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Improving Mobile Telecommunications Centralized Services Operations and Maintenance Process

By Combining Lean and Agile Practices

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In any process, there is the beginning and the end. In the beginning, the process ahead may look difficult, the target even not visible yet. The daily struggle with hard work is located between the beginning and the end, with the focus on the immediate next steps. In the end, it is time to look back after all the effort and gauge the results. Looking back, the process does not seem as difficult in it seemed at the beginning. Partly because I have learned, partly because it is easy to forget daily difficulties. Something not to be forgotten, however, is all the support I received. It made this happen!

First, I would like to thank my employer, Elisa oyj, for the opportunity of helping to solve real-life business problem of the company and for being able to combine studies with daily work. Thank you for the managers and all other stakeholders who participated in the interviews and workshops, thereby contributing to this study!

Second, special thanks to my instructors, Dr. Thomas Rohweder and Zinaida Grabovskaia, PhL, for all the guidance and support you provided! Thanks for the rest of the faculty at the department of Industrial Management at Metropolia University of Applied Sciences for the continued support as well. For the fellow students of the Industrial Management Master's Program, I would like to deliver my sincere thanks for the positive co-learning atmosphere.

Finally, I would like to express my gratitude to my wife Katri. Your support gave me the strength to keep going!

Rauli Rautavuori
Helsinki
April 12, 2019
The case company needed to improve the efficiency of the existing framework-level process for mobile telecommunications centralized services operations & maintenance (CSO&M). With the current process, it was seen difficult by the company to achieve shorter delivery cycles for introducing new features and fixes into its network. The objective of this study was to propose an improved process for mobile telecommunications CSO&M.

In this study, qualitative data collection techniques were utilized and the selected research approach was Design research. Current state analysis was conducted to find challenges of the current CSO&M process. After that, relevant literature was searched to find solutions to the identified challenges. Based on the findings, a proposal for the improved CSO&M process was co-created with the case company.

The proposal for the improved CSO&M process focused on three areas. First, establishing parallel pipelines through the process for work items with various urgencies, prioritizing work and limiting work in progress. Second, utilizing the Scrumban process framework for prioritizing items based on the cost of delay and for better synchronizing external dependencies. Third, organizing people according to the process by introducing virtual teams with end-to-end responsibility for a service or feature.

The outcome of the study, by increasing agility, would allow faster response to the customer’s needs for the case company’s voice subscription business. Currently, the business units and departments to be involved in the proposed process have somewhat different working practices and key performance indicators (KPIs). For successful implementation of the proposed CSO&M process, these differences should be resolved and common priorities for the whole organization established.

Keywords: Process development, Process management, Lean, Agile
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1 Introduction

In telecommunications business, saturation of subscription service markets, platform ecosystems, and agile software development drive the business in developed countries, such as Finland. The main direction is towards improving efficiency and co-creating new yet uncompleted services. As a prerequisite for both, more agile, faster development-to-delivery cycle needs to be adopted. The case company has identified the need to improve the efficiency of their processes to remain competitive.

In many of the developed countries, there are similar development trends in the telecommunications subscription service markets. First of two trends which are particularly important is that the subscription service markets are already quite saturated and therefore heavily competed. The second trend, shortening development and delivery cycles for information technology and communications services, is driven by agile software development concepts in concert with platform ecosystem which emphasizes co-creation, introduced by the largest smartphone software manufacturers.

The telecommunications service providers in these markets need to improve their operational efficiency and co-create new services with their customers to remain competitive. Many types of means for improvement are sought for. These range from reducing technology costs by more just-on-time purchasing schemes avoiding upfront investment (pay-as-you-grow purchasing model) to improving processes by removing waste time or work phases and by parallelizing work or shortening the development-to-delivery cycle.

The service provider’s quest for efficiency drives the need for change for telecommunications network equipment and software manufacturers as well. To remain competitive in a heavily competed telecommunications infrastructure market, they need to improve their efficiency for serving their customers – the telecommunications operators within markets of large economies – efficiency requirements.

This thesis focuses on improving the current state of the framework-level operations and maintenance process of the mobile telecommunications centralized services and proposes of the case company. This is done to improve the efficiency of the process and to make it more agile for co-creating new services.

1.1 Business Context

The case company of this thesis offers a wide range of communications and information technology services to its consumer customers and corporate customers. This thesis focuses on the mobile telecommunications subscription services.
The Finnish telecommunications subscription service market is heavily competed, with the focus of the companies having been shifting towards improving operational efficiency as the means for competing. After a period of mergers and acquisitions of smaller companies, there remain three main competitors: Elisa, Telia and DNA. Each of these companies are service providers – they provide communications and information technology services to fulfill their customer’s needs. In this context, operational efficiency means both cost savings from more efficient use of time and resources as well as being in closer co-creation relationship with the customer, being able to quickly respond to the customer’s needs with new services and features.

On international scale, however, Finnish telecommunications service providers are quite small. Even though they can choose from a host of multiple infrastructure manufacturers, they are quite dependent on the operating and delivery models and cycles of these international players. Therefore, they mostly need to adjust.

All this is also true for the case company, which is the one of the three largest telecommunications service providers in Finland.

1.2 Business Challenge, Objective and Outcome

Presently, in the company’s mobile telecommunications service business of the case company is currently following a loosely defined framework-level process. With this framework-level process, which has evolved over a long time, it is seen difficult by the company to achieve shorter delivery cycle needed for introducing new software features and fixes into its network.

To facilitate the change in the telecommunication service business, both processes and the organization (who is doing what) of the case company’s telecommunications centralized services operations & maintenance need to be adjusted towards lean/agile principles. These principles provide for quicker, more efficient delivery of services and features, a requirement of the case company’s key customer segments and other stakeholders.

Accordingly, the objective of this thesis is to propose an improved framework-level process for mobile telecommunications centralized services operations & maintenance, as well as guidelines for implementation.

Consequently, the outcome of this thesis is an improved framework-level process with guidelines for implementation.
1.3 Thesis Outline (Scope and Structure)

The scope of this thesis is the framework-level process for operations and maintenance of mobile telecommunications services of the case company. All the other processes of the case company are out of the scope of this thesis. The thesis also excludes changes in organizational structure of the case company. As a consequence, however, such changes may be needed later on.

This thesis is implemented based on design research approach, for which information is collected by qualitative interviews of relevant stakeholders and by investigating documentation of the current centralized services operations & maintenance (CSO&M) process. Based on the information collected and on best practices presented on the existing literature, a theoretical framework of lean/agile processes and operating models suitable for the case is established. The framework is then used to design an improved CSO&M process. For validation of the proposal for improved process, quantitative data of process throughput is collected. Results of the validation are utilized to create a final proposal for implementation.

The Thesis is written in seven sections. Section 1 is the Introduction. Section 2 describes the method and material used, followed by the current state analysis in Section 3. Section 4 establishes a conceptual framework of lean/agile principles for the case. As a result of co-creation between the author and the case company, Section 5 proposes an improved CSO&M process. In Section 6, the proposal is finalized based on the feedback from stakeholders. Discussion of the results and conclusions of this thesis are reported in Section 7.
2 Method and Material

This section begins with description of the research approach selected for this thesis in Section 2.1. Section 2.2 outlines the research design for the thesis, followed by description of data collection and analysis steps for each section in Section 2.3. Finally, Section 2.4 establishes the thesis evaluation plan.

2.1 Research Approach

Applied research, in contrast to basic research, aims to improve understanding of a particular problem and results in a solution to the problem. Often the new knowledge gained through the research is limited to the problem at hand. Applied research is often performed within companies or research institutes. Basic research, on the other hand, is mostly performed within universities, aiming to expand knowledge by resulting in new universal principles not tied with a particular problem. (Saunders et al. 2009: 9)

Various methodologies or approaches of applied research could be used for doing research in an organization, these being case research (case study), action research and design research. The first of these, case research is most suited to finding answers to the questions “why”, “what” and “how”, it is most often used in explanatory research (Saunders et al. 2009: 146; Yin 1994: 9). As the case research aims for in-depth understanding of a phenomenon, it is not especially suitable for making changes (Kananen 2017: 42). Action research as a research approach aims for a long-term change, has multiple cycles or iterations. In action research, the researcher typically is also personally part of the phenomena (a process, for example) to be studied and changed. (Kananen 2017: 42-44; Saunders et al. 2009: 147-148)

Design research, according to Kananen (2017: 20-22), a research approach which combines development and research in a cyclic process with a limited number of cycles, producing functional and practical solutions. Design research, as any research, is always based on a theory or multiple theories, on which the development is based on. The approach is different from other research approaches to be suitable for a shorter time development work conducted within organizations.

However, it can be argued if the before mentioned research approaches (case studies, action research and design research) actually make research approaches at all, but merely subsets of two main research approaches, qualitative research and quantitative research (Kananen 2017: 28). The reason for this argument is that these subsets do not have their own research methodologies, relying on the qualitative and/or qualitative
methodologies. In quantitative approach, the studied phenomenon is known by theory – it is already explained and needs to be tested by measurement. Qualitative approach, on the other hand, is best suited to studying a phenomenon not yet fully known, where both understanding of the phenomenon needs to be established and new theory to be developed. (Kananen 2017: 31) Qualitative and quantitative approaches, as described by Saunders et al. (2009: 152), can employ single or multiple data collection methods. These are called multi-method studies. They also state that qualitative and quantitative approaches can be combined into a mixed-methods study. This is supported by Kananen (2017: 20-22), arguing that in design research multiple data collection methods can be employed within a single study.

In this study, the selected research approach is design research, which is suited for this study because the purpose is to re-design and propose improvements to the existing CSO&M process. Action research could also be suitable, if the research would be conducted over a longer period of time and in multiple iterations. The time available for this study is quite limited due to internal schedule of the case company. As the purpose is to propose an improvement, case study as a research approach was not suitable either. For this study, qualitative multi-method data collection techniques were used to establish the state of current process and developing it further in a co-creative manner.

2.2 Research Design

This sub-section describes the research design for this study step by step. The design is shown in the Figure 1.
Figure 1. Research design of this study.

As shown in Figure 1, the research design of this study begins with establishing a business problem and setting the objective. The next step, research design and data plan are described in Section 2. Figure 1 itself represents an overview of Section 2, for which reason it is not displayed in the figure.

Sections 3 and 4, the current state analysis and literature review, can be completed in the said order or vice versa depending on the topic. This study analyzes current state of the CSO&M process and proposes improvements for the process. The study begins with current state analysis in Section 3. Data 1 provides the necessary input for Section 3. This section describes the current process in detail and as the main outcome finds the strengths and weaknesses of the process, with the focus being on main weaknesses to be improved later.

After establishing the current state of the CSO&M process, Section 4 then proceeds with literature review, aiming to find theoretical knowledge and best practices for improving the weaknesses identified in Section 3. Based on the review, as the outcome of section 4 a theoretical framework is established to serve as the basis for improving the process.
In the next stage, Section 5 begins with a workshop involving relevant stakeholders of the CSO&M process, where the main outcome from Sections 3 and 4 are used to co-create improved process. The output of the workshop is then used to finalize an initial proposal for improved process, the main outcome of Section 5. For writing the final proposal in Section 6, a second workshop is arranged to collect feedback for finalizing the proposal. Based on these, inputs Section 6 then ends with the final proposal for the improved process.

2.3 Data Collection and Analysis

This study used three data collection rounds. Main sources of data were workshops, interviews, one-to-one discussions and a qualitative questionnaire which substituted interviews for collecting data from specialist-level stakeholders. All workshops, interviews and questionnaires were conducted in Finnish. The field notes and summaries of field notes from data collection were written in English. Table 1 describes in detail the data collection of Data 1 for current state analysis. Data collection for Data 2 and Data 3 are described further.

Table 1. Details of Data 1 collected for the current state analysis.

<table>
<thead>
<tr>
<th>Data 1</th>
<th>Participants / role</th>
<th>Data type</th>
<th>Topic, description</th>
<th>Date, length</th>
<th>Documented as</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management team of the department responsible for the process</td>
<td>Kickoff meeting</td>
<td>Introduction of the topic to the stakeholders and informal discussion</td>
<td>11.10.2018, 1 hour</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>2</td>
<td>Team 1 within the department</td>
<td>Team workshop with members and the leader present, facilitated by 3rd person (a lean specialist)</td>
<td>Current status of using Kanban as a &quot;process&quot;</td>
<td>16.10.2018, 1 hour</td>
<td>Written notes. The participants provided their feedback in writing.</td>
</tr>
<tr>
<td>3</td>
<td>Team 2 within the department</td>
<td>Team workshop with members and the leader present, facilitated by 3rd person (a lean specialist)</td>
<td>Current status of using Kanban as a &quot;process&quot;</td>
<td>26.10.2018, 1 hour</td>
<td>Written notes. The participants provided their feedback in writing.</td>
</tr>
<tr>
<td>4</td>
<td>Team 3 within the department</td>
<td>Team workshop with members and the leader present, facilitated by 3rd person (a lean specialist)</td>
<td>Current status of using Kanban as a &quot;process&quot;</td>
<td>26.10.2018, 1 hour</td>
<td>Written notes. The participants provided their feedback in writing.</td>
</tr>
<tr>
<td>5</td>
<td>Team 4 within the department</td>
<td>Team workshop with members and the leader present, facilitated by 3rd person (a lean specialist)</td>
<td>Current status of using Kanban as a &quot;process&quot;</td>
<td>29.10.2018, 1 hour</td>
<td>Written notes. The participants provided their feedback in writing.</td>
</tr>
<tr>
<td>6</td>
<td>Team 5 within the department</td>
<td>Team workshop with members and the leader present, facilitated by 3rd person (a lean specialist)</td>
<td>Current status of using Kanban as a &quot;process&quot;</td>
<td>30.10.2018, 1 hour</td>
<td>Written notes. The participants provided their feedback in writing.</td>
</tr>
<tr>
<td>7</td>
<td>Team 1 leader</td>
<td>Face to face interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>12.11.2018, 1 h 31 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>8</td>
<td>Team 2 leader</td>
<td>Face to face interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>12.11.2018, 35 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td></td>
<td>Interview Type</td>
<td>Details</td>
<td>Date</td>
<td>Duration</td>
<td>Notes</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>---------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>9</td>
<td>Team 3 leader interview</td>
<td>Face to face Interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>13.11.2018, 1 h 21 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>10</td>
<td>Team 4 leader</td>
<td>Face to face Interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>14.11.2018, 1 h 13 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>11</td>
<td>Team 5 leader</td>
<td>Face to face Interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>15.11.2018, 1 h 20 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>12</td>
<td>Team leader 6</td>
<td>Face to face Interview</td>
<td>Team-level view of the current &quot;process&quot;</td>
<td>13.11.2018, 1 h 7 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>13</td>
<td>Head of department</td>
<td>Face to face Interview</td>
<td>Department-level view of the current &quot;process&quot;</td>
<td>20.11.2018, 1h 21 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>14</td>
<td>Consumer business stakeholder 1</td>
<td>Skype interview</td>
<td>Stakeholder view of the current &quot;process&quot;</td>
<td>27.11.2018, 32 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>15</td>
<td>Consumer business stakeholder 2</td>
<td>Skype interview</td>
<td>Stakeholder view of the current &quot;process&quot;</td>
<td>22.11.2018, 55 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>16</td>
<td>Corporate customers business stakeholder 1</td>
<td>Skype interview</td>
<td>Stakeholder view of the current &quot;process&quot;</td>
<td>29.11.2018, 33 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>17</td>
<td>Production unit stakeholder 1</td>
<td>Skype interview</td>
<td>Stakeholder view of the current &quot;process&quot;</td>
<td>26.11.2018, 50 min</td>
<td>Field notes and recording</td>
</tr>
<tr>
<td>18</td>
<td>Specialists within the department</td>
<td>Google Forms questionnaire, qualitative (free-text)</td>
<td>Specialists views of the current &quot;process&quot;</td>
<td>Over a period of two weeks, Nov 2018</td>
<td>Summary table</td>
</tr>
</tbody>
</table>

As shown in Table 1, data collection round 1 for Data 1 consisted of three different elements. Team workshops were conducted to map out the current state of utilizing Kanban as a part of the CSO&M process in the case organization. These workshops were conducted using a one-slide Kanban evaluation tool in use within the company. The participants were tasked to evaluate each area by writing down on a shared online notebook all the items from the one-slider which they thought were unclear to them or were not used in their team. Then they were tasked with selecting a few of the before mentioned unclear or not used points, of which they thought being particularly important, to elaborate them further. In this way, the participants created the notes from the workshops by themselves. Eventually, they also discussed the items using voice. Insights from these discussions were written down into notes. The one-slider can be found in Appendix 1 of this study.

Face-to-face interviews with team leaders and most important external stakeholders were conducted to clarify information found on written documentation of the process and to collect their insights on the strengths and weaknesses of the current process. The interviews were conducted in the company premises, in most cases face-to-face but in some cases over a Skype meeting due to difficulties in finding common time at the office. The interviews were semi-structured, the questions having been formed in advance but the respondents being allowed to provide broader answers. The questions were a bit
different for team leaders and external stakeholders within the organization. The questions can be found in Appendices 2 and 3. All interviews were recorded using Skype for Business recording and field notes were taken. Summary of field notes can be found in Appendices 6 and 7.

The third element for collecting Data 1 was a qualitative (free-text) questionnaire aimed at the specialists of the case organization. The questions were formed in advance as the questionnaire form was created. The questionnaire allowed the specialists to answer a set of questions whenever they have a timeslot available instead of inviting them to semi-formal interviews. All specialist within the case organization were invited to respond. Of these, nine provided their answers. Questions of the questionnaire can be found in Appendix 4. Summary of field notes can be found in Appendix 8.

For co-creating a proposal for improved CSO&M process, the section 5, and for finalizing the proposal, section 6, rounds for collecting Data 2 and Data 3 were carried out. Table 2 lists details for the data collection steps for Data 2 and Data 3.

Table 2. Details of interviews and workshops for the Data 2 and Data 3, co-creating an improvement proposal and finalizing the proposal.

<table>
<thead>
<tr>
<th>Data 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants / role</td>
<td>Data type</td>
<td>Topic, description</td>
<td>Date, length</td>
</tr>
<tr>
<td>Management team of the department responsible for the process and relevant stakeholders</td>
<td>Workshop</td>
<td>Co-creating the improved process</td>
<td>27.2.2019 1h</td>
</tr>
<tr>
<td>Head of department</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>5.3.2019 52min</td>
</tr>
<tr>
<td>Team leader 1</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>4.3.2019 30min</td>
</tr>
<tr>
<td>Team leader 2</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>5.3.2019 43min</td>
</tr>
<tr>
<td>Team leader 3</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>6.3.2019 32min</td>
</tr>
<tr>
<td>Team leader 4</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>7.3.2019 53min</td>
</tr>
<tr>
<td>Team leader 5</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>8.3.2019 28min</td>
</tr>
<tr>
<td>Team leader 6</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>1.3.2019 38min</td>
</tr>
<tr>
<td>Consumer business stakeholder 1</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>6.3.2019 31min</td>
</tr>
<tr>
<td>Production unit stakeholder 1</td>
<td>1-to-1 discussion</td>
<td>Co-creating the improved process</td>
<td>4.3.2019 36min</td>
</tr>
</tbody>
</table>
As shown in Table 2, Data 2 and Data 3 collection rounds had management and stakeholder workshop(s) as their main collection method. Workshops were planned in advance so that results from the current state analysis in Section 3 and the theoretical framework in Section 4 were applied in an organized way to co-create a basis for proposal. One-to-one discussions were used to supplement the data, whenever clarifications are needed.

Table 3 lists the company internal documents used for the current state analysis (Data 1). The documents were used to gain an understanding of how the current process is designed and documented before proceeding with stakeholder interviews for collecting in-depth information for the current state analysis. The data from the documents and understanding based on the data were used to formulate questions for the interviews.

### Table 3. Internal document used in the current state analysis for Data 1.

<table>
<thead>
<tr>
<th>Name of the document</th>
<th>Type of the document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized Networks &quot;Way it works&quot;</td>
<td>Internal documentation system (Intranet), 4 web pages</td>
<td>Description of and instructions for using the current framework-level Kanban-based “process”</td>
</tr>
<tr>
<td>Centralized Networks Epics</td>
<td>Jira Agile board</td>
<td>Department-level Kanban board</td>
</tr>
<tr>
<td>Team Kanban</td>
<td>Jira Agile board</td>
<td>Team-level Kanban boards (five boards)</td>
</tr>
<tr>
<td>Company organization structure</td>
<td>Intranet web page</td>
<td>The organizational structure of the case company</td>
</tr>
<tr>
<td>Network Services organization</td>
<td>Powerpoint file</td>
<td>Organizational chart of the unit in which the case organization belongs to</td>
</tr>
</tbody>
</table>

As shown in Table 3, the Centralized Networks “Way it works” describes the current framework-level Kanban-based “process”. Furthermore, the documentation contains instructions for using the Kanban board tool in use in the case organization. Centralized Networks Epics and Team Kanban boards are the boards currently in use within the Jira system. They are used to document the statuses of work within the current “process”. 
All the data collected were analyzed using the means of thematic and content analysis. Majority of the data was collected for the current state analysis, for establishing the current state of the framework-level process for mobile telecommunications centralized services operations & maintenance (Data 1). The findings of the Data 1 analysis, including strengths and weaknesses of the current process, are discussed in Section 3 of this study.
3 Current State Analysis of Framework-level Process for Mobile Telecommunications Centralized services Operations & Maintenance

This section discusses the results of the current state analysis (CSA) of the case company’s framework-level process for mobile telecommunications centralized services operations & maintenance. The focus is on identifying the main weaknesses/challenges, which make it difficult to achieve shorter delivery cycle of new software features and fixes into network, of the process to be improved.

3.1 Overview of the Current State Analysis Stage

In this study, the CSA was conducted in four phases. First, the existing documentation of the CSO&M process was retrieved from the case company’s internal documentation system and analyzed to establish an overview of the process.

Second, the study utilized an ongoing effort within the case company to map out the usage of Kanban methodology and tools within the organization. For each team within the case organization, a workshop was arranged to walk through a Kanban status analysis sheet used by the company. This phase was conducted to establish a basic understanding of the current reality with regards to implementation of the process as defined in the documentation. Summary of field notes for this phase can be found in Appendix 5.

Third, based on the first and second phases, interview questions were formulated for clarifying things and for gathering additional information on strengths and weaknesses of the process. This phase consisted of interviews of members of the management team of the case organization and representatives of most relevant company internal stakeholders who give inputs to the process. This phase was conducted to strengthen the documentation-based understanding of the process with experiences and views of management and stakeholders. Summary of field notes for this phase can be found in Appendices 6 and 7.

Finally, the study triangulated the findings by utilizing the specialist’s viewpoint. This phase consisted of an online questionnaire form which consisted of qualitative questions. The questionnaire, instead of interviews, was selected for this phase to overcome the difficulties of finding common timeslots from calendars, as well as allowing for responding anonymously, therefore removing any hindrance of responding freely. Summary of field notes for this phase can be found in Appendix 8.
3.2 Case Organization within the Organizational Structure of the Case Company

Figure 2 shows the organization of the case company, with the case organization of this study indicated with green color.

![Organizational Structure Diagram](image)

Figure 2. Organization of the case company.

As shown in Figure 2, the organization is divided into three main business units, two of which are the customer units having the ownership of the products and services and customer-facing processes for their respective customer segments. The third unit is the production unit with ownership of the technological platform as well as the service production processes. Support units are responsible for their respective areas over the whole operations of the company.

The Centralized Networks department, the case organization utilizing the CSO&M process, resides in the Network Services sub-unit within the Production unit. The two main internal stakeholders within the case company, who give tasks to the process, are subscription services business departments within customer-facing Consumer and Corporate Customers business units. The third main source of tasks to the process are the Centralized Networks department itself as well as various other departments within the Production unit. The Centralized Networks department plans, develops, maintains and operates all the centralized network elements of the case company's mobile and fixed telecommunications infrastructure used to provide subscription services to customers. Centralized does not include network elements belonging to access networks and business support systems or operations support systems. These systems are maintained...
elsewhere within the organization. Datacenter operations do not belong to the responsibility of the department, either.

The Centralized Networks department itself is divided into five teams, with each team responsible for a technological segment of the total area of responsibility of the department. These teams are shown in Figure 3.

![Figure 3. Structure of Centralized Networks department.](image)

As shown in Figure 3, the teams marked in blue are actual teams, while teams marked in yellow are matrix functions for the whole sub-unit, which are located in the department but are not part of the scope of this thesis. Each team consists a number of specialists. Specialists within the teams have their own areas of specialization. Specialist’s roles also vary, some of them being generalists doing almost any kind of tasks, but some of them focusing on certain types of tasks only such as development and planning, or operations. The variation of roles and responsibilities is not similar from team to team.

3.3 Current Framework-level Process for Mobile Telecommunications Centralized Services Operations & Maintenance

This Section establishes the current framework-level process for mobile telecommunications centralized services operations & maintenance. The text is further divided into three Sections. The first of them provides with detailed description of the process, while the next two subsequently detail out department level and team level Kanban procedures as they are defined.
3.3.1 Detailed Description of the Current Process

The purpose of the process as a framework-level process is to guide all work done within the case organization regardless of the type of work, actually the management process for the case organization. The current process as such was defined in August-September 2018 during an organizational change project which resulted into the current organization and current process. The process has been gradually adopted into use towards the end of year 2018, replacing existing line organizational management with a management process.

All tasks destined for the case organization are input to the process, regardless of the source of the task, be it a different part of the organization of the case company, an external partner or another process within the case company. The way the task enters the process, however, may vary depending on the source of the task. Figure 4 shows the framework-level process for mobile telecommunications centralized services operations & maintenance.

![Diagram of the framework-level process](image)

**Figure 4.** Framework-level Process for Mobile Telecommunications Centralized Services Operations & Maintenance.

As shown in Figure 4, the flow of the process is shown over a period of time. Tasks are allowed into the process at a weekly cycle. Department level and team level Kanban tables are used in the process to manage tasks. These Kanban tables and their processing are described in detail in Sections 3.3.2 and 3.3.3, respectively.
Stakeholders are presented on the top of the picture. Tasks from stakeholders, depending on the type/size of tasks and type of stakeholder, may reach the process either via the management team of the case organization or via the specialist within the organization. Tasks from the case organization’s strategic action plan are typically introduced to the process via the management team. Smaller tasks and even minor projects, however, often enter the process via specialists. Tasks may also originate within the organization. All incoming tasks are recorded to the Kanban backlog queue until decision to start work on them is made. Status review of existing tasks, allocation for teams/specialists and prioritization of new tasks is done at Kanban standup meetings. The weekly Kanban standup meetings are held separately on the department level, with the management team attending, and on the team level, with everyone in the team attending.

Department level Kanban standups deal with epics, which are either strategic action plan items or other larger projects. The size and duration of an epic may vary, from one week to half a year. Only in exceptional cases epics last longer than half a year. Epics are started and assigned to a team or often to multiple teams at a department standup. Epics requiring special attention are escalated for the meeting for example for inter-team coordination of work scheduling. Epics which are completed are reviewed and their status moved to done. At the department level, a number of epics may be in progress at any given point of time. Each epic typically consists of a number of tasks.

Team level standups deal with epics assigned for the team and tasks within the epic, or individual tasks if such exist. Each team has a number of epics labeled as “ongoing work” for routine tasks, for small project-type tasks and small tasks originating from other processes such as incident management process. These epics are never shown or dealt with on the department level standups. Tasks are typically shorter than epics but may last almost as long as an epic. Tasks within a large epic can be parallel or sequential. Some tasks can be done in parallel, while others require other tasks to complete as a prerequisite. Epics are planned into tasks typically at the team level, recorded to the backlog within an epic and decided upon on the standups.

3.3.2 Department Level Kanban

Atlassian/Confluence JIRA is used as the electronic Kanban tool within the organization. All epics and tasks are handled in the JIRA Kanban boards. There is one department-level Kanban board for epics. The department level Kanban board is shown in Figure 5.
Figure 5. Screenshot of the department level Kanban with company-sensitive details obfuscated/removed.

As shown in Figure 5, an epic can have five states during its cycle in the process. Epics progress across states from left to right on the Kanban board. The first state is labeled “To Do” in the JIRA Kanban where incoming tasks are recorded. After an epic is accepted into Kanban, it will be moved to the state labeled “Starting”. Planning for the epic and its tasks are done across the teams.

After it has been decided at a Kanban standup to start work on an epic, it is moved into “in progress” state. Kanban “Work In Progress (WIP)” limits are not in use, meaning that there can be a large number of epics in progress at any given moment. If an epic in progress is on hold for some reason, there is some kind of showstopper slowing down the work or preventing it completely, or a high prioritization for the epic is requested, the epic can be moved to “escalated” state for the next department level standup. After discussions the epic is moved back to the left to the “in progress” state if the issue can be resolved, otherwise it in left to the “escalated” state. An epic that remains in the “escalated” state indicates that it is not progressed. When the work on an epic is completed, it is moved to “Done/Closed” state before the Kanban standup.

The department level Kanban standup is arranged every Wednesday afternoon, lasting maximum of one hour. Once a month, epics are re-prioritized at the department level Kanban standup. The priority of epics is indicated by their order on the Kanban table.
from top down – items on the top have highest priority. The priorities reflect the short-
term importance of epics. Standups are not used for planning.

Figure 6 shows a connection from an epic on the department level Kanban to tasks on a team level Kanban.

![Screenshot showing the connection between department and team Kanban.](image)

Figure 6. Screenshot showing the connection between department and team Kanban.

As shown in Figure 6, epics are also visible on the team level Kanban of each team to which it has been assigned to. Each epic consists of a number of tasks. Consequently, a task must belong to an epic. There are placeholder epics for smaller tasks that do not fit into any of the other epics or are launched independently of an epic.

3.3.3 Team Level Kanban

Each team has their own Kanban board, which shows the epics assigned for the team and tasks which belong under an epic. Figure 7 shows an example of a team level Kanban board.
As shown in Figure 7, each task can have five states in the Kanban. In principle, the states follow the same logic with the epics on the department level Kanban. Each task must be assigned to a specialist as it is moved to the “in progress” state. Each team prioritizes the tasks they are working with. Each team follows the priorities of epics on the department level Kanban. This requires ongoing discussion between the team and other teams in the department to align priorities of tasks.

The team level Kanban standups are arranged once a week, but the schedule varies from team to team. At the team standup work in the “in progress” state is the walked through, with emphasis on the tasks which are on the “blocked” state. The team then decides on the tasks to be started and moved from “to do” to “in progress” state.

3.4 Findings from the Current State Analysis

This Section presents the key findings from the analysis of the current CSO&M process grouped around the main analysis topics.
3.4.1 Kanban Utilization

Based on the analysis results, the Kanban based process and utilizing the Kanban boards is still in its learning phase. The boards are mainly used for visualization. There are a lot of ongoing tasks hidden from the department level Kanban board because many tasks, belong to epics dedicated for so-called ongoing work. These epics are hidden from department level Kanban. Ongoing work epics and tasks belonging to these are not reviewed at the team level Kanban standups.

Based on the results from Data 1, there was some confusion of the product owner role, its purpose and of the persons vested with the role. The role and the definition of product were not understood from actual end customer service/product offering perspective. Stakeholders representatives were not recognized as product owners either. Stakeholders interpreted products as something being part of offering towards customer and belonging to their responsibility.

Based on the results from Data 1, Kanban was not updated and checked upon daily, and daily standups were not held. Existence the department level Kanban containing the epics was not clear. There is also a lot of work completely missing from Kanban system, since because of ad-hoc tasks arriving from various directions and change resistance the specialists do not enter all tasks into the system. Most of the planning work is done outside of the Kanban system and scheduled meetings within it. One of the specialists expressed it in the response to the questionnaire in the following way:

“Planning meetings are mostly missing. Planning is not visible to others and often not visible on Kanban backlog. And what about Kanban of the whole organization? It would be helpful to be able to move Kanban cards within the organization if they are blocked of wait for actions from elsewhere.” (One of the specialists)

Instead, the planning is done by individual specialists or ad-hoc groups of the specialists in separate meetings or casually at the office desk. Only indirect communications, separately by specialists and by management take place between the case organization and those responsible for business planning and business decisions.

To add to the findings, the purpose of many key elements of the Kanban and lean/agile principles was unclear to part of the participants of Data 1 workshops. Some other elements were understood, but not fully utilized.
3.4.2 Competencies, Roles and Responsibilities

Based on the process analysis and results from Data 1 workshops, the roles, responsibilities and competencies are not documented within the process itself. Documentation and development of these is mostly done via semi-annual development discussions, held for each specialist individually by their direct supervisors. There is long-term competence risk associated with aging employees, the average age in most team being well over 50 years. This will not realize over the next few years, but rather on a time-span of about ten years if new generation of specialist is not developed gaining knowledge from the current employees before they retire.

Additionally, the specialists have tight roles and siloed competencies. There are difficulties in developing real competency. Even though there would be sufficient time to attend training courses on new technologies, learning does not really happen if the courses are not supported by getting to use the newly acquired knowledge hands-on to turn it into skills. This, in turn, is hindered or sometimes even prevented by the before-mentioned heavily siloed roles.

The subject matter skills are at sufficient level in the case organization as a whole. However, subject matter skills are not evenly distributed among specialists within teams resulting in tasks getting personalized. Certain specialists are needed to handle certain tasks.

3.4.3 Management Challenges

Based on the results from Data 1 interviews, department-level management challenges are connected to tight schedule of meetings, but also have to do with the double-role of team leaders as leading specialists. Furthermore, more time for co-operational management would be needed. With these constraints, there are difficulties in managing inter-organizational communication and co-operation both within the case organization as well as towards the major internal stakeholders.

Based on the specialist questionnaire, change resistance towards adopting the Kanban system represents a managerial challenge with the relatively new process. An example of change resistance, possibly induced by the earlier mentioned issues with utilizing the Kanban, by one of the specialists responding to the questionnaire:

"Waste is created. JIRA Kanban is frustrating – first we use time for filling in the Kanban tasks, then we read and explain them to our supervisors on weekly basis … And next week we read them again." (One of the specialists)
From the specialist perspective, the change resistance was associated with the extra work it was seen to cause, as the organization had not dropped any of its previous meeting schedules, as well as reporting and planning meetings.

3.4.4 Process Throughput and Workload Management

Based on the results from Data 1 workshops, the means for measuring the amount of work done on epics and associated tasks over a period of time is not implemented, meaning that there are no effective means for workload-based or time-based measurement of throughput of the process. The relative size of the epics and tasks is not currently estimated. The tool of the Kanban system to control the number of tasks in progress, work in progress (WIP) limit, is not used. Instead, almost everything is prioritized and moved to “Ongoing” state right away. As a result, there are lots of epics and tasks in progress at any given moment. As a numerical example of this, at the time the workshops were conducted there were 55 epics in progress for the whole department, with one example of a team having 14 ongoing tasks with 17 more in the blocked state.

With the current meeting cycle, where department level Kanban standups happen once a week, with team level standups in between, it takes at least a week and usually more to start a new epic. Upgrades are typically planned about half a year in advance to get them through in the middle of other urgent work. An upgrade requires some planning and other preparations before the upgrade and testing after it. In the current situation where all tasks get basically the same priority, it may take two months to complete single upgrade cycle. Some upgrades even need to be skipped because of lack of time.

It was also complained that there is not enough time to manage and develop the process, or with specialists to work according to the process properly.

"Larger units of work should be progressed, but the work gets fragmented into small tasks. There has been quite a lot of ad-hoc work. Need to go where the largest fire is. I haven’t had time to take a look at the Kanban board for the last two weeks." (One of the specialists)

Based on results, no real team level product (or task) backlogs are in use, although some teams use a Kanban backlog. On the department and team levels, the “To do” Kanban state and respective part of the Kanban board are used to indicate task queue. The prioritization of items (epics and tasks) is only vaguely connected to real business value of them. Furthermore, demo to the stakeholders do not take place.
3.4.5 Process Input and Output

Based on the results from Data 1 interviews, there are inefficiencies in conveying the information back and forth to the stakeholders. All the business decisions are made within customer facing business units. These decisions are communicated towards the case organization (and the Production organization as a whole) primarily through the strategy process where the senior management of both of these prepare the strategy and associated action plan together. Customer focus gets distracted because or communication weaknesses. As informant 14 commented:

*The customer is quite often forgotten. Things may go back and forth. The production doesn't always get enough information, either. Things can often be tackled on only after something has gone wrong in a hard way.* (Informant 14)

As the comment shows, customer specific information is not conveyed within the case organization. In the case of urgent needs emerging from business units, the first point of contact towards the case organization is the demand management function of the production unit, a function which is another role of the unit’s development director.

Based on the results from interviews and questionnaire, many tasks towards the case organization are initiated either by members of the case organization themselves, other departments within the production unit or by external partners. An example of informant’s comments showing message which repeated many times:

*Mostly from colleagues in neighboring teams, a bit less from my team leader.* (One of the specialists, when asked from where the tasks come from)

These tasks have no connection towards the business units. Still they are to be completed within the process and may have tight schedules. Furthermore, especially smaller tasks actually are received from multiple sources over multiple means of communication.

3.4.6 Long Term Planning and Technology-Service Visibility

Based on the results from Data 1 interviews and questionnaire, not enough in advance information of customer needs gets conveyed and mapped to technological opportunities/developments. Similar problem is seen from the other side of the organizational border as well – the business units would need more information on technological developments and opportunities they provide than is available to the from the case organization.

As Informant 15 put it:
There are challenges with up-down (in-silo) communications as well as between lower levels of both organizations. Communication deficiencies cause too much urgent extra work. (Informant 15)

In other words, both parties as an organization see a need to understand why to develop – and what can be developed – which to their comments is not fulfilled with the way the current process takes inputs.

Both from the customer unit stakeholder perspective and from the case organization perspective, it was clearly indicated that there is a need for common roadmap thinking – what needs to be built and when. As informant 15 stated:

“Over the last years it has been a little bit unclear how much the business unit should keep themselves aware of technological opportunities and how much they should drive development – and also how much the production should present information. More direct and formalized communication would be necessary. Otherwise the competitor might bring new services out of nowhere.” (Informant 15)

In the current situation the organization is siloed, causing barriers to communication and interaction both from silo-to silo at various levels as well as within a silo between various level of organization. Service development often proceeds on ad-hoc basis in terms of budgeting and technological preparedness. Reporting and prioritization of action plan items and large projects does not involve lower levels of organization, the specialists.

Technology forums, which are organized about 2-4 times a year are the only means to convey information for wider audience about technological developments. There are lot of informal direct contacts at various levels between specialists, but not they are not part of the structured, managed way of providing input and output to and from the process. Rather, these communications are reactions to clarify and manage the tasks received.

3.5 Summary of Strengths and Weaknesses from the Current State Analysis

This section summarizes the key findings from the CSA, dividing them into strengths and weaknesses. The findings are shown in Figure 8. The logic of the visualization follows the headings of Sections 3.4.1 – 3.4.6. Strengths are indicated with a “plus” sign and weaknesses with a “minus” sign. Where an item falls somewhere in between, it is indicated with “plus/minus” sign.
Figure 8. Summary of the key findings from the analysis of the framework-level process for mobile telecommunications centralized services operations & maintenance
As shown in Figure 8, the key findings from the process analysis grouped into six categories. In each of the categories, some weaknesses were found out. As the focus of the CSA was on finding the areas to be improved and the process is relatively new, major strengths were not found within each category. Each of the categories can, therefore, be thought as a problem area. To summarize the findings, each of the problem areas surrounding the ultimate target of the study – to propose an improved framework-level process for mobile telecommunications centralized services operations & maintenance based on lean/agile principles to enable the case organization achieving shorter delivery cycle of features and fixes into its network – are briefly described.

Starting from the problem areas on the left side of Figure 8, there are three problem areas which are closely related to the process but not exactly within the process. Starting from top down, (1) Kanban utilization indicated that procedures and tools are still in adoption phase and not utilized in full, also hindered by difficulties with the tools in use. (2) Competencies, roles and responsibilities, while being defined and sufficient at overall level, are not evenly distributed within teams. Competencies and related roles of specialists vary from team to team, with some tasks getting personalized to the level that only a few people have sufficient knowledge (and even access) for accomplishing tasks. Furthermore, skills and knowledge regarding lean/agile principles, including Kanban, are not at sufficient level for effectively utilizing the current process. For (3) the Management team of the case organization, while being committed to change, the greatest challenge is related to time. They don’t have sufficient time for developing the process together. In more general terms, they have such schedules which don’t leave them enough time for co-working, for planning and coordinating actual work. They also face change resistance within the case organization.

Continuing with the problem areas on the right side of Figure 8, two of the three, (4) Process input and output as well as (5) Process throughput and workload management, are directly within the process, while the third, (6) Long-term planning and technology-service visibility is closely related to both. Key findings related to process input and output indicate that a strength, managing action plan items in a structured way, happens in a slow manner related to the objective of this study. Weaknesses found are, that there are many and varying sources of smaller tasks, that currently it takes more than week to launch a larger task according to the process and that with the task not enough information of what and for what purpose needs to be accomplished, indicate areas for development.
Considering the *long-term planning and technology-service visibility*, main weaknesses are that not enough information of technological opportunities and customer needs to be fulfilled get conveyed from main stakeholders to the case organization and vice versa. This is further complicated by the finding that the specialists have even worse visibility to the information than the managers, while the specialists are expected to deliver up to the needs. These contribute to a need of working in an ad-hoc style.

Finally, even though the *process throughput* is seen sufficient over a longer period of time, in the process throughput and workload management there are weaknesses as well. First of the weaknesses, that there are no limits for tasks in progress means that all incoming tasks are basically progressed regardless of the relative size of the tasks or how many tasks there already are in progress in a best effort manner. This, in combination with all the work not being visible on the Kanban, leads to the specialists having difficulties in completing everything they are tasked with within their working hours. To add to the complication, workload is not always evenly distributed, with difficulties of distributing large tasks for multiple specialists within multiple teams.

### 3.6 Selection of the Problem Areas/Weaknesses for Improvement

To sum up, the CSA found that there are two types of problem areas. The problem areas of the first type first are closely related to the process but not in direct relationship with the process. The problem areas of the second type are in direct relationship within the process. The problem areas of the first type are something that need to be improved but are of such nature that they will be improved anyway as a part of ongoing adoption of the process.

Furthermore, as the timeframe for this study is limited, it is necessary to focus improvement efforts on the problem areas of the second type, those having direct relationship and therefore greater influence with the process and the business problem. These - *process input and output, process throughput and workload management*, and *long-term planning and technology-service visibility* - are shown in Figure 9.
As shown in Figure 9, there are problems in long-term planning and technology-service visibility, influencing the process input and output. With gaps in information flows related to the first, the latter inevitably suffers from lack of beforehand knowledge. These two subsequently influence the process throughput and workload management. Without having all the participants of the process sufficiently informed, progressing tasks becomes more time-consuming as time needs to be spent with pulling all the information together.

The lack of information also prevents effective prioritization of work, leaving attempting to progress all tasks within the process simultaneously as the sole option. With unpredictable throughput and increased workload, combined with communication weaknesses, the feedback needed for long-term planning and technology-service visibility is not conveyed clearly enough. For these reasons, process input and output, process throughput and workload management, and long-term planning and technology-service visibility are the selected problem areas with weaknesses on which this study focuses thereafter.

In the next section, section 4 relevant literature is studied and a conceptual framework for improving the selected problem areas will be established.
4 Existing Knowledge on Lean and Agile Principles and Frameworks for Improved Process

This section focuses on exploring best practice and existing knowledge related to the problem areas identified in Section 3. These problem areas relate to the process input and output, process throughput and workload management, and long-term planning and technology-service visibility. Next, this section discusses how to improve the efficiency of process throughput and workload management utilizing Lean and Agile principles. Then, it proceeds with identifying Lean and Agile practices for improved process input and output, and then continues by exploring existing knowledge of scaled-up Lean and Agile frameworks and industry best practice of utilizing them for long-term planning and technology-service visibility. The section ends with establishing the conceptual framework for this study.

4.1 Efficiency for Process Throughput and Workload Management

This Section 4.1 shortly discusses fundamental principles of lean and its applicability for various types of tasks discussed in Section 4.1.1, followed by discussion on the agile principles for development-type of work in Section 4.1.2. Section 4.1.3 then concludes by focusing on the “Leagile” approach for managing all types of tasks within a single process.

4.1.1 Understanding the Applicability of Lean

To understand the applicability of Lean approach for various types of work, the principles of lean (Womack and Jones 1994; Staats and Upton 2011) are that lean is characterized by attention to detail, experimentation based on observations, seeking for increasing efficiency and eliminating waste. Poppendieck and Poppendieck (2014: 3) define Lean in the context of software development as “a mindset”. Lean divides work in three categories, these being value-adding activities, non-value-adding but required activities and non-value-adding activities.

The focus of lean is to remove the unnecessary non-value-adding activities to improve customer value (Wang et al. 2012). By focusing on customer satisfaction and ultimately value, lean thinking raises to the strategic level above operational level of lean (Hines et al. 2004). Lean thinking has some similarities to agile in terms of focusing customer satisfaction. According to Hines et al. (2004), lean thinking sees two ways of increasing
customer value and thereby satisfaction: by reducing waste and developing customer value by developing new services; or by amending existing services with new features. Wang et al. (2012: 2) describes the concepts of lean thinking to include understanding that the value is defined by the customer that each step of the process should add to the value, that products or services are delivered just in time and that perfection in the process is continuously sought for. Lean thinking can be applied to anything from a process to entire company (Wang et al (2012: 4).

From the Process throughput and workload management perspective prioritized as one of the focus areas in this study, lean is suitable for managing repeatable well-defined work. For work requiring more visionary, development-type approach, however, there are other more suitable approaches as development work is easily categorized as non-value-adding waste in Lean approach. Principles of more suitable approaches for development work, agile approaches (Staats and Upton 2011), are discussed in the next section.

4.1.2 Agile Principles for Development Work

Widely established by the Agile Manifesto (Agile Alliance 2011), Agile started as an umbrella term for adaptive software development but has spread to other development work and more generally to management of work (Davidson and Klemme 2016: 1; Denning 2016: 3). Vallon et al. (2018) define agile as a method for creating of supporting rapid change while contributing to the value perceived by the customer. Agile methods differentiate from lean in many ways, somewhat explained by the four principles by Hines et al. (2004).

First, agile aims to satisfy the customer by tailoring, where lean tries to eliminate waste by standardizing work. Second, agile focuses on customer satisfaction, while lean is based on measuring process performance and output. Third, agile allows for unpredictability – unexpected types of tasks are accommodated – whereas lean avoids it, trying to plan ahead and optimize the workflow. Fourth and final principle, compared to lean being originally designed for manufacturing and trying to optimize the supply chain as well, agile allows for keeping stock to be able to serve the unexpected. Davidson and Klemme, (2016: 1) and Boehm and Turner (2005: 3) add to these principles that agile work is done by self-organizing, cross-functional (Denning 2016: 2-3), teams and agile method must be of iterative nature where results are achieved through multiple incremental cycles. Davidson and Klemme, (2016: 1) further add that agile work is focused on fulfilling the customer’s needs and that the level of fulfilment is assessed on every
cycle (iteration) of the process. This form the basis for prioritizing work for each cycle, which is on the responsibility and authority of the team Davidson and Klemme (2016: 3).

In addition to agile principles, Vallon et al. (2018: 2) distinguish between agile principles and agile practices which are used within various agile methods such as daily standups, retrospectives and customer collaboration, arguing that agile practices can be used either in their original form or in a form adapted for a particular purpose. For successfully implementing agile practices, the organization needs to identify a suitable agility level, to be found in the areas of work where requirements are changing rapidly or where the approach or requirements are unclear at the beginning (Boehm and Turner 2005: 3).

A characteristic of an agile organization, as argued by Denning (2016: 5), is that “instead of a giant warship it is more like a bunch of high-performance speedboats”, meaning that the organization is a network where each participant understands the goal and is focused to delivering value to the customers. In an agile way of organizing work, according to (Boehm and Turner 2005: 9; Davidson and Klemme 2016: 3-5; Denning 2016: 4; Denning 2017: 6-7), the emphasis is on value, both the value delivered to the customer and the value of the members of the organization taking part in the work.

Summing up, Lean is not suitable for every imaginable type of work, being most efficient for repetitive tasks. This section has established that Agile is fills the gap by providing for rapid, incremental development. However, neither Lean or Agile alone can provide for the process dealing with full complement of tasks concerning development, operations and maintenance. For these purposes, Section 4.1.3 progresses on combining Lean and Agile approaches together.

4.1.3 "Leagile", Combination of Lean and Agile

As Repenning et al (2017: 6) argue, both lean and agile methods make the examples of dynamic management of work, continuing that trying to handle both well-defined, limited tasks and development work within exactly the same process lead into difficulties. For service or product development, Beaumont et al (2017: 4) recommend an iterative (agile) approach for clarifying the requirements and thereby reducing uncertainty. To have the competencies for the task at hand, Repenning et al. (2017: 6) find it critical to identify the individuals with competency rather that roles, functions or departments. According to Beaumont et al. (2017: 4), teams with members nominated to the team only for the purpose of the task at hand based on their competencies are needed.
For service development, waterfall or stage-gate approach also used in Lean, can be used in combination with Agile approach (Cooper 2016: 2-3). However, in the view of Beaumont et al. (2017: 5), it is better to implement the waterfall-type (phase-gate) and agile paths and process pipelines side by side, for having proper methodologies available for both well-defined repetitive work and for creating new services through development work. According to Ebert and Paasivaara (2018: 2), these types of approaches combining lean for repetitive work and agile for service development are currently utilized to address industry needs. The term “Leagile” describes the combination approach (Wang et al. 2012). The approach is shown in Figure 10.

Figure 10. Combining phase-gate (lean) and agile approaches. (Adapted from Beaumont et al. 2017: 6).

As shown in Figure 10, common portfolio planning is followed by two separate process pipelines as described by Beaumont et al. (2017: 5). The phase-gate pipeline, which can also utilize lean approach, provides for incremental development, minimizing the time-to-market for small improvements when the requirements are clear. The agile pipeline, in contrast, provides for developing completely new where the results are somewhat unclear at the beginning. The agile pipeline handles most of the development initiating from company strategy or from co-creation with the customer. The two pipelines merge again for production, distribution and support of the products or services. The same personnel can act as resources to both pipelines (Beaumont et al. 2017: 5-6; Repenning et al. 2017: 9). Interestingly, Beaumont et al. (2017: 5) suggest creating a “studio mode” of working for cases requiring agile approach – a certain common window of daily work time of specialists is dedicated to processing tasks requiring agile work. If there are no tasks in agile work queue, the time is used for working on the backlog of tasks or progressing tasks in the other process pipelines. (Beaumont et al. 2017: 5; Repenning et al. 2017: 9)

Summing up, the suggestion from literature regarding the parallel paths through the process could allow for the efficient process throughput and workload management prioritized as the third focus areas in this study. It can be done by combining features of Lean
and Agile approaches. In the combination approach, tasks are directed through dedicated process pipelines for repetitive well-defined tasks and development tasks. Directing the tasks through dedicated pipelines ensures that required schedules with each task are met, while the workload in the process remains manageable.

The principles established in Section 4.1 above are further discussed and developed in Section 4.2 by exploring the practical frameworks for Lean and Agile.

4.2 Improved Process Input and Output

This section explores best practices existing in Lean and Agile frameworks. Section 4.2.1 elaborates on the utilization of the Kanban system for horizontal and vertical expansion for end-to-end process coverage, as well as for controlled process flow. Section 4.2.2 looks closer into Scrum to find means for incremental, quick response for urgent work. Section 4.2.3 combines elements from Kanban and Scrum together into Scrumban process framework which prioritizes work items based on the cost of delay.

4.2.1 Expanding Utilization of Kanban

Kanban is defined as a system for implementing lean principles by optimizing the flow through the process (Ahmad et al. 2018: 3). Kanban intends to make full use of the capabilities of the company’s employees, for the process output to match the demand just in time. In the field of software development and testing, the Kanban approach as a form of implementing lean (and in some cases agile), is one of the more recent tools to be introduced (Wang et al. 2012: 3).

Kanban focuses on limiting the amount of work in progress to maintain a continuous flow through the process (Anderson and Carmichael 2016; Wang et al. 2012: 3). According to Wang et al. (2012: 3), excess work in progress is seen as waste within the Kanban system, reducing the effectiveness of the process. The system uses Kanban boards for visualizing and controlling tasks within it, shown in Figure 11.
As shown in Figure 11, work items (tasks) progress from left to right on the Kanban board on its way through the Kanban system. Starting from the left, from a pool of ideas (input), proposals are formed. From proposals towards right, items are work in progress – someone is actually working on them. Work in Progress (WIP), a multitasking limit, is used to control the amount of work in progress (Ladas 2009: 1130). The WIP limit is the count of work items in progress at any given moment. The whole idea of the system is to keep the amount of work in progress at such a level that the time starting work on an item to delivery (the item is completed), the lead time, is kept at predefined, low level. There is a law (Anderson and Carmichael 2016: 16; Burrows 2014: 2649) defining the delivery rate

\[
\text{Delivery rate} = \frac{\text{WIP}}{\text{Lead Time}} \quad \text{OR} \quad \text{Lead Time} = \frac{\text{WIP}}{\text{Delivery rate}}
\]

that establishes a constant delivery rate and shows how the increase of the WIP increases the lead time as well, slowing the throughput of the Kanban system. Therefore, it is essential to optimize the amount of work in progress. As a remedy, prioritization of work within Kanban system is based on the cost of delay of work items (Anderson and Carmichael 2016: 21), meaning the change in the amount of the item’s value lost over accumulated lead time. Items which have higher cost of delay are prioritized higher than items having low cost of delay. (Anderson and Carmichael 2016: 14-21; Ladas 2009: 1130; Burrows 2014: 2649, 2659)

A system of Kanban boards can be scaled horizontally, vertically or depth-wise either to add more process steps into single board, to break down higher level items into multiple
sub-items in a “daughter” Kanban board or to visualize dependencies for example in between items in different teams Kanban boards (Anderson and Carmichael 2016: 41-44). Horizontal scaling means that additional steps outside of the system are adopted, stretching the process accordingly. Scaling in height means that either thorough the entire system or for certain parts of it there may be more granular sub-boards providing for managing work items for smaller entities. Depth-wise scaling is meant for managing interdependencies between multiple flows of work, for example between product lines. (Anderson and Carmichael 2016: 41-44; Burrows 2014: 3213-3295)

For improving the input and output of process flow, expanding Kanban system horizontally and vertically provides for better end-to-end coverage. Wang et al. (2012: 11) argue that while Kanban share prioritization as a common feature with agile approaches, it is still focused on managing the number of tasks within the system. Instead of limiting the amount of work within a fixed timeframe Kanban limits the numbers of tasks allowed to be in progress simultaneously. Therefore, Kanban as a lean solution needs to be accompanied by other, Agile practices. An Agile practice, Scrum, is discussed in the next section.

4.2.2 Adding Agility with Scrum

Scrum is a process framework for problems where an adaptive approach is needed, consisting of Scrum teams and associated roles and procedures (Schwaber and Sutherland 2017: 3). Originating from software development, Scrum has been widely used for various types of development projects. Scrum, however, is not as well suited to managing entire organization (or a large process) as it is for managing team level work because of its team-centric nature (Reddy 2016: 721). (Schwaber and Sutherland 2017: 3)

Figure 12 shows an example of typical Scrum process flow.
As shown in Figure 12, the Scrum service or product development process begins with product backlog which consists of prioritized product features. A limited set of features is chosen by the team for each development sprint (a time-limited or “time-boxed” batch of work items).

Actual tasks for completing the features are established with priorities based on customer value, estimation of the size of the features and associated tasks, and the amount of work the team can commit on a fixed period of time. Typical length of one sprint is from one to four weeks, 30 days in Figure 12. During the sprint the team works independently on the backlog items, holding a 15 minute daily meeting each day to monitor the progress, identify obstacles and agree on next steps. (Boehm and Turner 2005: 4; Cooper 2016: 4; Schwaber and Sutherland 2017: 9-12)

During one sprint, the scrum team is a self-managing entity, making decisions of progress by themselves. The team is supported by a scrum master who typically is member of the team, either an assigned person or chosen ad-hoc for a sprint. The scrum master facilitates work within the team, helping the team organizing for tasks and removing impediments of work. The other specified role within a scrum team, the product owner represents the business and is responsible for prioritizing work based on customer’s needs and business value of the tasks. In some organizations the product owner is a product manager or even a director responsible for customer facing products. (Cooper 2016: 4; Srivastava and Jain 2017: 2-4; Schwaber and Sutherland 2017: 6-8)

Due to the incremental nature of Scrum it is suitable for responding quickly to smaller, urgent requests of work. The team-centricity of Scrum, however, makes it less viable
alternative for managing all types of tasks within a process. Since Kanban, described in Section 4.2.1, on the other hand does not provide well for small urgent tasks, a combination of Kanban and Scrum is discussed in the next section for filling the gaps in both approaches.

4.2.3 Combining Lean and Agile Elements with Scrumban

Scrumban is a system originally established for software engineering by Ladas (2009: 1158), combining the time-boxed iteration and planning of Scrum with pull-type scheduling of work of Kanban. In addition to developing new, the Scrumban system is suited for continuous maintenance of software or services where unexpected may happen. Practices from both Scrum and Kanban can be applied within Scrumban system. In a Scrumban system, practices of Scrum are typically used within micro level, while practices of Kanban are used on macro level, providing for incremental development while maintaining constant flow. In Scrumban, a shorter iteration than in Scrum is often used, but iterations of any length can be used for different purposes. As the any of the work items is finished, new item is pulled in. A Kanban table is used to control the amount of work within Scrumban system. (Ladas 2009: 1119-1189; Reddy 2016: 632; Wang et al 2012: 2)

The main improvement of Scrumban over Scrum and Kanban is division of work items on parallel process pipelines based on urgency (cost of delay). Process pipelines for various work items can be visualized by horizontal swimming lanes on a Kanban board. A number of cost profiles, or urgency classes may be established. To allow for efficient prioritization of work items within the Scrumban system, workload caused by various work items must also be weighted and indicated. Weighted workloads of work items can used to limit the work in progress (WIP) within Scrumban system. Weighting of work items can be tailored for the purpose. (Ladas 2019: 526, 533; Reddy 2016: 3447, 5558, 6598; Burrows 2014: 2549)

Scrumban promotes using reason and adapting to the situation at hand and using the tools within the system as viewed appropriate by the organization implementing Scrumban. To progress work items, any combination of sprints and continuous flow can be implemented as seen suitable. These features together allow for scalability and adaptability of the Scrumban system. Reddy (2016: 2889, 6598)
The Scrumban system provides a scalable process framework for combining lean and agile, contributing to improved process input and output. For improved scalability, however it is important to look into the existing large-scale agile frameworks and experiences of implementing agile practices from the telecom industry.

4.3 Long-term Planning and Technology-service Visibility (Based on the Examples from Telecom)

This section describes two large-scale agile frameworks out of a host of frameworks available, Scaled Agile Framework (SAFe) and DevOps, and discusses practical implementation experiences of scaling agile for larger organization from the telecom industry. Section 4.3.1 introduces SAFe and DevOps with their central ideas and practices to ensure compatibility with established frameworks for large organization. Section 4.3.2 draws together from literature experiences of companies selecting and combining best practices of multiple frameworks into their own process framework.

4.3.1 Large-scale Agile Framework SAFe and DevOps

There are number of large-scale agile frameworks and practices used within the software industry. Many of the frameworks are quite large and complicated, necessitating changing the whole organization at once (Ebert and Paasivaara: 3). Out of these, Ebert and Paasivaara (2018: 4) argue that companies within the telecom industry have experimented with Scaled Agile Framework (SAFe).

Similar to Scrumban, which was discussed in Section 4.2.3, SAFe is a combination of lean and agile (Reddy 2016: 5734). Similar concept for prioritizing work is used in both Scrumban and SAFe. The SAFe is more structured than Scrumban, providing four subsets of the framework scaling from essentials at team level to full framework for organizing a complete company for lean and agile work.

While the structure and instructions of implementing SAFe lower the barrier for adoption, it is argued by Reddy (2016: 5734) that the fixed structure somewhat reduce the agility provided, advocating a more purpose-built and flexible structure instead. The main principles of SAFe are systems thinking focusing on optimizing the whole solution development value stream, small batch size for ensuring that work items are broken down into small quickly deployable tasks, short iterations (work cycles in Scrum mode of working) and fast feedback from the end customer or from the product owner representing the customer (Scaled Agile 2019).
Regarding the DevOps, the principles of SAFe are compatible with the concept of DevOps, which is all about building a pipeline for continuous development and delivery for minimizing the lead time (Kim et al. 2016; Scaled Agile 2019). The DevOps, combining development and operations into single agile process, aims to making it safer for experimental development by breaking the work into smaller steps, making both speed of delivery and recovery from failed experiments much faster (Kim 2012). To achieve the goals of DevOps, market-oriented or product-oriented organizational structure, either virtual or actual, need to replace the functionally oriented, siloed organization. Teams within the organization should be cross-functional in the terms of existing line organization structures, consisting of all the necessary expertise for developing, maintaining and operating a service or even a portfolio of services. All activities of the DevOps product teams are made visible on shared Kanban boards through the process. Management of technical changes is streamlined in the DevOps by enabling peer review of changes – fellow specialist review changes before implementing them - and by implementing changes in short cycles as well. (Kim et al. 2016: 1968, 1982, 2050, 2334, 4691)

Both Scaled Agile Framework (SAFe) and DevOps have lean and agile as their core principles, adding practical models and tool for scaling into large organizations. Based on this section, the ScrumBan model is in principle compatible with established frameworks for large organization, SAFe and DevOps. For a complete company-wide transition into SAFe however, some changes would be needed to accommodate the pre-defined roles and procedures of SAFe. Within the DevOps model, the DevOps being more loosely defined, ScrumBan could be used as such. Section 4.3.2 below highlights the experiences from companies within telecom industry to find out how these frameworks can be implemented in practice.

4.3.2 Learning from Experiences within the Telecom Industry

To lead a step-by step transition from the traditional approach to agile approaches of organizing work, waterfall-type development (either managed by Lean/Kanban or more traditional tools) can be combined with agile development (Cooper 2016: 3).

The examples of Ericsson, ABB and Vodafone (Cooper 2016: 3) the companies were able to build agile approaches into their existing processes. In addition, Ebert and Paasivaara (2018: 4-5) describe a case example at Comptel, a subsidiary of Nokia, where the Scaled Agile Framework was successfully adopted at two separate product lines. Yet another case example from Ericsson, a transition process of product lines has taken place over recent years (Poppendieck and Poppendieck 2013: 103 – 104;
Paasivaara et al. 2018: 15-18), with similar experiences. Ericsson decided to make a phased transition to a combination of lean and agile, where traditional development was to be replaced by rapid development of features by dedicated virtual feature teams, similar to the Scrum approach. (Poppendieck and Poppendieck 2013: 103 – 104; Paasivaara et al. 2018: 15-18) Adding to the experiences and learnings, Nokia has recently introduced agile approach through DevOps into telecoms business, advocating that telecom operator companies – part of Nokia’s partner network - should adopt it as well (Nokia 2017: 2).

The key learnings from Ericsson, as discussed by Paasivaara et al. (2018: 36-40) were that successful transition into lean and agile had to do with implementing the transition step-by-step and experimenting different options, allowing for specialization – all specialists are not required to do or best suited to doing any type of task – within the process as well as implementing common agile framework for the whole organization. Additional learnings from Comptel (Ebert and Paasivaara 2018: 4-5) were that personnel need to be trained in advance to be fluent in utilizing the framework from day one and that employees need to be engaged in the transition and in the new process so that they understand the reasons for development – to change the company culture. The importance of changing the company culture is recognized by Nokia (2017: 4) as well. Kim et al. (2016: 1741) argue that creating a full-time transition team is instrumental to the successful adoption of agile.

In conclusion, for utilizing lean and agile for improved long-term planning and technology-service visibility in their processes the companies select and combine best practices from existing frameworks and from examples within their area of business into their own process frameworks, followed by company-wide adoption of the process framework. As Ebert and Paasivaara (2018: 5) argue “there is no out of the box” framework that would function perfectly. Instead, whichever framework a company chooses to implement, tailoring the chosen framework to suit the company reality – area of business, existing organization and culture to name a few – is a key to success (Paasivaara et al. 2018: 40).

4.4 Conceptual Framework for Improved Process

The most relevant elements of the topics discussed above summarize into a Conceptual Framework of this study. The conceptual framework forms the basis for improved process for mobile telecommunications centralized service operations & maintenance enabling shorter delivery cycles. Figure 13 shows the conceptual framework for building the proposal in this study.
An improved process for mobile telecommunications centralized services operations & maintenance enabling short delivery cycles.

Efficiency for process throughput and workload management

- Understanding the applicability of Lean
  * For repeatable, well defined work
    - Womack and Jones 1996
    - Staels and Upton 2011
    - Hines et al. 2004
    - Poppendieck and Poppendieck 2003

- Agile principles for development work
  * Iterative development by self-organizing teams, involving multiple levels of organization
    - Agile Alliance 2001
    - Davidson and Klemme 2016
    - Denning 2016
    - Vallon et al. 2018
    - Boehm and Turner 2005
    - George et al. 2018

- "Leagile", combination of Lean and Agile
  * Parallel paths through the process
    - Ebert and Pasvivaara 2018
    - Cooper 2016
    - Repenning et al. 2017
    - Beaumont et al. 2017

Improved process input and output

- Expanding utilization of Kanban
  * Horizontal and vertical expansion for end-to-end process coverage, controlled process flow
    - Anderson and Carmichael 2016
    - Ahmed et al. 2018
    - Wang et al. 2012

- Adding agility with Scrum
  * Incremental, quick response for urgent work
    - Schwaber and Sutherland 2015
    - Boehm and Turner 2005
    - Reddy 2016
    - Srivastava and Jain 2017
    - Denning 2017

- Combining Lean and Agile elements with Scrum ban
  * Prioritizing work items based on the cost of delay
    - Ladis 2009
    - Reddy 2016
    - Wang et al. 2012

Long term planning and technology-service visibility

- Large-scale agile frameworks (SAFe) and DevOps
  * Compatibility with established frameworks for large organization
    - Ebert and Pasvivaara 2018
    - Scaled Agile 2018
    - Kim et al. 2016

- Learning from experiences within the telecom industry
  * Companies select and combine best practices into their own frameworks
    - Poppendieck and Poppendieck 2013
    - Ebert and Pasvivaara 2018
    - Pasvivaara et al. 2018

Figure 13. Conceptual framework of this study.
As shown in Figure 13, foundations of the conceptual framework of this study are set with seeking efficiency for process throughput and workload management.

First, for improving efficiency for the Process Throughput and Workload Management, it was established that Lean is applicable for repeatable, well-defined work (Womack and Jones 1994; Hines et al 2004) and that through the Lean principles the focus is on creating value to the customer. However, Staats and Upton (2011) argue that for changing and more ambiguous work, agile approach is more suitable. The principles of agile approach, defined originally for software development, are described by Agile Alliance (2001). Agile principles rely on self-organizing teams working in an iterative, cyclic way (Boehm and Turner 2005; Davidsson and Klemme 2016). Agile principles are applicable to many types of development work, even at strategic level (Denning 2016). To utilize the principles and agile practices through the organization, a clear path for change need to be established and everyone in the organization engaged (Denning 2016; George et al 2018; Vallon et al. 2018). “Leagile”, combination of Lean and Agile, allows for parallel paths through the process by creating separate Lean and Agile process pipelines for routine tasks and for developing new (Ebert and Paasivaara 2018; Cooper 2016; Repenning et al. 2017). Beaumont et al (2017) propose dividing the time of the employees to serve both pipelines by utilizing a “studio mode” where certain fixed time window is used for urgent tasks requiring agile work.

Second, for improving the Process Input and Output, Lean and Agile practices can be used, based on Lean and Agile principles. Expanding the utilization of Kanban both horizontally to stretch the boundaries of a process and vertically to have better control of dependencies in parallel processes provide better end-to end process coverage (Andersson and Charmichael 2016; Wang et al 2012). Limiting the work in progress is the most essential feature of Kanban allowing for smooth flow through the process and for keeping the workload in control (Andersson and Charmichael 2016). For urgent tasks, however, Wang et al (2012) argue the work in progress limit alone may be a hindrance, therefore requiring the use of agile practices. Agility can be added with Scrum (Schwaber and Sutherland 2017). Scrum provides means for time-boxed, urgent request for work, as well as for incremental development of new features (Boehm and Turner 2005; Schwaber and Sutherland 2017). Due to team-specific nature of Scrum it is not well suited for larger organization (Reddy 2016). Scrumban combines elements of Kanban and Scrum (Ladas 2009), to be applicable in larger organizations as well (Wang et al 2012; Reddy 2016). In the Scrumban, work items are prioritized and weighted based on the cost of delay as defined by a prioritization policy to be carried through the process on various pipelines (Reddy 2016). Scrumban process pipelines are customizable and
can use elements of both Kanban and Scrum, while controlling the process flow with work in progress limit (Reddy 2016). The work in progress limit is based on weighted size of work items, indicating maximum total size of work in progress at a particular moment instead of just the number of items (Reddy 2016).

Third, for improving the Long-term Planning and Technology-service Visibility, utilizing lean and agile within large organizations can be utilized, together with scalable agile frameworks. Of these, Scaled Agile Framework (SAFe) and DevOps are compatible with Kanban, Scrum and Scrumban utilizing elements from these (Ebert and Paasivaara 2018; Scaled Agile 2019; Kim et al. 2016). While Scaled Agile Framework differs from Scrumban, having a well-defined structure which makes it quite complex (Paasivaara et al. 2018; Reddy 2016), the DevOps builds on flexibility and the culture of experimenting (Kim 2012). DevOps combines development and operations into a single process, taking account of all work while focusing into minimizing the lead time (Kim et al. 2016). The DevOps model advocates a market-oriented or service-oriented organizational structure responsible for the service end-to-end from development to operations, building the organization along the process pipeline (Kim et al. 2016). To implement combinations of lean and agile on a large scale, companies within telecom industry select and combine best practices from multiple frameworks and approaches into their own process frameworks, followed by company-wide adoption of the process framework (Ebert and Paasivaara 2018; Paasivaara et al. 2018; Nokia 2017). For successful implementation of a process framework combining lean and agile, the change needs to be planned and grounded well, the employees engaged to the change already from the beginning and the whole company culture to be changed (Poppendieck and Poppendieck 2013; Ebert and Paasivaara 2018; Paasivaara et al. 2018; Nokia 2017).

Based on this conceptual framework, the study continues to build the initial proposal for the improved mobile telecommunications centralized services operations & maintenance process for the case company. First, the proposal will be built on the combination of Lean and Agile to allow for smooth flow through the process and quick delivery of urgent items. Second, Scrumban practices will be utilized for creating the process pipelines with prioritization policies, allowing for compatibility with large-scale agile frameworks. After that, based on experiences from the industry, the proposed solution will be adapted to case organization’s needs, putting together suitable bits and pieces from existing literature.
5 Building Proposal for Improved Process for Mobile Telecommunications Centralized Services Operations & Maintenance for the Case Company

This section builds the proposal for the improved process for Mobile Telecommunications Services Operations & Maintenance. Section 5.1 gives an overview of the proposal building for initial proposal. Section 5.2 presents the findings from Data 2 collection. Sections 5.3 – 5.5 discuss the finding in relation to the focus areas selected for improvement. Section 5.6 puts the discussion together into the initial proposal.

5.1 Overview of the Proposal Building Stage

Three main focus areas for improvement were selected from the findings from CSA of the mobile telecommunications centralized services operations & maintenance process. The first CSA finding related to the challenges in handling all the workload consisting of different types of tasks within the process. The second finding indicated that process input was received through multitude of different channels and formats. The lack of information also prevented effective prioritization of work, leaving attempting to progress all tasks within the process simultaneously as the sole option. The third findings concerned the difficulties in conveying information of customer needs, business decisions and development of technological challenges back and forth within the case company.

Next, for building the conceptual framework, this study searched for the tools for improving these three main findings based on academic literature and business best practice. First, literature suggested that separate lean and agile pipelines are needed within the process for repeating well-defined tasks and for iterative rapid task of developing new. Second, literature suggested that the Scrum and Kanban process framework can be useful for combining Kanban for lean and Scrum for agile into a system which prioritizes tasks and places them on separate process pipelines based on the cost of delay. Third, the study also identified evidence that the companies within the telecom industry have found it necessary to select and combine parts of existing lean/agile process frameworks into their own process frameworks.

Based on that knowledge, the improvement proposal was built. The proposal was built using suggestions from the company stakeholders (Data 2) collected in two phases. For the first phase, a co-creation workshop for the management team of the case organization was organized as part of proposal building. In preparation for the workshop, a sum-
mary of the results from CSA and the conceptual framework was distributed to the participants. In the workshop, the results from CSA and conceptual framework were elaborated, continued with discussion and drafting of improvement ideas. The second phase of proposal building was based on the results of the workshop. The results were combined into a presentation, which was the further discussed individually with each of the stakeholders, including management team of the case organization as well as most important internal stakeholders within the case company.

This approach was selected to get the most out of co-creative development and further develop the results by allowing each of the stakeholders speak out their individual thoughts.

The improvement ideas and suggestions are discussed below and combined into the initial Proposal in the subsequent sections.

5.2 Findings from Data 2 Collection

For building the improvement proposal, this study gathered improvement suggestions from the main stakeholders (Data 2) that resulted in finding ideas and suggestions for improvement on all three key focus areas for development. The key focus areas with findings were 1) the Process throughput and workload management, 12) the Process input and output, and 3) the Long-term planning and technology-service visibility. The findings are grouped by focus area and shown in Table 4.

Table 4. Improvement ideas and suggestions from the main stakeholders (Data 2) grouped by key focus areas identified as challenges from CSA.

<table>
<thead>
<tr>
<th>Key focus area from CSA (from Data 1)</th>
<th>Suggestions from stakeholders, categorized into groups (Data 2)</th>
<th>Description of the suggestion</th>
</tr>
</thead>
</table>
| 1 Process Throughput and Workload Management: | a) Begin estimating the size of work items  
b) Define work in progress (WIP) limits based on size of work items and introduce into use. Utilize Kanban “pull” system as is intended  
c) experiment with the limits and estimations  
d) establish paths for different priorities/urgencies through the process | a) The amount of work in progress can’t be limited, if the size of individual items is not understood. The size of a task could be defined by various means – one could be the man-hours required to complete a task, while other could be the workload in percentage over a period of time  
b) Work in progress should be limited. It had earlier been thought of, but with no decisions. Consequently, it is important to take the Kanban-style “pull” into use, as it was understood that these go hand-by-hand.  
c) The correct limits should be found out by experimentation as the case company has |
| 2 | Process Input and Output: | a) Experiment with Scrumban-style process framework  
b) Prioritize based on value and estimate size of work items by the man-hours required to complete them  
c) All work items to be treated as tasks of different sizes  
d) Two backlogs, one as an input buffer for incoming work, another prioritized backlog from which tasks are pulled in  
e) Separate pipelines for urgent, fixed due date and standard work  
f) Do not record everything on Kanban table or similar, but utilize the system to control the amount of work | a) The Scrumban framework could be a way forward, even though it was noted that Scrumban differs quite a lot from the current limited use of Kanban  
b) Prioritization should be based on value of the work items. Some of the methods for measuring value were listed; expected turnover, measured customer experience, etc.  
c) The current classification of work items into epics and tasks might need to be abandoned, instead classifying all as tasks of different sizes.  
d) The first backlog should act as an input buffer for incoming items and the second should contain only prioritized items ready to be pulled in.  
e) Urgent tasks (to be started immediately), tasks with fixed due date and standard work mostly originating from within the case organization should have parallel pipelines with priorities.  
f) The work should not be broken down into very small items on the Scrumban table. Instead, the Scrumban would be utilized as a system, and incoming work items should be treated as such, allocating specialists directly for each item. |
| 3 | Long-Term Planning and Technology-Service Visibility: | a) Extend the process to involve planning of work and make it visible  
b) The specialist do the work planning & tell who is needed. As continuously as possible.  
c) Allocate peer-led virtual teams. Every team should be led by specialist in an architect role, not everyone capable of facilitating a peer team  
d) Virtual teams allocate time for studio mode working, daily/weekly | a) The concept of extending the process framework to cover planning phases as well was discussed. The planning and prioritization probably should involve both consumer and corporate businesses simultaneously.  
b) The specialist have key role in planning and prioritization of work, as they are the ones who really know how much effort the tasks would require. It was also suggested to keep the planning cycle short.  
c - d) Informal virtual teams have already been formed for some tasks, but it is not yet a process-wide practice. One of the teams had begun experimenting virtual teams with its stakeholders, with good experiences. Furthermore, the team pre-allocated |
basis. Line managers to help allocating
e) Plan how to effectively nominate virtual teams/specialists for tasks where the requirements and/or expected results are not (well) known beforehand
f) Align with large-scale agile developments within the company
timeslots for mutual work. These virtual teams should involve business managers (product specialists) from business units as well.
e) Effectively allocating virtual teams for urgent work should be planned for. There should be a separate virtual team in place for urgent tasks. The urgent path through the process should be able to react like the Ferrari formula 1 pit stop crew – a red team.
f) The draft summary from the workshop and 1to1 discussions is on track with the company strategy regarding agile work and adaptive organizations.

As shown in Table 4, there were multiple findings (ideas and suggestions) from the stakeholders for each focus area. To present a short overview, suggestions for (1) the Process throughput and workload management, show that it was seen necessary to prioritize work and establish guidelines for prioritization. Ideas for (2) the Process input and output, suggest designing a process framework based on ScrumBan. Suggestions for (3) the Long-term planning and technology-service visibility, indicate a preference towards extending the process through the use of virtual teams, breaking the siloed structure between the case organization and its stakeholders.

Next, these suggestions from the stakeholders are further discussed (in Sections 5.3-5.5) and build into a proposal for the improved the Mobile telecommunications centralized services operations & maintenance process (in Section 5.6).

5.3 Efficiency for the Process Throughput and Workload Management

The challenges related to 1) the Process throughput and workload management pointed to the difficulties in handling all the workload within the process while keeping the schedule. This was partly explained by the finding that there was no clear prioritization in place. Instead, all types of tasks, regardless of their urgency and relative size, were placed on the same process queue.

For solving these challenges, literature search suggested that parallel process pipelines can be defined for tasks requiring lean and agile approaches. This study also identified from literature that both of these parallel process pipelines are to be operated by the same specialists.

It means that, to be able to split the working time of the specialists for operating parallel process pipelines, prioritization procedures need to be defined and documented. In addition to the prioritization procedures, procedures of allocating specialist’s working time
and especially for finding common time windows for specialists for co-working need to be defined.

Based on the stakeholder workshop, an idea emerged that there should be three different process pipelines for various types of work items requiring either lean or agile approach. These process pipelines were thought as analogous to parallel conveyor belts in a factory. Each conveyor belt has its own specifications for tasks that can be inserted, including the urgency, size and maximum allowed lead time from insertion to output from the other end. These process pipelines or conveyor belts are shown in Figure 14.

![Three process pipelines for various types of work items requiring either lean or agile approach.](image)

Figure 14. Three process pipelines for various types of work items requiring either lean or agile approach.

As shown in Figure 14, the minimum set of process pipelines consists of one pipeline for urgent tasks that cannot wait, such as tasks originating from incident management process or urgent development tasks for key customers. The second pipeline is for regular development work with fixed due date, such as many tasks originating from the strategic action plan of the case company. The third pipeline is for processing all other work, often routines tasks such as periodical updates, planning for capabilities, and other work that can be progressed on best effort basis. Splitting work to parallel process pipelines requires that specialist’s working time is allocated for each pipeline.

Furthermore, specialists need to have allocated time to co-work together, especially for the tasks requiring urgent action. Allocation of co-working time can be achieved by Scrum or “studio” mode of working, pre-allocating daily of weekly timeslots from specialist’s calendars for each task entering the process. These timeslots are utilized when needed. If it appears that there isn’t need for a common timeslot, the specialists can use the time for progressing other tasks individually.

Based on the results from 1-to-1 discussions, it was concluded that since the case organization does not have an indefinite pool of specialists or working time available, the
work in progress – how much there is work within the process at any given moment - must be limited. As one of the team leaders expressed his thoughts:

“You need to have you mental WIP limit, each specialist, if not a written one” (Informant 22)

In other words, for effectively limiting the work in progress, prioritization of work must take place. For the existing Kanban system in use within the case organization, there are tools and procedures for both prioritization and limiting the amount of work in progress. These tools are procedures are further discussed in Section 5.4.

5.4 Improved Process Input and Output

Another challenge identified in the process was that 2) Input was received through multitude of different channels and that depending on the channel the input could be in various formats. It was identified in CSA that, after receiving the input, it was entered into the Kanban system. The variance in contents and information value of the input caused difficulties for entering the input into Kanban, requiring varying amounts of planning work not visible in the system. Due to the lack of information on the input phase, effective prioritization of work was impossible, leaving the sole option of considering all the tasks with roughly the same urgency. Even though the Kanban system is focused on limiting the work in progress, there were no such limits in place. Another element of the Kanban system, immediate pulling of more work into the process when the work in progress limit allows, was not in use either.

Furthermore, there were challenges identified in the process output, such as communication on the results of the tasks, suffered from similar challenges as the process input. Once again, there were multiple channels and formats for communicating output, with variance in the information value. These challenges for the output, which in turn is one of the sources of information for planning new features and tasks, made it difficult to close the feedback loop for continuous development.

As suggested by literature, solutions for these challenges include taking these essential features of Kanban system into use and combining them together with agile practices from Scrum to form a Scrumban process framework. The Scrumban process framework prioritizes tasks and places them on separate process pipelines based on the cost of delay – the higher the monetary value of the delay, the higher priority the task is assigned with.
As an improvement proposal, the company stakeholders suggested that the three process pipelines should be implemented as a part of Scrumban system and that prioritization of work should follow the Scrumban principles. This was suggested by the stakeholders in the stakeholder workshop to mitigate the current challenges with the input and output received through multiple channels. The proposed department level Scrumban system is shown in Figure 15.

![Figure 15. Department level Scrumban system with process pipelines.](image)

As shown in Figure 15, Scrumban system for the department level is proposed to be extended horizontally. The stages of the Scrumban system may or may not correspond to actual sections of the department-level Scrumban table. First, all work items entering the process arrive to Backlog 1 stage yet unprioritized. The main change from the current process (as described in Section 3) is that at Backlog 1 stage, all incoming items are considered as “tasks” or “work items” regardless of their source or size. One of the informants suggested:

“This was the idea already in the first place (that epics are just large tasks)” (Informant 19)

In other words, a concept of the current process of categorizing work into larger “epics” and smaller “tasks” are proposed to be replaced with the concept of “tasks” of various sizes. Second, scheduled periodical meetings or workshops are to be held for prioritizing the work items which have arrived into the backlog queue. At the prioritization event, the relevant specialists and managers together determine the priority for each item for placing the item into one of the three process pipelines defined in Section 5.3.

In addition to prioritizing, the size of each item is should be estimated. Two options for estimating the size were recognized, either by the absolute work-hours required to com-
plete the item or by required percentage of the total weekly effort of the team (or specialists) involved. At this stage it is also established whether the work item requires planning or even preliminary study type of effort before implementation. Third, prioritized and weighted work items either wait for entering the Preliminary study and planning stage, or directly move to Backlog 2 stage to wait for implementation. The concept of two-stage backlog was elaborated by one of the informants

“Exactly. We will prioritize into our To Do list (on current terminology), that is our true backlog.” (Informant 19)

Fourth, work items entering both the Preliminary study and planning stage as well as the Work in Progress stage are solely controlled by the respective work in progress limits for each stage. As capacity becomes available, work items are pulled in into the next stage. Finally, completed work is pushed out of the process and the service, feature or functionality communicated to relevant stakeholders at the demo event. The demo event can be separate event or part of the backlog prioritization and planning.

Additionally, the company stakeholders saw it important to extend the existing Kanban tables horizontally within the Scrumban process framework. Based on feedback from the 1-to-1 discussions, the framework should provide for visibility to and management of all work of the specialists, including the planning work. The stakeholders also suggested that the Scrumban should be utilized as a system of managing work instead of literally breaking work items down into atomic tasks to be recorded to a Scrumban table. As one of the team leaders suggested:

“I think we try to climb to the tree with backside first if the document everything on Kanban cards.” (Informant 20)

This comment was grounded by the argument that writing down everything would consume a lot of time, adding waste. Figure 16 shows the proposed Scrumban for teams and specialists.
As shown in Figure 16, the proposed Scrumban for teams and specialists consists of four stages. Exactly the same process pipelines as in the department level Scrumban are to be implemented. The first stage, Backlog 1, is to be populated by items from department level Scrumban Backlog 1 and Backlog 2. This way all the work items for teams and specialists will be presented towards team through a single prioritized backlog, since the priorities are already set at department level backlog prioritization event. Teams and specialists pull work from the backlog after completing previous work. Work in progress limit controls how much work can be pulled in. Work in progress limit follows the same principles as in the department level Scrumban. Teams and group of specialists hold meeting together for progressing work and for communicating with each other about blocked items or other impediments to work and the ways of solving them out. For urgent work, studio mode of working will be utilized. The formation of teams which meet and/or allocate time for working together is further addressed in Section 5.5.

At the stakeholder workshop there was a consensus that policies need to be established for determining how to prioritize the backlog, as well as how and when to pull work from the backlog. As this study found from literature, prioritization policy, in general, defines the cost of delay limits according to which work items are placed on parallel pipelines. Pull policy, on the other hand, defines whether new tasks are pulled in immediately when work in progress limit allows, what happens to other tasks when urgent tasks appear in backlog and based on what criteria a task on the fixed pipeline may be reprioritized and moved into the urgent pipeline. An apparent scenario for moving tasks from fixed to urgent pipeline might be approaching due date for a task with relatively high cost of delay.
The team leaders saw it important to determine both prioritization policies and pull policies by experimenting, redefining based on the results of experiments, and experimenting again. The approach of reaching towards goals by experimenting was familiar to the team leaders since it has already been utilized at the case company.

Additional findings by this study were that many tasks entering the process involve specialists from multiple teams within the case organization or even outside of the case organization and that preliminary study and planning phase often requires collaboration with the business units from which the development tasks originate from. There also were challenges in managing such an intra-organizational and inter-organizational collaboration. For these reasons, Section 5.5 focuses on scaling up and further extending the mobile telecommunications centralized services operations & maintenance process.

5.5 Enhanced Long Term Planning and Technology-Service Visibility

The challenges with 3) the Long-term planning and technology-service visibility, were that long-term planning collaboration between the case organization and its stakeholders suffered from difficulties in conveying information of customer needs, business decisions and development of technological challenges back and forth. It was identified in the CSA that especially the specialists indicated lack of visibility both in-silo (within line organization) and silo-to-silo (case-organization – stakeholder organizations), preventing them in-advance knowledge of development needs. These challenges ultimately led to increased sense of ad-hoc style of working.

This study found from literature that large-scale agile process frameworks do not as such provide complete solution to the challenges identified. Other relevant findings from literature were that the Scrumban process framework is in principle compatible with large-scale agile framework SAFe, even though more flexible, and DevOps methodology. The most important cornerstone of the DevOps, regarding the objective of this study and findings from CSA, is the need for organizing people according to the process and not vice versa. The companies within telecom industry had found from their experiments that establishing virtual teams, which were responsible for features/services through the process, improved both communications and end-to-end understanding of the customer’s needs. Furthermore, the experiences of other companies indicated that it is necessary to select and combine parts of existing lean/agile process frameworks into companies own process frameworks.
The finding that there was a need for common planning between the case organization and its main stakeholders (the business units) was discussed with stakeholders. One of the main stakeholders suggested common planning by saying:

“That is how it is. We need to establish an agile way of conveying information.” (Informant 26)

It was also found important that the relevant specialists, at least those working in a product manager or technology architect role, should participate in the planning meetings. As this study had indicated that lack of knowledge in business value of work items entering the process was an obstacle to prioritization, it was suggested that the planning should take place at planning meetings where all the various work items are prioritized into parallel process pipelines based on the business value and cost of delay – the urgency.

The size of tasks needs to be estimated as well for the implementation part of the process to have clear, prioritized backlog of work available to pull from. The Scrumban readily allows for the common planning by extending the system horizontally - boundaries of the process are extended so that business planning and prioritization are included in the process as well. It was also suggested by a stakeholder that

“We need to do this together, subscription services business from both consumer customers and corporate customers units and the production.” (informant 26)

In other words, it was found necessary to involve both units for establishing mutual understanding of the needs of various customer segment, thus bringing them together into a single prioritized backlog for implementation part of the process.

To allow for all the relevant specialists be available through the process for each work item the concept of virtual service or feature teams, shown in Figure 17, was discussed in Data 2 workshop:

![Figure 17. Concept of virtual teams.](image-url)
As shown in Figure 17, virtual teams can be established either for individual work items or for services, products or features. In the former case, establishing virtual teams will be a part of the planning and prioritization of work. In the latter case, the virtual team will form the organizational base for planning as well, meaning that virtual teams are tasked with prioritizing and estimating all incoming work related to their area of responsibility.

While some of the stakeholders expressed their concern of managing a number of overlapping virtual teams, generally it was agreed that virtual teams should be formed. One of the team leaders described that specialist from his team was already participating in such a virtual team concept established in the context of another product line.

“In fact, we already have the virtual team concept in use with our stakeholders … It would be helpful to have the concept in use at the unit level, if not even at company level” (Informant 23)

As seen from this comment, the experience of Informant 23 was positive, while the concept had been experimented only for a few months. The virtual teams, consisting of all relevant business specialists and technology specialists, had recurring planning and prioritization meetings, just as literature search had suggested, where each team were assigned with tasks by populating their backlogs. It was also suggested to prioritize meeting and mutual work with the virtual teams instead of line teams.

“If I need to choose, the virtual teams are the ones to hold meetings and mutual work sessions” (Informant 20)

This concern of having specialists allocated to too many virtual teams simultaneously should be managed by work in progress limits for teams and specialists as well as by pre-allocated timeslots for mutual work. These pre-allocated timeslots, studio mode of work or very short Scrum sprints allow for working together on urgent tasks or passing information and making decisions on not so urgent individual tasks.

Summing up, the challenges with long-term planning and technology-service visibility can be addressed by extending boundaries of the process to include business and technology planning and prioritization. Regular, recurring planning meetings are to be held to prioritize work items into backlog. Virtual service or feature teams are established for continuously progressing work items through the process. Next, Section 5.6 pulls together all the development proposals from Sections 5.3 – 5.5, creating a draft proposal for improved framework-level process.

5.6 Proposal Draft

The proposed framework-level process is shown in Figure 18.
Figure 18. Initial proposal for a framework-level process.
As shown in Figure 18, the framework-level process includes cyclic prioritization and planning of work items, combined with continuous implementation.

The virtual teams responsible for services, features or development projects form the core of the proposed framework-level process. Each virtual team consists of specialists from all relevant parts of the organization, extending boundaries of the process to the customer facing business units and other stakeholders. The virtual team plans its work independently, according to the policies and guidelines for the process. Each virtual team is peer-led. Typically, either a business manager or technology architect is assigned with leadership of the virtual team, though anyone with the motivation and skill can be assigned. The main responsibility of the team leader for a virtual team is to facilitate and coordinate work within the team, removing impediments of work and communicating outside of the team.

All work items entering the process, regardless of their size and importance, are initially treated in a similar fashion:

First, the work items, whether they originate from directly from customer needs, from other processes or from other sources within our outside of the case organization, are placed into input buffer, Backlog 1.

Second, the work items are prioritized based on the value – the cost of delay associated with each item – and their size estimated, according to the guidelines of the prioritization policy. Assigning virtual teams and ultimately specialists for progressing each work item is part of the prioritization. Prioritization of work items relies heavily on the specialists, as they are the ones with sufficient knowledge of estimating how much effort each work item takes and what is required to accomplish results. The specialists need to be provided with understanding of the value associated with work items and supported in decision making by the management. Prioritization of work items is conducted at recurring workshops, where all the required specialists (business managers, technology architects and implementation specialists) and line managers are present.

For urgent work items entering the process, the line management is responsible for assigning a priority to them. After the prioritization, work items are placed on the Backlog 2 for each virtual team established to progress the items.

From Backlog 2, virtual teams pull work items into their process pipelines for urgent work, work with fixed due date and standard work according to the defined pull policy and work in progress limit. The pull policy defines the order in which work items are pulled in, for example the way how urgent items are handled and in whether an item with fixed due
date can be pushed up into the urgent pipeline should the due date be approaching. The work in progress limit dictates how much work can be in progress simultaneously. Basically, work can be pulled in only if the total amount of work in progress is less than the work in progress limit.

As the work items are completed, teams communicate or otherwise output the results independently.

Summing up, an initial proposal for the improved process for mobile telecommunications centralized services operations & maintenance included:

a) establishing parallel pipelines through the process for work items with various urgencies, prioritizing work and limiting work in progress for improved *Process throughput and workload management*

b) utilizing the Scrumban process framework, which prioritizes items based the cost of delay, for *Improved process input and output*

c) organizing people according to the process by introducing virtual teams with end-to-end responsibility for a service or feature for *Enhanced long-term planning and technology-service visibility*.

The improvement suggestions aim at enabling shorter delivery cycles.

Next, Section 6 contains the initial proposal validated through internal workshop and discussions with stakeholders within the case company to form the final proposal together with guidelines for a step-by-step (iterative) implementation.
6 Validation of the Proposal

This section reports on the results of the validation stage and points to further developments to the initial Proposal. At the end of this section, the final proposal and guidelines for implementation are presented.

6.1 Overview of the Validation Stage

This section reports on the results of validation of the initial proposal developed in Section 5. The initial proposal was developed by combining main learnings from CSA (discussed in Section 3) together with suggestions from literature and best practice (reviewed in Section 4) and enriched by the vital suggestions from the stakeholders within the case company (reported in Section 5). The initial proposal was validated through internal workshop and discussions with stakeholders within the case company. Based on the results of validation, the final proposal was formulated together with the guidelines for a step-by-step (iterative) implementation of the proposed improvements (presented in this Section).

Validation comments and feedback from the stakeholders, Data 3 for this study, was primarily collected in a co-creation workshop with the management team of the case organization. Additional suggestions were collected through interviews of the company internal stakeholders. In preparation for the workshop, a summary of the initial proposal as well as full text of the initial proposal were distributed to the participants well in advance. In the workshop, the management team worked with two tasks. The first task was an adapted SWOT analysis of the initial proposal and the current state of the process. The participants of the workshop were asked to work in small teams, documenting their thoughts on post-it notes. Results of the teamwork were then pulled together on a whiteboard. The second task was based on the results of the first task. Following agile principles, the participants were asked to produce ideas for initial steps for the incremental path towards the proposed process. Results were grouped on the whiteboard and priority order for the ideas was established by voting.

This approach was selected to get the most out of co-creative development while giving participants the opportunity to discuss and share their thoughts. The improvement ideas and suggestions are discussed below and combined into the Final proposal and Guidelines for implementation.
6.2 Findings of Data Collection 3

Data 3 collection round had two main results. The first outcome, SWOT analysis of the initial proposal and the current state of the process, is shown in Figure 19.

Figure 19. SWOT analysis of the initial proposal and the current state of the process.

As shown in Figure 19, the modified SWOT analysis resulted in four segments of findings. First, segment S of the analysis captured the items from the initial proposal to be utilized as such. Second, segment W captured the items to be utilized after further (more detailed) planning within the case organization. Third, segment O captured the desired objectives (outcomes) for implementing the proposed process. Fourth, segment T captured the existing items to be enhanced or abandoned from the current state of the process, as seen by the participants. While the second segment (W) indicated that there are elements which require further planning before practical implementation, the fourth segment (T) indicated that there are no major needs for modifying the proposal.

The second result from Data 3 collection what the ideas and suggestions for further development actions grouped by focus area and shown in Table 5.

Table 5. Findings from Data 3 collection grouped by key focus areas from the CSA and conceptual framework
As shown in Table 5, there were multiple ideas and suggestions for each focus area. These ideas and suggestions were collected for building the Guidelines for implementation – the practical next steps for an incremental path towards the proposed CSO&M process. (The results are discussed in Section 6.3 and guidelines presented in Section 6.5).

To present a short overview, the findings in general indicate that there were no major changes suggested to the initial proposal. The findings for area (1) the Process throughput and workload management, show that practical actions were suggested to manage the workload. For area (2) the Process input and output, the findings suggest that policies need to be defined, allowing implementation of the proposal. Findings for area (3) the Long-term planning and technology-service visibility, indicate that the concept of virtual
teams needs to be supported by guidelines (code of conduct). Furthermore, the scope of end-to-end needs to be experimented and defined.

Next, the findings from the stakeholders are further discussed and built into the final proposal for the improved-mobile telecommunications centralized services operations & maintenance process (in Section 6.3).

6.3 Developments to the Proposal for CSO&M Process (Based on Findings of Data Collection 3)

In the validation part, the stakeholders suggested only minor improvements to the proposal during the workshop and interviews (Data 3). The stakeholders thought that the proposal would provide for faster delivery of features, allowing for minimizing risk and efficiently allocating resources to the tasks. Instead, the co-creative action in the workshop was focused on defining guidelines for implementation of the proposal – what needs to be further experimented, defined and documented while implementing the proposal. It was also suggested a culture of experimenting needs to be endorsed by the case organization to allow for agile, step-by-step adoption of the proposed process.

First, the validation results for focus area (1) the Process throughput and workload management, indicate that the proposals for parallelizing and prioritizing were deemed to be utilized as such. Further actions proposed for the focus included: defining the work in progress limit by experimentation and replacing old line organization-oriented ways of working with process-oriented ones. In other words, it was suggested that the old way of working should be abandoned.

Second, for focus area (2) the Process input and output, the validation resulted in approving the idea of replacing the existing Kanban-based process framework with the proposed Scrum-based process framework. However, next steps for the case organization for implementing the proposal include first creating the policies for prioritizing work, for estimating the size of tasks, and for allocating resources to the tasks. For synchronizing the dependencies with actions expected from outside of the process, the Scrum-based framework needs to be extended in depth (a concept that this study found from the literature). To make such an extension effective for coordinating with external partners outside of the case company, the extension needs to be mutually agreed with all the company internal stakeholder organizations. The agreement is needed to ensure that there are not multiple parallel ways of interacting with external stakeholders. Furthermore, the tools for monitoring the process from input to output either do not exist or
cannot be utilized as such, therefore, they need to be designed or adapted for the purpose.

Third, for focus area (3) the Long-term planning and technology-service visibility, the validation resulted in approving the concept of virtual teams with end-to-end responsibility for services or features. Based on the experience presented in the workshop, the virtual team concept is a key feature of the proposal. For the concept to be effective, boundaries for the process are to be established, ensuring that all the relevant specialists and teams are part of the process and that the virtual teams include all relevant stakeholders. The specific actions for the case organization for this focus area should include establishing a code of conduct, common guidelines for nominating team members, managing work within teams, and leading the teams towards targets.

Putting together the results, there were minor suggestions for developing the proposal itself. The final proposal is presented in Section 6.4. However, multiple suggestions from the stakeholders emerged for more detailed definitions of various components of the proposal. The proposed CSO&M process, being a framework-level process, is intended to be adaptable for organizations within the case company as well. As one of the stakeholders suggested, to get the most out of the proposed framework-level process, similar (compatible) CSO&M processes need to be adopted by other parts of the organization as well. Therefore, the process is defined in such a way that it is adjustable. As it became clear from validation, the process can be adjusted through guidelines for implementation – selection of policies and decisions to be made. Therefore, the Guidelines for the case organization are proposed Section 6.5, Guidelines for Implementation of the Proposal.

6.4 Final Proposal

Final proposal for the improved mobile telecommunications centralized services operations & maintenance process, which aims at enabling shorter delivery cycles, is shown in Figure 20 as a high-level description.
Figure 20. High-level description of the Final proposal for the process.

As shown in Figure 20, the final proposal includes the main elements from the initial proposal presented in Section 5 (shown in dark blue). Additionally, the final proposal includes extending the Scrumban process framework in depth, allowing for synchronization with dependencies outside of the process (shown in light blue). The elements of the final proposal include:

a) establishing parallel pipelines through the process for work items with various urgencies, prioritizing work and limiting work in progress for improved Process throughput and workload management,

b) utilizing the Scrumban process framework, which prioritizes items based on the cost of delay, for Improved process input and output,

c) extending the Scrumban process framework in depth, better synchronizing external dependencies, for Improved process input and output,

d) organizing people according to the process by introducing virtual teams with end-to-end responsibility for a service or feature for Enhanced long-term planning and technology-service visibility.
Next, Section 6.5 contains the Guidelines for a step-by-step (iterative) implementation of the proposed CSO&M process.

6.5 Guidelines for Implementation of the Proposal

Co-creative work in the stakeholder workshop resulted in prioritized Guidelines towards practical implementation of the CSO&M process. In addition to the prioritized guidelines, a few additional guidelines emerged based on the SWOT analysis of the initial proposal and current state of the process. The guidelines are shown in Table 6.

Table 6. Guidelines for practical implementation of the proposed CSO&M process.

<table>
<thead>
<tr>
<th>#</th>
<th>Area</th>
<th>Priority</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Resource management</td>
<td>High</td>
<td>Define work in progress (WIP) limit by experimenting</td>
<td>Find the correct way of measuring and limiting the work in progress, define policy for WIP</td>
</tr>
<tr>
<td>2</td>
<td>Resource management</td>
<td>High</td>
<td>Replace existing line-oriented management procedures</td>
<td>While taking the proposed process into use, the existing line organization management procedures, meeting schedules for example, need to be replaced with process-oriented procedures</td>
</tr>
<tr>
<td>3</td>
<td>Resource allocation</td>
<td>6</td>
<td>Define resource allocation policy</td>
<td>Prioritization (planned items vs. ad-hoc), allocation of virtual teams, common policy for allocating resources from a number of line teams</td>
</tr>
<tr>
<td>4</td>
<td>Virtual teams</td>
<td>4</td>
<td>Establish code of conduct (common guidelines) for virtual teams</td>
<td>How to conduct planning workshops, allocate timeslots for mutual work, other guidelines for day-to-day work</td>
</tr>
<tr>
<td>5</td>
<td>Scheduling and measuring performance</td>
<td>3</td>
<td>Define policy for estimating size of work items and for prioritizing</td>
<td>How to order work items by priority, estimate sizes and do preliminary scheduling</td>
</tr>
<tr>
<td>6</td>
<td>Scheduling and measuring performance</td>
<td>3</td>
<td>Develop tool(s) for monitoring progress</td>
<td>Dashboard for following the progress of various work items (Scrumban board(s))</td>
</tr>
<tr>
<td>7</td>
<td>Virtual teams</td>
<td>2</td>
<td>Establish guidelines for nominating virtual team leaders</td>
<td>How to select the leader for each virtual team, for coordinating actions related to work items</td>
</tr>
<tr>
<td>8</td>
<td>Common tools</td>
<td></td>
<td>Vertically extend Scrumban towards SW/HW vendors</td>
<td>Common way of coordinating work with external partners from different parts of the case company organization</td>
</tr>
</tbody>
</table>

As shown in Table 6, guidelines 3-8 relate to the priority order, while guidelines 1-2 (in italics) have no stakeholder-defined priority. The stakeholders agreed that these guidelines are to be followed in the priority order. The additional guidelines emerged already
very early in the workshop. Unfortunately, therefore forgotten to be prioritized later in the workshop. However, these two guidelines were considered instrumental for the proposal when they emerged, therefore given high priority and placed at the top of the list.

The first guideline, *Define work in progress (WIP) limit by experimenting*, aims at finding the correct limit for work in progress for virtual teams and specialists. As there is no prior experience from utilizing WIP limit within the case organization, the limit must be found out by trial and error - experimenting with values and adjusting based on the results. Second guideline, *Replace existing line-oriented management procedures*, means that for process oriented virtual teams, the existing line-oriented procedures represent waste - excess work to be done without clear purpose. Third guideline, *Define resource allocation policy*, points the case company towards deciding and documenting how to establish virtual teams and how to prioritize work. Again, experimentation may be necessary for finding the correct procedures. Finally, rest of the guidelines provide for fine-tuning the process.

Next, Section 7 proceeds to the conclusions to the study.
7 Conclusions

This section contains executive summary of this study, followed by discussion of managerial implications and evaluation of the results. Finally, closing words conclude the study.

7.1 Executive Summary

The objective of this study was to propose an improved framework-level process for mobile telecommunications centralized services operations & maintenance. The need for this study emerged since the case company identified it necessary to improve the efficiency of its processes to remain competitive. For some time already, the company’s mobile telecommunications service business has had a loosely defined framework-level process in place for operating, maintaining and developing its mobile telecommunications centralized services. However, with this current process, it was seen difficult by the company to achieve a shorter delivery cycle needed for introducing new software features and fixes into its network, while this shorter delivery cycle was a major requirement of the key customer segments and other stakeholders. To tackle this challenge, the study placed its focus on exploring and improving the current process for mobile telecommunications centralized services operations & maintenance.

In this study, the selected research approach was Design research, which was suited for purpose of proposing improvements to the existing process. Qualitative data collection techniques were used to establish the state of current process and develop the improvement proposal in a co-creative manner. The proposal was developed based on three data collection and analysis rounds. First, the current state analysis was conducted to find challenges in the current CSO&M process. Next, relevant literature was searched to find solutions and best practice to the challenges found. Finally, the Proposal for the improved CSO&M process was co-created and then validated with stakeholders from the case company.

From the current state analysis, this study found challenges in (1) Process Input and Output, (2) Process Throughput and Workload Management, and (3) Long-Term Planning and Technology-Service Visibility. It was identified that, without having all the participants of the process sufficiently informed, progressing tasks became more time-consuming as time needed to be spent with pulling all the information together. The lack of information also prevented effective prioritization of work, leaving attempting to progress all tasks within the process simultaneously as the sole option. With unpredictable
throughput and increased workload, combined with communication weaknesses, the feedback was not conveyed back and forth clearly enough.

From literature, available solutions and industry best practice were searched for the identified challenges. First, for improving efficiency for the Process Throughput and Workload Management, it was found that combination of Lean and Agile allows for parallel paths through the process by creating separate Lean and Agile process pipelines for routine tasks and for developing new (Ebert and Paasivaara 2018; Cooper 2016; Repenning et al. 2017). Second, for improving the Process Input and Output, the Scrumban, prioritizes and weights work items based on the cost of delay (Reddy 2016). Third, for improving the Long-term Planning and Technology-service Visibility, The DevOps model advocates a market-oriented or service-oriented organizational structure responsible for the service end-to-end from development to operations (Kim et al. 2016). To implement combinations of lean and agile on a large scale, companies within telecom industry select and combine best practices from multiple frameworks and approaches into their own process frameworks (Ebert and Paasivaara 2018; Paasivaara et al. 2018; Nokia 2017).

In the Proposal, the improved process was co-created with the stakeholders to provide practical company-tailored solutions to the current challenges. First, it was formulated and then validated by the stakeholders that (a) establishing parallel pipelines through the process for work items with various urgencies, prioritizing work and limiting work in progress would allow for the improved Process throughput and workload management. Second, it was proposed and then conformed with the stakeholders that (b) utilizing the Scrumban process framework, which prioritizes items based the cost of delay, and extending the Scrumban process framework in depth, better synchronizing external dependencies would contribute to the Improved process input and output. Third, it was identified and approved by the stakeholders that (c) organizing people according to the process by introducing virtual teams with end-to-end responsibility for a service or feature would provide for the Enhanced long-term planning and technology-service visibility. In addition to the solutions, the Guidelines for implementation of the CSO&M process were created for making the process adjustable. The Guidelines, as required by the stakeholders, indicate the policies to be defined and the decisions to be made as a part of practical CSO&M implementation.

The feedback received from the stakeholders was positive, and it was used improve the proposal. For the final proposal, minor improvements were suggested. The stakeholders proceeded with planning for step-by-step implementation of the proposal.
The outcome of the study is, thus, the improved framework-level process for mobile telecommunications centralized services operations & maintenance that should enable shorter delivery cycles of services, features and fixes by the company. Increased agility, as the result of shorter delivery cycles, would allow for faster response to the customer’s needs in the case company’s voice subscription business.

7.2 Managerial Implications

The proposed process, being a framework-level process combining lean and agile approaches, is somewhat different from the current process within the case company. Guidelines for implementing the process, in Section 6.5, were co-created to assist adjusting the framework-level process for the purpose. However, even before following the guidelines, there are other steps to be taken.

First, there are substantial changes from the current process to the proposed process. The actors within the process, the specialists, need to learn and adopt the new process. One of the secondary findings from the CSA, change resistance was already noticeable within the organization, originating from an earlier change to the current process. As a remedy, actions for assuring the specialists of the benefits of the proposed process should be taken. One such step would be involving the specialists in finalizing the process and planning for the steps indicated by the guidelines for implementation. By involving the specialists, with their detailed knowledge of their daily work, the proposal could be further adjusted to the purpose.

Second, due to one of the main components of the proposal, organizing people according to the process by introducing virtual teams with end-to-end responsibility for a service or feature, the proposed process would cross several line organizational borders of the case company. Currently, the business units and departments to be involved in the proposed process have somewhat different working practices and key performance indicators (KPIs). The difference in practices and KPIs drive towards differing priorities. For successful implementation of the proposed process, these differences should be resolved and common priorities for the whole organization established.

7.3 Thesis Evaluation

The aim of the thesis was to analyze the current state of the process for mobile telecommunications centralized services operations & maintenance of the case company and to
propose an improved process based on literature review. The thesis proceeded with initial proposal, evaluated at the case company. Based on the results from the evaluation at the case company, the improved process was proposed, reaching the intended objective and outcome. In this section, credibility criteria for this thesis are discussed and evaluated in terms of validity, reliability, logic and relevance.

The selected research approach, Design research, as Kananen argues (2017: 181), does not establish its own methods but instead utilizes methods or combination of methods from other research approaches. For this thesis, methods of qualitative research were used. Consequently, the four evaluation criteria were validity, reliability, logic and relevance, described and utilized from qualitative research point of view.

In Design research, validity means that correct things are researched (Kananen 2017: 189). Validity contains three subcomponents, these being construct validity (have enough sources and establish a chain of evidence that can be tracked back), external validity (is it generalizable) and internal validity (does it respond to the research questions or tackle the original problem) (Yin 1994: 33-34; Patton 2005: 662). As Patton formulates, validity can be put into a single sentence “Do my conclusions (or does my theory) stand up to the closest scrutiny?” The main methods to ensure validity - triangulation, using different data collection tools or methods for the same question - allow for cross-checking the consistency of the information (Patton 2005: 662; Quinton and Smallbone 2006: 131). In Design research for the results to be valid, the data collection needs to be planned well in advance, the results of the data collection and their analysis to be documented properly, and data collected from multiple sources to triangulate on the analysis phase. Whether the results solve the original problem is to be judged together with the case organization.

In this thesis, validity was ensured by using multiple data collection methods. Data was collected through interviews, workshops and in writing through a qualitative (free-text) questionnaire from managers, specialists and other stakeholders of the process under analysis. Internal validity was also reviewed by informing the informants of the results and conclusions in each phase of research and thereby giving them the opportunity for constructive critique. Intermediate results were used as the input for co-creation workshops. The final output of the thesis, proposal for improvement, was also validated within the case company by distributing it to stakeholders for feedback.

Reliability ensures that, if the research is replicated, the same results can be obtained (Kananen 2017: 189). In reliable research, data is collected and analyzed in a way which
leads to consistent findings. Reliability also means transparency in handling and analyzing the data (Saunders et al. 2009: 156). To ensure reliability, a protocol for handling and analyzing the data should be developed, followed and documented (Yin 1994: 33). For the findings to be consistent, all the data collection must be implemented in standardized manner, with asking the same questions in interviews and documenting the answers in similar way. The results from the data collection are be stored in an organized way, since documenting all the collection and analysis phases allows for replicating them as well as following the trail of evidence.

In this thesis, to ensure reliability both methods for collecting and analyzing data as well as the actual results were documented using field notes, recordings and in writing. As with validity, reliability was also strengthened by triangulation. In order to get a holistic view of the process under research, the data was collected from different stakeholders individually so that personalities or organizational positions did not interfere with the stakeholder’s views and the results reflected how they really experienced the process and what they really thought about it.

Logic means ensuring that sound conclusions are achieved by reasoning, following the principles of validity (Oxford Dictionaries 2019; Business Dictionary 2019). In other words, conclusions are justifiable by reasoning by someone else than the original researcher based on the chain of evidence from data collection and analysis.

In this thesis, logic was ensured by grounded, documented choices which were validated with the case company through co-creation workshops. The thesis is also structured in a way where the outcome of each section is linked into the next section. In this manner, the current state analysis led into literature review where existing knowledge and solutions for the identified weaknesses were searched and a theoretical framework developed. Based on the results of the current state analysis and theoretical framework, an initial proposal for the improved process was co-created in the case company and documented. After that, the initial proposal was then validated through co-creation workshop and one-to-one discussions, and results were used to create the final proposal.

Relevance, in research literature, means that theories or conclusions are based on published evidence and arguments (Hjørland 2010: 12). In practice, particular with results or conclusions of a research is the importance of the research and the contribution it makes (Quinton and Smallbone 2006: 136).

In this thesis, relevance was judged mainly by the importance to and contribution it makes for the case company. This thesis is based on a real-life business problem within the company and the objective was co-created within the company to make a significant
contribution to solve the existing problem. The stakeholders within the case company were involved in each phase of this study to co-create a useful solution to their problem. The results of the final co-creation workshop indicate that the case company intends to proceed with implementing the proposal, thus meaning that the proposal was relevant to solving the problem the company had. To ensure relevance in scientific sense, theoretical information was gathered from published sources and conceptual framework was developed based on grounded, scientific proven facts. Thus, relevance of the thesis is ultimately judged by the case company, through their experiences in implementing the proposal.

7.4 Closing Words

The saturation of subscription service markets, platform ecosystems, and agile software development shape the telecommunications business Finland. The companies seek to compete by improving efficiency and co-creating new services. As a prerequisite for both, faster development-to-delivery cycle is necessary.

The proposed improved framework-level process for mobile telecommunications centralized services operations & maintenance offers a solution for the case company for addressing the need for faster development-to-delivery cycle. The proposal combines lean approach for recurring tasks with agile approach for development work with yet-unknown results, creating a process framework in which cyclic planning and prioritization results is followed by continuous delivery. All work entering the process in prioritized based on cost of delay – the value of each work item. Virtual teams are established to manage work items end-to-end.

Shorter delivery cycles, increased agility in the process, allows the case company respond quicker to needs of its voice subscription business customers.
References


Kanban adoption status evaluation Powerpoint slide

KANBAN

- Named product owner (PO)
  - PO is empowered to prioritize
  - PO has enough time for the team

- Team has a kanban board
  - Highly visible
  - Updated daily
  - Owned exclusively by the team

- Daily standup happens
  - Whole team participates
  - Problems & impediments are surfaced
  - PO participates at least a few times per week
  - Max. 15 minutes

- Have regular planning/grooming meetings
  - PO participates
  - PO brings up-to-date PBI
  - Whole team participates
  - Results in an updated PBI
  - Whole team believes release plan is achievable

- Have Definition of Done (DoD)
  - Achievable within each production deployment
  - Team respects DoD

- Retrospective happens regularly
  - Results in concrete improvement proposals
  - Prioritization proposals actually get implemented
  - Whole team + PO participates

- PO has a product backlog (PBI)
  - Top items are prioritized by business value
  - Top items are estimated
  - Estimates written by the team
  - Items small enough to not slow down frequent releases

- Demo happens regularly
  - Shows working, tested software
  - Feedback received from stakeholders & PO

- Team has all skills needed to bring backlog items to done
  - Team members not locked into specific roles
  - PO has clear vision that is in sync with PBI
  - PBI and product vision is highly visible

- PO available when team is estimating
  - Estimate relative size (story points) rather than time

- Whole team knows top 5-5 impediments:
  - SM has strategy for how to fix top impediment
  - SM focusing on removing impediments
  - Escalated to management when team can’t solve

- Velocity is measured
  - All items in progress have an estimate
  - PO uses velocity for release planning
  - Velocity only includes items that are Done

- Team has a Scrum Master (SM)
  - SM sits with the team

Date: ____________
Team: ____________

Scaling

- You have a Chief Product Owner (or many POs)
- Dependent teams do Scrum of Scrums
- Dependents integrate within each sprint

Positive indicators

- Having fun! High energy level.
- Overtime work is rare and happens voluntarily
- Discussing, criticizing, and experimenting with the process

Based on originally remixing
<table>
<thead>
<tr>
<th>Question</th>
<th>Statements</th>
<th>Comments / analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interviewee &amp; position (which team they are leading / belong to) and personal tasks</td>
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<tr>
<td>2. What are the sources of tasks (strategic deployment plan, new development, processes, projects, 3rd level support etc)? What kind of continuous tasks &amp; responsibilities does your team have?</td>
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<td>3. Who are the (internal) customers/stakeholders (who give tasks)? (are there others than the case organization?)</td>
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<td>4. (How) do you get information of the end customer’s needs – customer feedback? Do you process it - how?</td>
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<td>5. What channels are used to receive, handle and report tasks (workflow management for example)</td>
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<td>6. What is the output of various tasks? How is the output communicated?</td>
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<td>7. Who will prioritize and schedule tasks? What is the basis for prioritization? Are there tasks that always have the highest priority?</td>
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<td>8. How are the tasks and priorities communicated to the team members?</td>
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<td>Question</td>
<td>Answer</td>
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<tr>
<td>9. Describe team internal communication. What tools are used? What kind</td>
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<td>of meetings are held? where the team members are physically located?</td>
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<td>10. What kind of expertise is needed? Is there such an expertise in your</td>
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<td>team? Is there sufficient time/means for gaining expertise? Is the</td>
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<td>expertise evenly distributed?</td>
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<td>11. If other teams / other parts of organization (or vendors) are</td>
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<td>needed for completing a task, how the inter-organizational co-</td>
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<td>operation is arranged? Where the other stakeholders are located in</td>
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<td>terms of organization?</td>
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<td>12. Are there challenges? What kind of? (Describe showstoppers and</td>
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<td>how much they consume time &amp; why)</td>
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<td>13. What is the capacity (throughput) of the team? Can you keep the</td>
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<td>schedule for all tasks? For what tasks? How the throughput is</td>
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<td>measured?</td>
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<td>14. Describe the day-to-day operations of the team, how do you get</td>
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<td>along. Are there daily management-related challenges?</td>
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<td>15. What happens if there is ad-hoc/firefighting tasks. Does the senior</td>
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<td>management (or service management) override everything with an urgent</td>
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<td>task?</td>
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<td>16. How are different types of tasks and team performance measured? Daily, over longer period?</td>
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<td>17. What things are handled in the department level? Any challenges?</td>
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<td>18. What are your (teams) experiences on experimenting KANBAN so far? To what extent do you utilize it?</td>
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<tr>
<td>19. How would you like the work to be arranged? Anything to add?</td>
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<tr>
<td>Question</td>
<td>Statements</td>
<td>Comments / analysis</td>
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<tr>
<td>1. What are the tasks towards (expected from) Centralized networks? (strategic deployment plan, new development, processes, projects, 3rd level support etc)?</td>
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<td>2. Who are the (internal) stakeholders (who receive tasks)?</td>
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<td>3. (How) do you share information of the end customer’s needs – customer feedback? Do they process it - how?</td>
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<td>4. What channels are used to receive, handle and report tasks (workflow management for example)</td>
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<td>7. How are the tasks and priorities communicated to the CN stakeholders?</td>
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<td><strong>8.</strong> Describe stakeholder communication. What tools are used? What kind of meetings are held? Where the team members are physically located?</td>
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<tr>
<td><strong>9.</strong> What kind of expertise is needed? Is there such an expertise in the CN organization? Is there sufficient time/means for gaining expertise? Is the expertise evenly distributed?</td>
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<tr>
<td><strong>10.</strong> If other teams / other parts of organization (or vendors) are needed for completing a task, how the inter-organizational co-operation is arranged? Where the other stakeholders are located in terms of organization?</td>
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<tr>
<td><strong>11.</strong> Are there challenges? What kind of? (Describe showstoppers and how much they consume time &amp; why)</td>
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<tr>
<td><strong>12.</strong> What is the capacity (throughput) of the CN organization? Can they keep the schedule for all tasks? For what tasks? How the throughput is measured?</td>
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<tr>
<td><strong>13.</strong> Do you give ad-hoc/ firefighting tasks? For what reason?</td>
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</tbody>
</table>
14. How are different types of tasks and CN organizational performance measured?

15. How would you like the work to be arranged? Anything to add?
<table>
<thead>
<tr>
<th>Question</th>
<th>Statements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Which team you are member of</td>
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<tr>
<td>2. From who you receive your tasks (organisation/group). Which kind of tasks, related to action plan, processes, projects or smaller tasks (or something else)?</td>
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<tr>
<td>3. What are your team's and your personal continuous duties</td>
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<td>4. Via which channels you receive your tasks</td>
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<td>5. How the tasks are scheduled and prioritized</td>
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<tr>
<td>6. What types of issues cause delay or otherwise make you work difficult (are challenges)? How/why? Any ideas how to resolve?</td>
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<tr>
<td>7. What are your time and responsibilities in balance? Are there any time related challenges?</td>
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<tr>
<td>8. Is it possible to maintain &amp; renew your expertise?</td>
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<td>9. Is the Kanban useful for organizing your tasks? What do you think about it and other lean/agile methods? How would you make it more effective?</td>
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<tr>
<td>10. Is the flow of information to and from you sufficient to achieve goals of your tasks? How would you make it better?</td>
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<tr>
<td>11. Anything to add? What could be done otherwise, what would you keep as is, what would you develop?</td>
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</tbody>
</table>
## Summary of field notes from Kanban status workshops

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses: team 1, team 2, team 3, team 4, team 5</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK not done but OK</td>
<td><strong>Daily:</strong> No daily each morning, isn’t Mattermost chat a replacement &lt;&gt; Think the Wednesday daily is sufficient. &lt;&gt; No retro each Friday – what is retro in our case anyway? &lt;&gt; Daily standup happens in Mattermost its not a standup &lt;&gt; No daily but weekly &lt;&gt; Mattermost somehow replaces missing daily &lt;&gt;</td>
<td><strong>Storypoints:</strong> Isn’t the time required to do tasks the commanding fact when epics are split into tasks? &lt;&gt; Estimating is a very relative thing, difficult &lt;&gt; Estimating is not done &lt;&gt; We do not estimate our resources for the next cycle/week &lt;&gt;</td>
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<td></td>
<td><strong>Demo:</strong> Demos are useless for us, since they are for management &lt;&gt; My understanding of demo is that everyone does a quick walkthrough of a task so that other team member get the information. Not so important if everyone has their own specific role but when/if there are common responsibilities it is necessary to share information. &lt;&gt; Those who participate in the on-duty ring need to know what has happened so demos are important &lt;&gt; The information for management team is not exactly the same a a demo. &lt;&gt; Maybe sometimes &lt;&gt;</td>
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<td></td>
<td><strong>Velocity:</strong> for what reason would the velocity measurement be needed? &lt;&gt; we don’t utilize velocity &lt;&gt;</td>
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<td></td>
<td><strong>Tasks:</strong> we don’t create tasks for all work &lt;&gt; Team dependencies and contact not formalized &lt;&gt; Informal contact with other teams &lt;&gt; some tasks are quite lengthy &lt;&gt;</td>
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<td></td>
<td><strong>Regular planning meetings:</strong> do not have such &lt;&gt;</td>
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<td></td>
<td><strong>Scrum Master:</strong> the team doesn’t have such &lt;&gt; No we don’t have &lt;&gt;</td>
<td></td>
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<tr>
<td><strong>Listing of not done but ok, team 4, without any comments:</strong></td>
<td>Whole team participates in daily Whole team believes release plan is achievable Daily Max. 15 minutes PO brings up-to-date PBL in planning/grooming In demo, Feedback received from stakeholders &amp; PO Overtime work is rare and happens voluntarily Named product owner (PO) Dependent teams integrate within each sprint Team has a Scrum Master (SM) SM sits with the team SM has strategy for how to fix top impediment</td>
<td></td>
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</tbody>
</table>
SM focusing on removing impediments
PO has enough time for the team
AT PO has clear vision that is in sync with PBL
PO has a product backlog (PBL)
PO participates at least a few times per week in daily
PO available when team is estimating
PO uses velocity for release planning
Dependent teams do Scrum of Scrums

Listing of not done but ok, team 5, without any comments:
PO is empowered to prioritize
Problems & impediments are surfaced in fdaily
PO participates at least a few times per week in daily
Daily standup happens
Daily Max. 15 minutes
Prioritized proposals from retro actually get implemented
Estimate relative size (story points) rather than time
Whole team knows top 1-3 impediments
SM has strategy for how to fix top impediment
Team has a Scrum Master (SM) SM sits with the team
SM focusing on removing impediments
PO uses velocity for release planning
Dependent teams integrate within each sprint

<table>
<thead>
<tr>
<th>Not ok/un-clear</th>
<th>Product owner (PO):</th>
<th>PO too busy</th>
<th>We don’t have a official PO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>We don’t have a PO</td>
<td>&lt;&gt; We don’t have a single PO</td>
<td>&lt;&gt; Team leader, or is he</td>
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<tr>
<td></td>
<td>&lt;&gt; Who else could be the PO than team leader</td>
<td>&lt;&gt; Everyone in the team a PO</td>
<td>&lt;&gt; No clear PO for the team</td>
</tr>
<tr>
<td></td>
<td>&lt;&gt; Many PO’s if PO means a person responsible for a system</td>
<td>&lt;&gt; Team leader a PO of PO’s</td>
<td>&lt;&gt; Tasks come from many directions not from the PO</td>
</tr>
</tbody>
</table>

Kanban not updated/used daily: The table is not update daily, sometimes not even weekly | Is it useful at all | Yes we use it | <> We are still at the beginning | <> unclear of the epic Kanban | <> Not used daily |

Regular planning meetings: How do we handle backlog, does anybody know | <> Planning meetings mostly missing, planning happens elsewhere and is not visible on product backlog or the Kanban at |
| <> Isn’t the planning done in project meetings? | <> Does this rather mean roadmap-planning? | <> backlog doesn’t work on the team level |
| <> What is the product backlog | <> Unclear what is definition of product in our case | <> On planning meetings there is a lot of stuff that wouldn’t belong to these meetings but should be handled 1-to-1 |
| <> Still many things would require mutual planning meetings |
Appendix 5

Daily: Frustrating to walk through the same Kanban tasks each time – wouldn’t it be better to use the time to go through larger specific areas each time? We are self-guiding specialists anyway <> Not participated by whole team

Note

General: still difficulties in using Kanban for managing work distributed to multiple teams, trying to learn utilizing it ourselves <>

Definition of Done (DoD): Often goes wrong in the beginning. Too large tasks. Need to be split into multiple tasks later. <> Should put more effort into preparing DoD/tasks beforehand <> Currently everyone has their own view of DoD. Difficult to determine velocity as the DoD is unclear. <> Do we use DoD somewhere – not <> Unclear what is needed in each state of the Kanban <> DoD need to be documented <>

Retro: Retros are mostly missing <> Not enough retros. <> Retros could be useful for very large epics/projects and when def technologies are concerned <>

Tasks: too large tasks slow to complete <> Splitting is not an easy thing to do <> Many tasks get personalized, real teamwork doesn’t happen <> Often the tasks are dependent on external partners/vendors <>

Impediments to work: What does this mean? <>

Scaling: Need for organization level Kanban, possibility to move/coordinate tasks between teams <>

Skills: Need more skills to bring tasks to done <>

Demo: should be held for each task to distribute knowledge <>

Storypoints: estimating amount of work in tasks is not done using either storypoint or any other measurable unit <> What are storypoints after all <>

Listing of not ok, team 4, without any comments

Kanban Updated daily
Daily standup happens
<> Overtime work is rare and happens voluntarily
<> Named product owner (PO)
Have regular planning/grooming meetings
Items small enough to not slow down frequent releases
Have Definition of Done (DoD)
AT DOD Achievable within each production deployment
Team respects DoD
<table>
<thead>
<tr>
<th>Appendix 5</th>
<th>4 (5)</th>
</tr>
</thead>
</table>
| **Velocity** only includes items that are Done.  
-- Dependent teams integrate within each sprint  
Discussing, criticizing, and experimenting with the process  
Having fun! High energy level  
PBL Top items are prioritized by business value  
You have a Chief Product Owner (if many POs)  
Prioritized proposals from retro actually get implemented  
Estimate relative size (story points) rather than time  
All items in progress have an estimate  
**Listing of not ok, team 5, without any comments**  
You have a Chief Product Owner (if many POs)  
PO has enough time for the team  
PO participates at least a few times per week in daily  
PO brings up-to-date Product Backlog in planning/grooming  
PO has a product backlog (PBL)  
PBL and product vision is highly visible  
PBL Top items are estimated  
Estimates written by the team  
All items in progress have an estimate  
PO available when team is estimating  
Dependent teams do Scrum of Scrums  
Having fun! High energy level.  

| Development Ideas | DOD: Don’t allow tasks without clearly defined DoD <= If wrongly done, close the task and create a new better one <= If organization Kanban would be available, more tasks to the team which actually blocks them <= Create tasks so that they are small enough not to contain any work done by another team <= DoD to include maximum time for a task (task deadline) <= Need to document what the DoD means for use and how to do <= Lot of pre-planning/work (firewall openings etc) missing <=  

**Regular planning meetings:** More, shorter semi-formal planning meetings <= Ad-hoc planning meetings, virtual team with participants from any teams <= Can’t plan everything with the whole team, consumes too much time <= Before a new epic is opened, a planning meeting (kickoff) with all the required specialists <= Need separate “product” based planning meetings <= Need to formalize and handle better the backlog <=  

**Skills:** Skill matrix for each team and for the organization to allow for selecting right people for planning and executing tasks. <= Document better <= try to cross-work and to cross your confidence limit to learn more <= Same people expected to do both long-term planning and operational work, leads to escalation. Need to change. <=  

There was partial misunderstanding of demo/retro in the team 3 <=
<table>
<thead>
<tr>
<th>Appendix 5</th>
<th>5 (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scaling:</strong></td>
<td>The concept of epic to be opened/defined better &lt;&gt; blocked cards should be able to be moved to the team where they are blocked &lt;&gt; Each should focus on their own tasks/epics, not trying to follow everything on the board &lt;&gt; different “swimming lanes” for different urgencies &lt;&gt;</td>
</tr>
<tr>
<td><strong>General:</strong></td>
<td>Has been a lot of ad-hoc work lately. go where the largest fire burns &lt;&gt; Haven’t have time to look at the board for the last two weeks &lt;&gt; The work gets very fragmented because things appear suddenly &lt;&gt;</td>
</tr>
<tr>
<td><strong>Demo:</strong></td>
<td>Don’t demo tasks, but larger issues (epics) &lt;&gt; Use the team standup to pick things for the next demo &lt;&gt; Ask your colleagues for informal feedback &lt;&gt;</td>
</tr>
<tr>
<td><strong>Retro:</strong></td>
<td>Could we walk trough learnings from tasks at the Tuesday meeting &lt;&gt; Create a backlog for items found in retro &lt;&gt; If in-depth retro needed book the time at the team meeting &lt;&gt; Would be good to retro difficult cases &lt;&gt; Write instructions into documentation to avoid re-learning the hard way &lt;&gt; Retro some successes as well &lt;&gt;</td>
</tr>
<tr>
<td><strong>Tasks:</strong></td>
<td>Many tasks get personalized &lt;&gt; work not prioritized on the team level &lt;&gt; Some people overloaded with work &lt;&gt; Establish clear roles and responsibilities &lt;&gt; Get rid of the old roles, define what is required &lt;&gt; Encourage to take tasks outside of own expertise to distribute workload and expertise &lt;&gt; Team member are locked into specific roles &lt;&gt; define roles/responsibilities so that almost all work have second or third specialist who can do it as well &lt;&gt; Shuffle roles to learn &lt;&gt; Separate planning and operations</td>
</tr>
<tr>
<td><strong>Other Notes</strong></td>
<td>Teams 4 and 5 were the least knowledgeable on concepts of Kanban and lean/agile. Mostly they were guessing, providing comments only in a few places where they understood what the question is all about. From these teams many oral comments about having not enough knowledge on the basic terminology and concepts of Kanban, lean and agile surfaced. Other teams commented this as well, but to lesser extent. Change resistance was also observable especially in the oral comments of teams 4 and 5.</td>
</tr>
</tbody>
</table>
### Summary of field notes from interviews of the management team.

<table>
<thead>
<tr>
<th>Question</th>
<th>Statements: Synthesis of the statements is presented when the statements were similar. Most important content of differing statements are presented individually. Informant 1, informant 2, informant 3, informant 4, informant 5, informant 6</th>
<th>Comments / analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interviewee positions and tasks</td>
<td>Service manager, team leader. Responsible for system area and/or named services. Lifecycle management, planning and operations. Head of department. Quality, customer experience, productivity, cost efficiency. Development projects and strategy. Management and coaching of the team towards targets.</td>
<td>One team a virtual team, team members have different supervisors. Temas have similar responsibilities, synthesis presented here.</td>
</tr>
<tr>
<td>2. What are the sources of tasks (strategic deployment plan, new development, processes, projects, 3rd level support etc)? What kind of continuous tasks&amp;responsibilities does your team have?</td>
<td><strong>Tasks/responsibilities:</strong> Lifecycle management - contracts, planning, technical architecture, technical roadmaps. Operations – technical changes, testing, taking into production. Fault management / incident management, technical and customer support (third level). Project work for new features/services from hand to mouth – not much in advance information available. Need to have unallocated development budget for these. <strong>Sources of tasks:</strong> Customer units productize, related tasks flow in via action plan and projects. Urgent short-term development needs/projects come via the demand management (development director). Operative work is either self-tasked (within the same team or other teams) or comes from main processes. Other operators/companies (operator customers, sw/hw vendors). Tasks from neighbour teams and own action plan of the organization. Own action plan partly formed based on own input. Customer escalations via the senior management. Service operations center. Lots of ad hoc service development requests. Main processes have different priorities that the line organizational tasks.</td>
<td></td>
</tr>
<tr>
<td>3. Who are the (internal) customers/stakeholders (who give tasks)? (are there others than the case organization?)</td>
<td>Corporate customers/consumer customers units. Operator customers unit. Other units/teams within production. Change management. SW/HW vendors. Incident management process. Delivery process. Demand management. Would need direct contacts to customer units.</td>
<td></td>
</tr>
</tbody>
</table>
4. (How) do you get information of the end customer’s needs – customer feedback? Do you process it - how?

NPS free-text feedback doesn’t come through. Only the NPS value for the whole business area is visible. This would be necessary for the specialists to know what/how to develop. More detailed information from customer units needed. Some information comes via incident management cases, but only occasionally. Quality watch meeting on Fridays, focus on technical quality (measurements from the network). NPS development is reviewed as a part of larger development projects. Analytics from technical data being developed to address customer experience issues.

5. What channels are used to receive, handle and report tasks (workflow management for example)

Telehone, email, skype, personal contacts, meetings, projects and project meetings. Jira Kanban. Change management system, separate system for managing delivery and fault management tickets. Workflow management systems of external partners. Regular meeting with external partners. A few virtual teams with specialists from any teams. Mostly the task come in to team members who create Kanban tasks. Larger projects and action plan items come via the management.

An overview of the Kanban

Confluence is selected to document the process.

Kanban throughput is not measured. Two-stage Kanban, epics at the department level and tasks at each team. Unlike the original Kanban concept, we can also step back to the left on the Kanban. In theory incident management and change management should be included in the team level Kanban.

Reporting to the higher level management through the action plan.
6. What is the output of various tasks? How is the output communicated?

Output to the sources of the tasks about progress. All changes are documented. Mattermost and other tools used for daily communication between specialists. Both wiki-style and traditional document formats used, lots of data on traditional format. Often the only direct communication to customer related to incident management. Customer units handle all other end customer communication. Lots of communications by specialists.

7. Who will prioritize and schedule tasks? What is the basis for prioritization? Are there tasks that always have the highest priority?

The specialists prioritize operational work by themselves. Often first in, first out. Incident management has always the highest priority. The person on duty handles incident management cases unless extra hands needed. Escalation by the team leader. Action plan/project level prioritization done at the department level management team. Things which are in between these are prioritized at the team level, either by the team at standup or by the team leader. The management team should set common priorities, which is not always the case. Epics may last half the year. Tasks often 1-2 weeks of effective time.

8. How are the tasks and priorities communicated to the team members?

Decisions are documented to Jira Kanban. Standups, other meetings and Mattermost discussion channel are used to communicate.

We try to use Kanban, still quite much trouble with it because with current workload requires multitasking. Still learning to visualize things with Kanban.

All tasks are not in Kanban, for example daily operations (incident management and other). Ad hoc work, which there is quite much, is not visible in Kanban.

9. Describe team internal communication. What tools are used? What kind of meetings are held? where the team members are physically located?

Meetings:
Team located in multiple physical locations, meetings over Skype and locally.

Weekly on Mondays, general issues and Kanban standup (showstopper, completed, prioritization). On Tuesdays a weekly of neighboring team. On Thursdays planning meeting with neighboring team. Once a month roadmaps and major software upgrade decisions at the planning meeting. On Fridays a quality watch meeting. Every morning half an hour daily with access operations (named specialists). 1to1 in one and half month cycle.
On Mondays one hour Kanban standup. On Wednesdays a “daily” for changing topics + HR issues. On Fridays meeting for roadmaps and project/action plan issues. Otherwise Mattermost and emails used. locations Helsinki and Tampere.

On Tuesdays the Kanban standup, one hour. On Thursdays a two-hour weekly meeting, roadmaps and planning issues together with a neighbor team. Team daily each Monday morning. Quality watch meeting on Friday. Team locations Tampere and Helsinki, meetings over Skype and meeting room in Helsinki.

Every day a virtual daily standup in Mattermost chat. Each Friday a weekly over Skype, Kanban standup where completed, significant tasks in progress and backlog are reviewed. Locations Turku, Tampere, Helsinki

Team weekly meeting. Daily on Monday and Thursday mornings 30 minutes each, Kanban standup. Once in two weeks face to face meeting, half a day. Locations Jyväskylä, Tampere, Seinäjoki, Helsinki.

Meeting schedule for the department management team

10. What kind of expertise is needed? Is there such an expertise in your team? Is there sufficient time/means for gaining expertise? Is the expertise evenly distributed?

Expertise at a good level. Part of the team in operational roles, part in planning roles. Very deep-rooted areas of expertise. Tried to spread expertise, to have it more evenly distributed.

Ok. Everyone could know more about everything. Roles exist, some are planners, some do deliveries / ticket based work. Only part of the team have on-duty responsibilities.

Expertise meets the need but moving target hard to hit. Specialized roles to some extent. Risks related to special skills&knowledge centered on a few people.
Even access to certain systems limited for only a few people.

Evenly distributed expertise. Challenges with dedicating time for developing expertise. Planned to tackle with a “yearclock” of developing expertise within the team. Still there are some specialized areas of expertise.

<table>
<thead>
<tr>
<th>11. If other teams / other parts of organization (or vendors) are needed for completing a task, how the inter-organizational co-operation is arranged? Where the other stakeholders are located in terms of organization?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical care meetings and roadmap meetings with technology partners. Daily communication with dedicated contact personnel. Support tickets for official requests. Often cause more delay than would be expected. This causes Kanban tasks to be blocked for longer time, frustrating people.</td>
</tr>
<tr>
<td>Internal co-operation mostly unofficial. Some repeating semi-official meetings with internal partners within production unit. Larger things are done in projects where there are project meetings. Within the department completely unofficial. In the future need to exchange Kanban tasks from team to team.</td>
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<table>
<thead>
<tr>
<th>12. Are there challenges? What kind of? (Describe showstoppers and how much they consume time &amp; why)</th>
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<tbody>
<tr>
<td>Resources, software upgrades etc need to be stepped over (passed). Roles. How to feed the specialists will for continuous development of skills. Transfer of skills, also in between teams with mutual responsibilities. Aging – how long people can learn and be motivated. Learning – it is not enough to be able to participate training courses, if you can’t get hands on experience. This has to do with specialization and shared responsibilities between teams.</td>
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<tr>
<td>There are differing opinions/views within teams what is important and to what we should focus on.</td>
</tr>
<tr>
<td>Implementation of the new organization and process after the change. Aging of personnel not a problem on a short term, but over next 10 years.</td>
</tr>
<tr>
<td>Learning to utilize Kanban. Learning the new process.</td>
</tr>
<tr>
<td>Different types of specialists roles from planning to operations. Everyone can’t be tasked with every type of task. for those who have done only high level planning in the previous organization, to have a right mindset for adopting completely new causes difficulties sometimes. Usage of specialist resources over team and department limits causes some challenges. Especially</td>
</tr>
</tbody>
</table>
with other teams there are difficulties as they have their own prioritization. The ongoing heavy technological change, there is need to learn/adopt new and handle all the operative tasks simultaneously.

On the department and unit level, the availability of time for meetings and co-operation is a major problem.

<table>
<thead>
<tr>
<th>13. What is the capacity (throughput) of the team? Can you keep the schedule for all tasks? For what tasks? How the throughput is measured?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of incoming tasks meets with the capacity. There is a certain area of specialization where only a few personnel, they need to do too much overtime work. Software/hardware updates are done in the nighttime, takes a lot of time.</td>
</tr>
<tr>
<td>Mostly ok capacity.</td>
</tr>
<tr>
<td>Certain specialists are doing a lot of overtime work in certain projects. Otherwise ok. We don’t measure the throughput. This would be good to do, for example on the Kanban board.</td>
</tr>
<tr>
<td>We don’t measure throughput such as how long it takes to complete tasks. Would be good to have such measurements based on Kanban.</td>
</tr>
<tr>
<td>Action plan targets are measured. Quality measurements from the network are also used. On the balanced scorecard, success rate of changes, amount of major incidents.</td>
</tr>
</tbody>
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<tr>
<th>14.</th>
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<tbody>
<tr>
<td>Mostly well, while there are both early adopters and detractors in the teams. No official protocol for daily communication, some people are daily at the office while others do remote work.</td>
</tr>
<tr>
<td>I want to know what everyone is doing. I want to be up to date each day.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>15. What happens if there is ad-hoc/fire-fighting tasks. Does the senior management (or service management) override everything with an urgent task?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer complaints from corporate customers are often escalated via the senior management. These are usually from key customers. These have top priority, unless there is another ongoing incident (fault in the network) which needs to be addressed. From time to time may disrupt the planned work, but not a significant problem.</td>
</tr>
</tbody>
</table>
16. How are different types of tasks and team performance measured? Daily, over longer period?

The overall performance is measured with key performance indicators on the balanced scorecard (NPS, success rate of changes, major incidents). Weekly completed epics on the department level Kanban are used as a measurement. Action plan KPI’s action plan items (Kanban epics) separately from Kanban.

There aren’t work in progress limits in use on the Kanban, neither per team or per specialist.

17. What things are handled in the department level? Any challenges?

Budget issues take a considerable share of the management team’s time. Inter-organizational co-operation and management of it also cause challenges. There is no department-level action plan but instead items on the unit action plan. Learning lean/agile, this is still in its childhood in terms of maturity. Unit level deployment plan targets are planned in the management team, together with associated budget rows.

Management team meetings could be more formal. There should be clearly defined owner for everything. Too much discussion. We do action plan planning and associated budgeting, investments. Input for these comes also from customer units. The head of department provides input from the strategy.

We have weekly meeting on Wednesdays, a Kanban standup on Wednesdays as well, on Mondays a fifteen minute phone call to start the week. Regular meetings for action plan planning, for budgeting. We try to have exact budget rows, but also have a buffer budget for unexpected needs from customer units. On the department level an action plan excel is kept to track targets and associated budget and for approving investments.

We have our own Mattermost chat on good atmosphere. Lack of time a problem. We often run out of time on the two hour weekly meeting. Don’t meet the head of department very often but we have regular one to one meeting.

A designated team leader is responsible for putting together the budget for the department based on number sent by team leaders. Then we discuss it on the management team. Many people, especially the head of department, has quite populated calendar which is a challenge. We would need more co-operative work to develop our operating model/process but it is challenging to find common time.
### Challenge

To build and work on common targets, so that all would work in unison towards the same common targets. Too much steering from too many directions. Difficulties of progressing tasks belonging to same larger project (epic) in many teams simultaneously. Change resistance visible, as well.

### 18. What are your (teams) experiences on experimenting KANBAN so far?

**To what extent do you utilize it?**
What do you think about Kanban and other lean/agile methods?

Kanban used mainly for visualisation. No scrum-style usage. We don’t have work in progress limits. It is a good question if there should be limit. We **should get rid of tasks that stay there for weeks**.

- **Kanban is good for visualizing work.**

There are lots of frameworks. I think it is up to the organization to choose a suitable for own use. Now we have a lot on slogans/phrases we use, even though not everyone in the organization understand what they mean. They don’t have similar meaning for everyone. We need to progress step by step by experimenting from various frameworks, to find things that suit to our own work.

### 19. How would you like the work to be arranged?

Anything to add?

I would change on the department level – we need more time for the management team. Now the Kanban adoption related discussion is going back and forth without defining common ways of using it within teams.

- **Should have more time for operative issues on for the management team. Instead we handle requests from elsewhere. I don’t know too well how the other teams are doing. I believe in lean/agile but need to adopt/change for purpose – need to understand why and what.**

Need to have same information for everyone in the management team. Responsibilities are now too fragmented. Don’t know how to fix. We would need to have everyone within the department with the similar level of knowledge regarding lean/agile.

- **I wonder if we should move towards matrix type of management instead of line organizational management.**

Responsibility and decision making is now vested to team leaders. I think the specialists should have more technical decision making authority, with right to veto for team leaders. We should focus on managerial issues.
of the department level and one to one work. Need more time for that.

| We need to accommodate the DeOps model adopted by many of our technology partners into the current process. This is required in order to reach very short software installation and delivery cycles, two weeks or less, instead of the current cycle which may take months. Need to establish a red team concept like the Ferrari F1 team to do high priority tasks very rapidly. |
### Summary of field notes from interviews of the stakeholders

<table>
<thead>
<tr>
<th>Question</th>
<th>Statements: Synthesis of the statements is presented when the statements were similar. Most important content of differing statements are presented individually. <strong>Informant 1, Informant 2, Informant 3, Informant 4</strong></th>
<th>Comments / analysis</th>
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</thead>
<tbody>
<tr>
<td>1. What are the tasks towards (expected from) Centralized networks? (strategic deployment plan, new development, processes, projects, 3rd level support etc)?</td>
<td>Business-induced changes and new capabilities (for creating new services). Preparatory meetings with demand management function and with the head of the case organization. Technology forums bring information from the production and developments in the network. There would be place for a more regular forum to exchange information about new capabilities etc. Development managers and business managers should be involved from our side. Strategical issues are handled quarterly in a high level meeting where there is director-level representation from the production unit. Does not concretize to the team or specialist level as an information flow. Cannot keep up to date with the organizational structure of the case organization. It also happens that targets are not synchronized over the organizational borders. We should have mutually agreed roadmap thinking and focus on roadmap items. Some examples of projects which we have had to do hastily as the production hasn’t been able to prepare and we haven’t had sufficient knowledge of the capabilities ...</td>
<td>The case unit’s development director represents them in our weekly management team meetings. Telco steering group, participated by vice president level people from both sides handles and prioritizes all large projects and other initiatives involving investment. mostly we “manage” production unit activities through strategy. One typical example of quick ad-hoc assignments to production are when new phone models are introduced and interoperability of those with our services need to be ensured.</td>
</tr>
</tbody>
</table>
Strategy work, which is conducted through number of forums. Production strategy is synchronized to the business strategy.

Development director is the most important day-today contact between business units and the case organization. Single contact point for many things. Coordination of activities. Finding out specialist and managers for each project. Coordination of strategic planning and department level action plans.

<table>
<thead>
<tr>
<th>2. Who are the (internal) stakeholders (who receive tasks)?</th>
<th>Heads of departments, team leaders.</th>
</tr>
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</table>

<p>| 3. (How) do you share information of the end customer’s needs – customer feedback? Do they process it - how? | Mobile broadband NPS in special focus. Real feedback from customer and customer experience measurements have been taken into account, but case by case. No real co-creation with regards to customer feedback. This on done with specialist level on production side. The customer unit processes all customer feedback and plans actions based on them. Actions are then communicated to the production unit. On a more generic level it would be important to convey more customer experience information to the production unit personnel, including specialists. Ways to do this would be better direct communication, regular forums, sharing processed information. There is much room for development in this subject. The customer focus tends to be forgotten, but on the other hand we don’t often convey enough information towards the production unit. Often we get grips of the things only after something has gone totally wrongly and the customer complain directly. This information is not shared systematically enough between production and business units. Communication to lower levels of organization is not at sufficient level, needs to be improved. |</p>
<table>
<thead>
<tr>
<th>4. What channels are used to receive, handle and report tasks (work-flow management for example)</th>
<th>Daily office communication tools. No direct formal channels for daily work. Often we need to find the right people by triangulation. Would be welcome to hold a kickoff where people, roles and responsibilities would be introduced on each organization’s side. Larger projects are communicated through dedicated project manager. Can also escalate to management teams of production unit’s subunits.</th>
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<tbody>
<tr>
<td></td>
<td>There are challenges with up-down (in-silo) communications as well as between lower levels of both organizations. Communication deficiencies cause too much urgent extra work.</td>
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<tr>
<td></td>
<td>Projects are communicated through project management. Business managers find it frustrating that business challenges are not always understood on the production and resources are not available. There should be more formalized interaction regarding this. Business unit’s centralized initial communication channel towards the case organization in production is the demand management function (one person). Business managers also have direct informal contacts to team leaders or specialists or the production.</td>
</tr>
<tr>
<td>5. What is the output of various tasks? How is the output communicated?</td>
<td>Persons with the responsibility of various things communicate directly to each other (one-to-one). In the projects the communication is defined per project.</td>
</tr>
<tr>
<td>6. Who will prioritize and schedule tasks? What is the basis for prioritization? Are there tasks that always have the highest priority?</td>
<td>Prioritization is done in telco steering group and other high level forums. Works fairly well. Sometimes challenges at high level. Visibility to the production capacity is good in some areas, almost nonexistent in some others. Prioritization is basically based on expected customer value and customer experience.</td>
</tr>
<tr>
<td>7. How are the tasks and priorities communicated to the CN stakeholders?</td>
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</tbody>
</table>
8. Describe stakeholder communication. What tools are used? What kind of meetings are held? Where the team members are physically located?

The organization is too siloed on both sides. In our unit we have removed half of the KPI’s which would encourage siloed action. We need to create end-to-end visibility at all levels of organization.

9. What kind of expertise is needed? Is there such an expertise in the CN organization? Is there sufficient time/means for gaining expertise? Is the expertise evenly distributed?

Mostly at a good level. Sometimes there are indications of motivational problems. Performance at a good level. We would need personnel who can translate between languages of business and technology. The business requirements and technological capabilities would need to be combined in communication in such a way that these can be communicated in each part of the organization. Now the lack of this sometimes causes unacceptable lead times. For the case organization a development manager role might be needed.

10. If other teams / other parts of organization (or vendors) are needed for completing a task, how the interorganizational cooperation is arranged? Where the other stakeholders are located in terms of organization?

Over the last years it has been a bit unclear how much the business unit should actively seek information of new capabilities and how much the production should inform us. We need more formalized communication regarding business needs and technological capabilities.

The use of time for meetings need to be revised, now we use too much. The management must show example. We also think that processes guide our work, which really is not the case even though it should.

Our largest challenge is siloed approach to things. Also old style of management. Lean/agile must be applied from top to down through the whole organization. In order to adopt new, some old management structures must be abandoned.

11. Are there challenges? What kind of? (Describe showstoppers and how much they consume time & why)

Over the last years it has been a bit unclear how much the business unit should actively seek information of new capabilities and how much the production should inform us. We need more formalized communication regarding business needs and technological capabilities.

The use of time for meetings need to be revised, now we use too much. The management must show example. We also think that processes guide our work, which really is not the case even though it should.

Our largest challenge is siloed approach to things. Also old style of management. Lean/agile must be applied from top to down through the whole organization. In order to adopt new, some old management structures must be abandoned.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. What is the capacity (throughput) of the CN organization? Can they keep the schedule for all tasks? For what tasks? How the throughput is measured?</td>
<td>Production’s capacity does not meet the demand in every product area. This varies from product area to another.</td>
</tr>
<tr>
<td>13. Do you give ad-hoc/firefighting tasks? For what reason?</td>
<td>Firefighting/ad hoc tasks are often related to introduction of new mass-market device models, which are not completely supported by the company’s mobile network</td>
</tr>
<tr>
<td>14. How are different types of tasks and CN organizational performance measured?</td>
<td></td>
</tr>
<tr>
<td>15. How would you like the work to be arranged? Anything to add?</td>
<td>We would need to abandon old management structures in order to become lean. This cannot be achieved if we fill our calendars with all sorts of meetings and reporting at each level of the organization. We should seek for new ways to share information and involve specialists. Processes and management structures need to support this. We are adopting Kanban because we wanted to increase visibility and wanted to avoid tasks getting personalized. This would also serve better sharing of workload. We are looking for empowered teams and specialists, which is challenging because of the siloed organization.</td>
</tr>
</tbody>
</table>
### Results of questionnaire to specialists

<table>
<thead>
<tr>
<th>Question</th>
<th>Statements: All statements are translated into English as they were, but individual responses of each question can’t be associated with responses to other questions due to system used to implement the questionnaire. Confidential technical details removed.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Which team you are member of</td>
<td>Respondents represented three teams out of five.</td>
<td></td>
</tr>
<tr>
<td>2. From who you receive your tasks (organization/group). Which kind of tasks, related to action plan, processes, projects or smaller tasks (or something else)?</td>
<td>Mostly form other members of our team.</td>
<td>From teams of our own unit and from other operators directly.</td>
</tr>
<tr>
<td></td>
<td>From many directions.</td>
<td>From many directions.</td>
</tr>
<tr>
<td></td>
<td>Mostly from colleagues in neighboring teams, a bit less from my team leader.</td>
<td>Mostly from colleagues in neighboring teams, a bit less from my team leader.</td>
</tr>
<tr>
<td></td>
<td>Team leader, other departments within the unit. Daily operations. configuration changes.</td>
<td>Team leader, other departments within the unit. Daily operations. configuration changes.</td>
</tr>
<tr>
<td></td>
<td>Business units, other units within Production, neighboring teams. All the types of tasks mentioned in the question.</td>
<td>Business units, other units within Production, neighboring teams. All the types of tasks mentioned in the question.</td>
</tr>
<tr>
<td></td>
<td>Team leader, colleagues, other operators.</td>
<td>Team leader, colleagues, other operators.</td>
</tr>
<tr>
<td></td>
<td>Processes, projects and development tasks. Are connected to strategy or development.</td>
<td>Processes, projects and development tasks. Are connected to strategy or development.</td>
</tr>
<tr>
<td></td>
<td>Own team, ticket system and projects.</td>
<td>Own team, ticket system and projects.</td>
</tr>
<tr>
<td>3. What are your team’s and your personal continuous duties</td>
<td>Analysis and fixing of customer reported incidents.</td>
<td>Modernization of technology.</td>
</tr>
<tr>
<td></td>
<td>Modernization of technology.</td>
<td>Development and maintenance of the systems in my area of responsibility</td>
</tr>
<tr>
<td></td>
<td>Development and maintenance of the systems in my area of responsibility</td>
<td>Continuous routine duties related to team responsibilities.</td>
</tr>
<tr>
<td></td>
<td>Continuous routine duties related to team responsibilities.</td>
<td>Technology xx- configurations/removals</td>
</tr>
</tbody>
</table>
| 4. Via which channels you receive your tasks | Customer projects/deliveries, incident management process, software testing, network maintenance, informations security and service development  
On-duty shifts, network elements operations and maintenance  
Network monitoring and customer incident process support  
On duty shifts which include customer incident handling and everything else related to mobile voice services |
|---|---|
| 5. How the tasks are scheduled and prioritized | Mostly using own reasoning. Followed and communicated in weekly team meetings (skype)  
ASAP  
Independently. If the source of the task doesn’t approve, then escalated to team leader.  
Usually I schedule and prioritize, except projects where other people prioritizes. Even then I prioritize my own work. It is up to oneself whether to put tasks into team Kanban where they are processed and completion is reported.  
Normal operational work using own consideration. Project work in project planning meetings and from responsible for the project.  
I will prioritize and schedule my own work, feedback through the channel from which the task arrived.  
Team Kanban, own work log.  
Kanban aids with the scheduling and prioritization and with splitting tasks for both personal work queue and for reporting to the management.  
Mostly we prioritize by ourselves. |
### 6. What types of issues cause delay or otherwise make you work difficult (are challenges)?

How/why? Any ideas how to resolve?

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Often in difficult fault cases there are many moving parts meaning that there needs to be people from many teams. Then all the necessary people need to be updated with the details. Often new technologies cause additional complication as practical implementation is new to everyone.</td>
</tr>
<tr>
<td>2.</td>
<td>Other operator’s timetables. Deficiencies in technology partner’s systems.</td>
</tr>
<tr>
<td>3.</td>
<td>Waste. Jira/Kanban is frustrating. First we use a lot of time to complete task tickets. Then we read them to the team leader each week, even though he understands only superficially. And on the next week we read again. This takes 5-10% of the work time.</td>
</tr>
<tr>
<td>4.</td>
<td>Fragmentation of work and need work continuous learning are challenges but an opportunity as well. They say that rolling stone gathers no moss.</td>
</tr>
<tr>
<td>5.</td>
<td>No recurring delays or challenges. Sometimes challenges in projects due to various reasons.</td>
</tr>
<tr>
<td>6.</td>
<td>Third party / department work.</td>
</tr>
</tbody>
</table>

### 7. Are your time and responsibilities in balance? Are there any time related challenges?

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enough time, just need to stretch sometimes.</td>
</tr>
<tr>
<td>3.</td>
<td>Over the years a lot of responsibilities have gathered and more comes. This is not visible in salary.</td>
</tr>
<tr>
<td>4.</td>
<td>Would ne enough if I would have only one system in my responsibility. On the team we have many systems, which all must be managed by everyone at some level. Then tools for network monitoring and fault finding. Then the new technology changes. Regarding these, must skip many things to be able to manage existing tasks. Difficulties with the available time for tasks.</td>
</tr>
<tr>
<td>5.</td>
<td>Regular working hours are enough.</td>
</tr>
<tr>
<td>6.</td>
<td>Sometimes need to prioritize. Things won’t ne left completely undone but are delayed as more important tasks get done first.</td>
</tr>
<tr>
<td>7.</td>
<td>Sometimes need to leave something undone and prioritize.</td>
</tr>
<tr>
<td><strong>Appendix 8</strong></td>
<td><strong>8. Is it possible to maintain &amp; renew your expertise?</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Always need to prioritize and leave something undone but they must not be action plan items or projects.</td>
<td>Yes it is possible but requires effort. I refer to the new technology that puts us to the mercy of thechnology partner more that we were beforehand.</td>
</tr>
<tr>
<td>On own time.</td>
<td>They speak nice things, but in practice trainings are just dreams.</td>
</tr>
<tr>
<td>Not completely.</td>
<td>Not enough time for learning new through work because need to prioritize time. I’m able to deal with my current responsibilities but must bypass opportunities for new.</td>
</tr>
<tr>
<td>Possible, if you are intested. Learning opportunities relatively well available.</td>
<td>Possible, no challenges with current duties.</td>
</tr>
<tr>
<td>Possible, no challenges with current duties.</td>
<td>I think enough training is available, not to forget self-studying.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>too mechanically tried to implement even though their are not suitable for the task, when these are adapted to our needs, such as the Jira Kanban, there are benefits as well. I don’t believe it is purely lean or agile even though it is called Kanban.</td>
<td>Absolutely useful for keeping team and department actions aligned with each other.</td>
</tr>
<tr>
<td>Not too much benefit of Kanban so far.</td>
<td>The current Kanban should be developed with truly introducing the new organization into effect.</td>
</tr>
<tr>
<td>Lot of benefit. Need to move from other tools to Kanban functionality.</td>
<td>10. Is the flow of information to and from you sufficient to achieve goals of your tasks? How would you make it better?</td>
</tr>
<tr>
<td>Yes it is. Challenges exist with remote work and new offices, related to old times when everyone were near to each other. Now everything should be handled and information conveyed in meetings. Or write lengthy emails.</td>
<td>Yes it is. Challenges exist with remote work and new offices, related to old times when everyone were near to each other. Now everything should be handled and information conveyed in meetings. Or write lengthy emails.</td>
</tr>
<tr>
<td>More meetings for developing and sharing information.</td>
<td>More meetings for developing and sharing information.</td>
</tr>
<tr>
<td>Instead of regular meetings the team leader could send lot of information on email.</td>
<td>Instead of regular meetings the team leader could send lot of information on email.</td>
</tr>
<tr>
<td>I think yes, department level meetings are used to give overview of projects and associated action plan items.</td>
<td>I think yes, department level meetings are used to give overview of projects and associated action plan items.</td>
</tr>
<tr>
<td>Usually yes, but now some difficulties with neighboring team as the latest change separated one team into two.</td>
<td>Usually yes, but now some difficulties with neighboring team as the latest change separated one team into two.</td>
</tr>
<tr>
<td>Yes it is enough</td>
<td>Yes it is enough</td>
</tr>
<tr>
<td>Yes but everyone should focus on clarifying the message.</td>
<td>Yes but everyone should focus on clarifying the message.</td>
</tr>
<tr>
<td>11. Anything to add?</td>
<td>11. Anything to add?</td>
</tr>
<tr>
<td>What could be done otherwise, what would you keep as is, what would you develop?</td>
<td>What could be done otherwise, what would you keep as is, what would you develop?</td>
</tr>
</tbody>
</table>