices, info sharing and joint improvement activities instead of one team specific silos.

Scrum Master role has been moved more to Team Lead role. Team Lead is responsible for team's competence, work planning, resourcing, and ensuring project schedule is kept within team.

3.4.2 Process improvements

Process wise project management templates have been reiterated and tailored more from corporate level to fit better the delivery projects. New templates for certain topics have been created to ease and speed up project manager's work. Deployment teams' process has been simplified, split to clearer phases, and collected to one simple view with all the links to instructions and templates. New templates have been created in form of checklists to for example production go-live preparations, actual go-live and post-work of it.

Milestones were introduced to delivery projects. These milestones have always existed in the project but now they were changed to actual milestones which are visible to all. Deployment teams can organize their work freely as they see best but the milestones must be kept. This has enabled more autonomy inside the deployment teams and involvement of team members in planning phase.

3.4.3 Technical improvements

Main technical improvement done in recent years is taking automated installation in use. Automation was enabled from certain yearly release onwards. There is no turning back to manual installation anymore even though the transition to automation has required learning new from deployment specialists and SW development organization.

Error prone installation package type has been changed which has in addition to eliminated certain installation faults also removed need of certain server role and in this way saved customer's costs.

Reference infra was created and nowadays almost all customers are already transferred to it. To support reference infra the infra requirements were written down and exceptions to them have not been allowed.

3.4.4 Summary of current state

The improvement path has been correct as positive impacts have been seen. For example, the installation time has reduced even in the beginning of automated installation journey there were gaps in understanding new way to deploy new release to customer as well as bugs in installation packages.

Yet there is still room for improvement as there always is. Along this research there has been improvement implementation ongoing in parallel. But despite of that the theme interviews were held at good point: After several bigger changes it was fruitful to hear what improvement needs employees with separate roles feel are still needed.

4 Results

4.1 Introduction to results

As a result of theme interviews data analysis there are in total 457 items in the result list. Total amount includes all given comments: Nothing has been removed even though there were duplicates or contradicting views (for example: training is an issue vs. training is not an issue). The biggest realization based on the results is that all needed roles are not aware of the processes and practices in use. Everybody does not need to know everything, but the key roles must be aware of basics in nutshell to avoid confusions. Otherwise, there were no big surprises popping up from the results.

During brainstorming session, it was concluded for majority of the theme interview proposals “yes this is true”. Part of the given ideas have been normal process for years or have been either implemented recently or are currently under implementation but are not widely known. For very few improvement proposals the final statement was “no this will not be taken further”. Some of the comments were so called obvious statements “project has a project manager”. These were marked as Not Applicable (N/A) to indicate they are not actual improvement proposals. N/A class includes also duplicate items: there is no point to place same topic as several individual rows for example to “Yet to be improvement” -class as the focus would be lost.

The results were distributed to classes as per Table 4. As expected, highest number of items fall under class “To be improved”. One might think the expectation was leading the thoughts while each item was assigned to its’ class. In reality pivot tables were created only after all items had been fully categorized so in that sense there was no idea in between the process of total numbers and percentages.

Table 4. Classes of all answers with their numerical and percentual shares.

Class	Amount	Percentage
To be improved	156	34,1 %
In use / improved	101	22,1 %
N/A	98	21,4 %
Under improvement	70	15,3 %
Rejected	21	4,6 %
In use, but not known	11	2,4 %

On top of dividing the results to classes they were also categorized based on theme they concern. Themes were selected simply by identifying to which higher level entity the item relates to. As per literature the themes can be built on pre-defined classification or themes can raise up from research data [9, p. 149]. In this research both realized: part of themes is predefined, or more matching with hypothesis, and part are derived from research data.

Target was to keep Theme-level compact number wise. Final themes are presented in Table 5. There was total 13 of them out of which the Top 3 included Processes, Organization and Releases. Theme interview question regarding processes was among the questions which got least of the answers. But when the categorization of all answers was done, they were stated to be process related.

Table 5. Themes of all answers with their numerical and percentual shares.

Theme	Amount	Percentage
Processes	93	20,4 %
Organization	81	17,7 %
Releases	63	13,8 %
Testing	51	11,2 %
Tools	51	11,2 %
Project model	35	7,7 %
Infra	28	6,1 %
Installation	13	2,8 %
Training	12	2,6 %
Automation	9	2,0 %
Project duration	9	2,0 %
Technical work	7	1,5 %
Communication	5	1,1 %

Themes were further divided to subthemes. The final amount of subthemes is 44 which is somewhat big amount. The goal was to have 20-30 subthemes, but it became clear that by forcing items under some subtheme and limiting the amount of subthemes would lead to confusing results. In some entities, especially regarding Testing and Tools, there was a need for having third category level. But due the need was not universal and would have been empty to for majority of items, the 2-level categorization was kept.

The assumption before the interviews was that there would be lots of improvement ideas for example for Processes or Training. It was somewhat

unexpected to realize that these were not seen as key issues. Though the number of improvement ideas in some area does not necessarily correlate with the importance of some topic, but it gives some direction where to focus.

In the following chapters is described the results in more details class by class. The logic is the same in each chapter: There is table presenting the figures of themes touched with the class and the highlights of the actual items. All subthemes are not listed as well as all items due to considerable number of them.

As all comments were valuable, the full list of interview results with categories is shared with Company X in internal walkthrough but not included to the thesis. One of the key ideas of qualitative analysis is to focus on entities instead of individual items and treating them equally [9, p. 142]

In result summaries the items are modified for thesis purposes to general level instead of having Company X's exact terms in use.

4.2 Functioning well

Based on interviews, each interviewee mentioned one to many areas or exact topics which as per their opinion is/are working fine. In total there were 101 comments which indicated well working functions. In Table 6 is listed all themes which were included in well working comments. Top 3 themes cover 67% of all items in this class: Processes, Organization and Tools got most of the positive comments. This could lead to conclusion that the basis for working in delivery projects is in good shape.

Table 6. Well-functioning item's distribution as per theme.

Theme	Amount	Percentage
Processes	31	30,7 %
Organization	24	23,8 %
Tools	13	12,9 %
Infra	11	10,9 %
Project model	7	6,9 %
Releases	6	5,9 %
Training	4	4,0 %
Communication	3	3,0 %
Installation	2	2,0 %

From subtheme perspective the Top 3 included Production go-live, Area specific teams and Reference infra. These covered almost 44% of all items in working well class.

Highlights of well working themes are in Table 7. Answers were varying depending on interviewee: what one said is functioning well, the other may have raised as an issue during the interview. Yet all the positive comments are included in the results even there were contradicting comments.

With well working areas there is a catch and possible blind spot from any organization point of view. What is working fine now does not mean working well forever. In other words, the assumed or at some point proved success areas must be evaluated time to time from possible improvement need identification perspective.

Table 7. Highlights of well-functioning mentions.

Theme	Subtheme	Details
Organization	Communication	Stakeholders know what has been done and what will be done next.
Organization	Teams: Area specific	Team thinking working quite well: team is sharing work and knowledge.
Organization	Teams: Area specific	Teams can impact more on their work and organizing how the projects are implemented.
Tools	Backlog	Tool provides transparency to project wok.
Processes	Project Management	Higher level plan has been good. It is showing what and when.
Tools	Delivery tools	Automation improved.
Tools	Checklist	Go-live checklist created to unify delivery and reduce errors.
Infra	Reference infra	Bit by bit all customer environments are similar and future installations as well as customer support are easier.

4.3 Already improved proposals but not known

During the theme interviews were proposed improvement ideas which are actually either already part of normal process, improved within near history or were currently under improvement. Table 8 is listing these based on their theme.

One additional action should be considered for items in this class: better communication to ensure all relevant stakeholders are aware of them. Yet whole organization does not need to know all the details as they would drown to information. It was also stated in the brainstorming session that during the

interview the interviewee may not have quickly linked the question to correct topic and hence may have missed in the answer that the topic was already corrected with some action. Even if the interview as such caused misunderstanding, the communication cannot be emphasized too much.

Results in class “already improved but not known” are partially overlapping with “working fine” category. This was accepted as all items were wanted to keep in the result list no matter if they were falling under two classes. Other reason was making the information gaps visible. One interviewee might have answered topic X working fine and another proposed topic X to be improved, then they were falling to separate classes. The number of items in this class is very low compared to other classes. It gives also positive indication: Communication and info sharing is working well enough but should be under focus though.

Table 8. Distribution of themes for “Already improved but not known” -class.

Theme	Amount	Percentage
Processes	3	27,3 %
Project duration	3	27,3 %
Releases	2	18,2 %
Testing	2	18,2 %
Training	1	9,1 %

From subtheme perspective the Top 3 included Production go-live, Project management and Training. Most of the subthemes with their items were also somewhat specific to those interviewees which were not fully aware of the daily routines related to them.

Example of already improved item which was not known is presented in Table 9. There is a checklist review by technical team before production go-live which was not known by all interviewees.

Table 9. Example of improvement proposal which is already in use but not known by all stakeholders.

Theme	Subtheme	Details
Processes	Go-live	More specific planning meeting is needed for go-live: who does and what and when.

4.4 Proposals under improvement

At the time of theme interviews the interviewees were telling also of topics which they knew were under improvement. These were welcome statements as it was valuable to receive validation for ongoing activities: Organization is focusing on correct topics. This also proved that there is communication inside the organization i.e., improvements are not prepared under the hood only.

All of the items were not known by the interviewees but despite of that all were kept under this class instead of creating additional class for them. Time to time there can also be improvement actions planned or ongoing but those are not yet ready to be communicated to wider audience. Or some hint of improvement has been given but as every employee has own daily duties, the information has been missed.

Table 10 presents the theme distribution of improvement proposals which were already under improvement during the theme interviews. Top 3 covers with over 74% very practical areas. There are very few items in process related categories to which both Project Model and Processes fall into.

Table 10. Items under improvement with their theme distribution.

Theme	Amount	Percentage
Tools	27	38,6 %
Testing	18	25,7 %
Installation	7	10,0 %
Organization	6	8,6 %
Releases	5	7,1 %
Infra	4	5,7 %
Project model	2	2,9 %
Processes	1	1,4 %

Subtheme wise the Top 3 of Delivery Tools, Smoke testing and Packages covered almost 51%. Table 11 lists the highlights of items under improvement. As the theme and subtheme Top 3 already suggests, the actual verbal comments were also very practical. In general, there were very few abstract statements given by interviewees. If there were non-concrete answers, they were not related to improvement proposals but were more generic sayings.

Table 11. Examples of improvement proposals which are already under improvement.

Theme	Subtheme	Details
Installation	Packages	Error prone packages are changed from xxx packages to YYY packages.
Installation	Packages	YYY packages enable remote delivery scripts with which files can be copied automatically simultaneously from one server instead of several sessions.
Testing	Smoke Testing	Basic smoke testing in production go-live can be automated somewhat easily.
Tools	Delivery tools: Tool X	When deployment specialist makes delivery plan, each package is selected one by one. It would be much easier to select just product. Now deployment specialist must know which packages are related to a product and select each of them separately.

4.5 Yet to be improved

Under class “Yet to be improved” almost 63% of items fell under Top 3 areas as Table 12 illustrates. Most of the other touched themes have very small representation. Many interviewees stated that there is not one single reason long delivery project duration. Improvement proposal item’s theme distribution is supporting their view.

Based on the improvement if deciding purely on the theme wise distribution the next improvements should focus next on Releases, Processes, Organization and also on Testing. As stated in chapter 4.2 the well-functioning Top 3 themes included also Processes and Organization and they are also in to-be-improved Top 3. Firstly, it means that the improvement focus should not necessarily be drawn based on the number of comments under certain theme. Secondly it also

means that there are improvements done for these topics but there is work left on these areas still.

Table 12. Item's theme distribution under class "Yet to be improved".

Theme	Amount	Percentage
Releases	42	26,9 %
Processes	36	23,1 %
Organization	20	12,8 %
Testing	18	11,5 %
Infra	11	7,1 %
Automation	9	5,8 %
Technical work	7	4,5 %
Tools	7	4,5 %
Installation	3	1,9 %
Communication	2	1,3 %
Project duration	1	0,6 %

For Top 3 subthemes the coverage was a bit over 31%. These were Customer testing, Tech study and SW quality. In total 29 subthemes were represented in results. Out of those 20 had one to five items under them. Reason could be erroneous categorization, but also wide range of improvement needs out of which some may be more important than others.

Highlights of items for improvement are presented in Table 13. Part of the items in this class can be directly improved based on the answer given by interviewee. But many of them require planning how to improve. Amount of

work required for improvement varies; Some are easy quick fixes; some require more time.

Table 13. Highlights of items which need improvement as per theme interview results.

Theme	Subtheme	Details
Technical work	Tech study	Technical study is made too late.
Releases	SW quality	Too many HFs. Customers want time to test as they feel there will always be fixes and updates.
Tools	Automation	There is always room for moving manual steps and checks to the automatization. This work continues.
Processes	Documentation	There is information in too many places: Teams, Sharepoint, Confluence. Same or different information of same topic.
Processes	Pilot project	Pilot project is not productized properly: it is tried to be executed like normal delivery project.

4.6 Rejected proposals

There were few rejected improvement ideas as Table 14 reveals. It is a positive signal from organization point of view if the big majority of improvement proposals from experts are doable and very few must be rejected. During the analysis phase part of the “Rejected” class’s items could have been placed also under “Not Applicable” class: The line between these two classes was time-to-time very thin.

Even being rejected, for some items the real improvement should be giving a reasoning to the interviewee why some task or process is done as it is. In other words, if something cannot be changed due some reason, it has to be explained to the employee or rather to all persons in similar role. If reasoning exists, then

the employee satisfaction might get higher and similarly the motivation would improve.

Top 3 of Project Model, Organization and Processes cover almost 62% of all items under this class. But as the total amount of items and also items in each theme are very low, the percentages are not useful from further conclusion perspective.

Table 14. Theme distribution of rejected improvement ideas.

Theme	Amount	Percentage
Organization	5	23,8 %
Processes	4	19,0 %
Project model	4	19,0 %
Releases	3	14,3 %
Testing	2	9,5 %
Training	2	9,5 %
Tools	1	4,8 %

Top 3 of subthemes covered over 52% of all items. The total number of items was low, hence there were four subthemes in shared second place. It is also notable that all subthemes had one to three items under them so there was not a single heavily impacted subtheme.

Rejected improvement ideas were mainly misunderstandings or ideas which had been rejected already in the history.

Table 15. Examples of rejected improvement proposals.

Area	Subarea	Details
Organization	Resourcing	More people and competence are needed. System is wide and understanding it requires time.
Project model	Project Management	Delivery projects feel bureaucratic

4.7 Not applicable proposals

Many items in “Not applicable” class were statements of past or current situation. Or they were duplicates of an item under some other class. There were also duplicates of duplicates ie. if some item was with almost same words or with same meaning already elsewhere, it was not repeated there but put to N/A class. In other words, item being under “Not applicable” class does not mean the comment was not taken in count at all during analysis phase.

Not applicable item’s Top 3 themes covered over 67% of all items in this class as can be seen from Table 16. Very few items touched practical themes like Installation or Tools. Instead, the Top 3 is including Organizational, Project model or Process related items.

Table 16. Not applicable item's distribution to themes.

Theme	Amount	Percentage
Organization	26	26,5 %
Project model	22	22,4 %
Processes	18	18,4 %
Testing	11	11,2 %
Project duration	5	5,1 %
Releases	5	5,1 %
Training	5	5,1 %
Tools	3	3,1 %
Infra	2	2,0 %
Installation	1	1,0 %

There was total 28 subthemes to which the “Not applicable” items fell in. Top 3 covered less than 34% of all items and had four subthemes as there was shared first and third place. As the distribution to subthemes was somewhat even, there has not been conscious placement of certain type of items as not applicable.

Highlights of the items are presented in Table 17. In the list is included example representatives of duplicates and statements of current or past situations based on which cannot be drawn improvement activities.

Table 17. Examples of items in “Not applicable” class.

Theme	Subtheme	Details
Organization	General	Situation was worse couple of years ago
Organization	Teams: Area specific	Pandemic slowed down team cooperation
Infra	Reference infra	Earlier each infra specification was personal view of each tech lead
Project duration	Project Management	Long project duration is due several reasons: some of them are company internal, some are customer related
Organization	Project organization	Infra provider plays a role out of which we are dependent
Training	End user training	End user training may not be as big issue as thought
Project model	Agile: No	Waterfall is not a problem; how else delivery projects could be driven?
Organization	Resourcing	No more resources. Adding them does not solve the problem of working methods.

5 Summary

5.1 Executive summary

The goal of research was to find out ways how to speed up the delivery projects. The aim was to prepare a concrete proposal for improvement actions with their prioritization. Data for research has been collected by interviewing five employees who have a role in delivery projects or nearby them. In data analysis phase brainstorming was conducted by researcher and Deployment RTM. Final data analysis with all categorization and conclusions has been done by researcher.

Table 18. All items raised in the interviews with their distribution to various classes.

Class	Amount	Percentage
To be improved	156	34,1 %
In use / improved	101	22,1 %
N/A	98	21,4 %
Under improvement	70	15,3 %
Rejected	21	4,6 %
In use, but not known	11	2,4 %

There were in total 457 items raised in the interviews. As the statistics in Table 18 reveal, during interviews was identified many well-functioning items as well as those which are already under improvement. The improvement journey was praised during the interviews; the direction was stated to be good. Yet the situation is not perfect and projects last too long. The class "To be improved" includes the proposals for further improvements.

Table 19. Main improvement proposals with their priorities.

Priority	Topic	Details
1	Tech study Network (NW) openings	Tech study content review and improvements. Find out ways to ease up NW openings and testing of them.
2	Automation Delivery tools	Evaluate possibilities to automate post-deployment work. Explore ways to implement cloud-based pipeline repository. Renew delivery planning tool.
3	Testing	Deployment testing should be mandatory for all release types. Smoke testing automation finalization should be continued by adding some basic functions to it. Evaluate the customer testing automation needs and possibilities.
4	Productization Releases	Renew productization model by identifying role-based needs. Continue release content control tightening. Improve release content presentations. Include more customer test cases to release testing.
5	Documentation Communication Changes in Project Plan	Explore the current instruction and template locations to find a single source for information Ensure effective communication for technical info sharing between teams. Investigate ways to conduct project replanning without causing snowball effect to other projects.
6	Pilot project Delivery model	Define the process in more details from whole organization and customer point of view. Evaluate the possibilities to do delivery by one team instead of several teams.

Improvement proposals have been prioritized in Table 19 but as a roadmap they can be implemented partially in parallel. I.e., the roadmap does not have to be sequential as it would also require more time for reaching better and faster delivery projects. It is understood that all improvement proposals are not straight forward but need detailed planning.

Prioritized improvement proposals need to be gone through with management. In addition, the detailed items would be good to be read by management to get the full understanding of organization representatives' thoughts. If the focus areas for improvements are agreed to be implemented, an owner for each topic needs to be nominated. If all improvements are driven by one single person, then the estimated improvement lead time would be a year. But in case several owners can be appointed, then there would be evidences available faster, possibly within a half of year.

5.2 Conclusions

Based on research results there is not a one single reason causing long delivery project duration. Instead, there are multiple varying size topics which can be improved, and which can directly or indirectly speed up the project lead time. It is inevitable that the items which were identified along this research are not the last improvement activities. In other words, the improvement journey is not ready after the items defined in Chapter 4 are conducted. In the spirit of ISO 9001, ISO 13485, and ISO 10006 the continuous improvement is a journey which should never end. [13, p. 29] [14, p. 17] [15, p. 31] [16, p. 139] Company X has well-functioning processes and methods for continuous improvement, which are proven for example in audits. Hence there are no additional proposals for changing or enhancing them. From research perspective it is only worth to encourage Company X to carry on the current approach.

Organization's improvement journey has been continuous and current path was seen good by interviewees. None of the interviewees identified only improvement proposals but all of them were able to list positives despite of not knowing beforehand "what is working well" would be asked.

The number of interviewees was five employees of whole organization. With five interviewees the result was 457 items. More interviewees would have been good from extended organization view coverage perspective. Though the data analysis would have been more time consuming from thesis completion point of view, and the overall results would have required more summarizing than with current set. The number of interviewees was decided to be adequate for this research. But by having two representatives from each role would have brought either validation to views given by role representative or more deviation.

The interviews should be repeated after one year to get understanding if the under improvement -activities have had any impact. The same interviewees should be included to get comparison whether there has been any change since last interview round. Additionally, their peers should be interviewed to get wider perspective under analysis. At least one interviewee from independent product delivery teams would be good addition to coverage. Repeating interviews can be only Company X internal activity as part of normal continuous improvement or it could be a topic for next research.

Result summary was prioritized but not put on a timeline for implementation purposes. Reason for leaving the roadmap with schedules out of improvement proposals is the areas touched with the proposals. All of the items are not for one expertise area only but most of them are. It depends on Company X how many owners are wanted to be appointed and hence also the timeline for implementing them is depending on the Company X. If all the items would have

been behind one role or all behind different roles, then preparing roadmap with schedule would have made sense.

As stated in previous chapters, part of the interview results was contradicting with each other. In these cases, it was evaluated case by case should the worst case or happy scenario be taken in count. Partially the voice of majority ruled but sometimes also minority won. As an example, there were requested more resources but also stated that extra resources will not help. Here majority stated, “no more resources” and hence the request for additional resources was rejected.

Based on literature one typical characteristic of qualitative research is finding out unexpected topics [9, p. 141]. Before the research started, the hypothesis was pointing to long customer testing and end user trainings as main reason for delivery project duration. During the research it became clear that these two areas are not the major pain points. Actually, the end user training is not a problem from whole delivery project duration point of view at all. As the delivery project team can prepare the next project phase while the end user trainings are ongoing, there is no delay caused by them.

Communication related proposals were partially inconclusive and partially contradicting. For example, it was stated that teams are sharing information but also that they do not share enough. Professor Osmo Antero Wiio has stated “*Communication usually fails, except by accident*” [17]. Communication related improvement needs could be buried behind Professor’s statement. But yet there are realistic easy to implement ideas revealed by the interviews. One of them is related to overall awareness of delivery projects. As all roles were not aware of each step of delivery project a way to present the delivery projects’ typical content and flow should be done. Process definitions and pictures exist but

those do not necessarily open up the real life and root level delivery project activities conducted Company X internally, with customers or third parties.

Future research could be conducted from improvement effectiveness perspective: It would be interesting to validate if the implemented improvements had desired impact or not. Another perspective would be more focused research: studying one specific area in more detailed level either by deriving improvement proposals or investigating if the completed improvement activities have had positive effect or not.

5.3 Discussion

5.3.1 Researcher's lessons learnt

The idea of having thesis subject close to own work duties have pros and cons. Researching something with which one is dealing on daily basis in the office may lead to blind spots as the topic is too close. On the other hand, there is lots of data and experiences in use via personal knowledge bank compared to an outsider. The main problem was time to time occurred exhaustion over the topic. Mainly it came from the difficulty of separating obvious things to researcher from the non-obvious to someone else.

Staying neutral and avoiding the subjective views or conclusions was also somewhat challenging due to the thesis topic closeness. Work history of quality manager but mostly project and program manager caused time to time challenges. Though the work history also helped in understanding the big picture as well as what interviewees were talking about. But it caused also demanding situations during the interviews. Theme interviews are supposed to be discussion-like interviews, yet the interviewer should not lead the answers to any predefined results. Phishing the correct answer did not happen but when

one did not know of already implemented improvement, then there was short discussion and introduction to the topic. In other words, the theme interviews were also info spreading opportunities which was not planned beforehand. As a researcher this outcome would be judged negatively, as a Company X representative ruling would be positive.

Literature says that the level of interpretation and understanding researched topic depends on how well researcher gets inside the researched social world [9, p. 10]. Based on that topic closeness is a big advantage from research outcome perspective. As we all are human beings, the mixed thoughts, colliding feelings, and many doubts of too close relationship with research topic were natural no matter what the theories in books state.

From thesis perspective the complete process should have run through as fast as possible. As the time went by the improvement ideas raised were already implemented and the value add to the company via “proposal of improvement areas” started to dry out. From company perspective the value was gained but the thesis suffered as time passed by. Even good planning phase is key to success, too much planning is not good either. As a meme circulating in social media says, “*well planned is completely undone*”. If time could be reversed one year back, there would be much faster interview execution as well as result analysis.

Theme interview questions were leading analysis phase in the beginning to wrong direction. Data was managed first only from the original interview questions perspective. Partially this was correct direction, but it took some time to realize that the final categorization does not have to be the same as the interview questions. How in any research the researcher would know in planning phase what the results are? Once this became clear, then the data categorization was also crystalized. On the other hand, maybe there was a

need to figure out categories first from question perspective; After all questions asked were real topics too. Wrong direction in the beginning might have been eliminated by reading for example book *Qualitative research views and methods* [9] written by Pauli Juuti and Anu Puusa before starting the data analysis.

It is stated that the themes should not be only one to two words. If themes are not phrases or sentences, then they are underdeveloped. [18] In this research themes are exactly one to two words long and that was the goal from the very beginning of the research. Here researcher's own opinion and subjective view overruled the theory: If a theme is one full sentence having one or more commas in between, then the thought process is not done or is done lazily. That indeed would be underdevelopment.

5.3.2 Research closure

This research would not have been possible without support. As an author of this thesis and research I want to thank all the interviewees who were willing to share their thoughts and the instructors both in school and office for providing feedback and encouragement.

Juuti and Puusa are stating "*Reason for conducting qualitative research is to help people living better life*" [9, p. 324]. Hopefully, this research fulfills that criterion and provides some seeds for even better future inside Company X.

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Appendix

Theme interview questions

1. Introduction

May I record this session?

Goal of this session is to hear your feedback and ideas for improving the speed but also quality of delivery projects.

I have heard and seen samples of some of your projects and got some understanding of the dilemma. But to get your valuable comments noted, please pretend I don't know all the details.

Time of interview: dd.mm.2022 hh:mm – hh:mm

Role of interviewee:

2. Warm-up

1. What is working well right now?
2. What has already been improved?
3. Do you feel the long duration of projects is related to one issue only or are there several?

3. Theme 1: Processes & Tools

1. Is the waterfall model in delivery projects an issue?
2. Could the delivery projects move to Agile world?
 - If no, why?
 - If yes, fully, or partially?

3. Is there improvement need with processes and practices or with tools?
4. Are the deployment tools in a level where you would like them to be?
5. Are there any improvement needs on development organization and releasing practices?

4. Theme 2: Customer & 3rd party

1. Some customers are stating that the projects should last many months if not 1 year. If you'll think from customer perspective, how could they be convinced of shorter projects?
2. Could the deployments be done without third parties?
3. Is the end user training as big issue as it has been stated and how it could be improved?

5. Theme 3: Automation level

1. How the finalizing of core delivery with good quality could be done faster?
2. How the individual product's deployment could be speed-up?
3. Can the technical specification be further automated?
4. Can the NW openings specification be automated?
5. Is there anything which could be further automated in the actual deployment?
6. Could we automate our smoke test cases for both deployment specialist's and application specialists and workflows?
7. What could be done to customer testing phase
 - Provide automated TCs for customer too?
 - More detailed information of release content i.e., changes, impact of them?
 - Something else?

6. Theme 4: Project organization and resourcing

1. Is the project organization functioning well?
2. What would you change in project organization?
 - Are there any unnecessary roles?
 - Are there any missing roles?
3. How are the teams communicating with each other? (Core deployment team vs product specific ones, app specialists etc.)?

4. Is adding more resources still an answer?
5. Are all employees in same competence level?
 - If not, how to raise everyone to needed level?
6. Are teams sharing knowledge with each other?
 - If not, how to ensure knowledge will be shared?
7. Are there any barriers from history which should be changed?

7. Retrospective

1. After the discussion, to what is the biggest root cause mostly related to?
2. What would you change first if you had all the power in the world?