A Matrix Organization in Change
— The Challenges of Resource Allocation in a Growing Multi-Project Environment

En matrisorganisation i förändring
— Utmaningarna med resursallokering i en växande multi-projektverksamhet

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Abstract

It is not uncommon for organizations going through a change connected to growth to be faced by new challenges. To grow, they need to explore new markets and engage in development of new products which they have little or no previous experience in developing. Uncertainty highly influences these settings which creates problems not always connected to technical development. Dealing with a situation where more and more projects are undertaken is complex, and it puts pressure on resource allocation methods. The portfolio of projects sets demand for human resources, which is supplied through a human resource management system by the line organization, to projects. If problems occur, the project portfolio demands re-allocation of resources and prioritizing to cope with new prerequisites.

At the studied site, TECHX has gone from a small company focusing on a narrow market segment, to become a manufacturer of several product solutions expanding their presence in the market. By exploring new market segments and employing more personnel, TECHX are in a completely new position compared to 20 years ago. The company has experienced difficulties in dealing with resource allocation in projects, and a lot of resource re-allocation is done to put out fires in projects. This creates a situation where resources are moved around, which affects smooth-going projects negatively. This study has found a lack of project portfolio management, and that not enough focus is directed towards long-term resource allocation.

This master’s thesis has studied the interaction between project portfolio management, human resource management and day-to-day planning, and how they affect resource allocation. It was obvious that TECHX do not have a management system in place for their project portfolio which was determined to be a major factor for having problems connected to resource allocation. Adding the informal and insufficient communication between departments and managers, and the unsuitable project work set-up, and the situation has become too hard to handle. This thesis recommends TECHX to engage in the project portfolio through a defined project portfolio manager. This role will formalize how projects are prioritized and how resources will be re-allocated to projects in need. To get the most out of the projects, project teams would benefit from co-location with each other to improve knowledge and experience sharing, reducing the barriers between them. To make sure a sustainable work environment is achieved, HR need to be more active in the daily work to support managers in need of guidance.

**Keywords:** Human resource allocation, Project portfolio management, PPM, Human resource management, HRM, Matrix organization, Multi-project organization, Qualitative research, Case study.
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1. Introduction
The introduction aims to give the reader an initial understanding of the reason behind this thesis and what previous research has shown. First, the background to the problem is discussed, followed by the description of the case company. These two parts will be the foundation to the problem discussion, which then will form the purpose and research question. To further concretize the thesis, a section with limitations will be presented as well.

1.1 Problem background
The 1960’s have been acknowledged as the decade when matrix organization structures became increasingly important for companies in their new product and service development (Laslo & Goldberg, 2001; Kuprenas, 2003). The matrix organization is known as the organization structure in between the two extremes; functional organization and project-based organization (Hobday, 2000). The authority over resources delegated to functional management and project management respectively, allows for varying types of matrix organization between the two extreme organization types. Matrix organizations utilize the strengths of both functional- and project led organizations and combines them to create cross-functional communication paths between functional departments via the use of a project manager. There are several reasons why organizations move towards a matrix structure; strategic choice (Engwall & Jerbrant, 2003), competition from other actors (Dooley, et al., 2005) but also for unintentional reasons or result of pure coincidences, e.g. when multiple project with different scopes and goals happen to start at the same time (Engwall & Jerbrant, 2003). Hobday (2000) argues that opting for project-focus settings often provide the advantage of managing the development of high technology products providing fast-changing, customer focused innovations. In this situation, Laslo & Goldberg (2001) and Larson & Gobeli (1989) state that the project manager is responsible for developing the new product while the line manager’s [functional manager’s] main task is to support the employee’s technical knowledge development. Larson & Gobeli (1987) present matrix organizations as being more effective compared to pure functional- or project-based organizations, considering amongst others the efficient usage of resources. However, shortcomings of matrix organizations are presented as well. A commonly identified problem has been competition over resources (Laslo & Goldberg, 2001; Laslo & Goldberg, 2008). When adopting the matrix structure, organizations face a new dimension of competition between resources; not only between project managers, but also between project managers and line managers (Engwall & Jerbrant, 2003; Laslo & Goldberg, 2008).

A fundamental aspect differentiating successful project management from an unsuccessful is projects receiving resources necessary to reach set objectives whilst the organization is able to maintain day-to-day functional activities (Laslo & Goldberg, 2001). In regards of resources necessary they naturally vary from financial-, physical- and time-resources. Although these all play a crucial role in the success of project management, the resources taking part in the demand- and supply between function and project are primarily human resources. The organization structure and interaction between the function and project may be heavy influenced by the resource allocation policies set in place (Laslo & Goldberg, 2001). Arguably, a successful management of parallel projects with efficient resource allocation is highly dependent on a functioning human resource management system (HRMS) (Laslo & Goldberg, 2008). As a multi-project environment allows for several temporary organization constellations, the adaptation of an HRM system becomes more crucial. Turner et al. (2010) argues that HRM systems are in need of revision every time a project is started or completed and in need of implementation throughout functional management and project management respectively in order to support the day-to-day activities in the organization. Further, in adaptation of multi-project settings, Engwall & Jerbrant (2003) raises concerns for allocating human resources between projects, and the problems this may lead to. If everything goes to plan, the projects will most likely run along smoothly, provided the planning is sufficiently done. However, if problems occur (which they most likely will), the plan usually become obsolete. Planning becomes more complicated when projects are started without considering the number of projects already in the system. The vast number of projects risk becoming unmanageable for the company with complications such as delays, constant resource re-allocation and extra stress put on the employees as a result. As HRM systems are set to support the activities
of resource allocation with the necessary tools and principles, there is a more holistic and strategic issue to be addressed. With project portfolio management (PPM) organization can set a strategic constellation of projects to align with existing prerequisites such as capacity and technology. The fundamental idea of a functioning PPM is to track multiple projects in their progress as well as the demand and supply of resources providing an improved general overview of projects by employees and managers. Apart from increasing the success of projects, PPM aims to relieve employees and managers of undue stress and confusion (Blichfeldt & Eskerod, 2008). In an ideal world this would be sufficient, but since planning is difficult and problems do occur, there is also a need to allocate resources on a day-to-day basis which creates the opportunity to adapt to current situations (Hendriks, et al., 1999). As project management and functional management could be viewed as an interaction of demand and supply of resources, equally HRM, PPM and day-to-day planning could be viewed as tools interacting in demand and supply. It is not uncommon for matrix organizations to face the challenges of understanding the principles and tools necessary to best cope with the supply and demand created by this organization model.

1.2 Case company description
This thesis refers to the case company as TECHX, a fictional name referring to a real-life company. TECHX is a global company with two sites in Sweden, the case company is one of these two sites. The other site in Sweden, which is not a central part of this thesis, has a centralized role in TECHX’s presence in Sweden. This site will from now on be referred to as “the sister-site”. The studied site will from now on be referred to as TECHX. The company has experienced significant growth in recent years. From being a small and flat organization, they have grown to employ more than 120 people at the studied site. In this transition the organization structure has been changed to empower a line organization compared to the very project dominated organization earlier in place. The project dominated organization gave rise to a senior-dominated culture, with long-time employees with wide and deep internal experience. The structure allowed essentially all employees to work cross-functional in the many stages of the projects. TECHX’s growth over the past years has led to new organizational challenges, previously not experienced. Moving from a project driven organization with project managers having decision-making authority, to a structured matrix organization with new roles, have therefore proven difficult for them. The new organization structure, empowering the line organization, have now three levels of line managers owning and allocating resources to the project organization. Figure 1 illustrates the current organization chart, where each box represents a manager and the number on the left of each box presents number of subordinates to that department.

![Organization chart TECHX](image)

Figure 1: Organization chart TECHX.
The studied site, TECHX develops and deliver integrated solutions as a supplier to larger final assembly customers. The development of high complex solutions is carried out in cross functional project settings from initiating RFQ (request for quotation), to finished product delivery to customer. Generally, products are of mechanical nature with the exception of future product developments requiring solutions of mechatronic nature, with on-site production. With an increasing market demand, the number of active projects at TECHX has also increased. As a result, the organization is struggling to obtain a sustainable resource allocation strategy.

As lifted by management, engineers at the line departments have experienced issues with the new organization structure and the sheer number of projects. Dealing with too many projects, unclear prioritizing and constantly moving between projects have been brought up by engineers and managers to affect their work negatively. It is not uncommon for employees to be assigned to at least 2-3 major projects and a few minor projects as well. At the time of this thesis, TECHX have between 30-40 active projects, ranging from major contract projects and minor internal development projects. It is common for employees to have only one week of planning horizon; after which they do not know what project they might be allocated to. Human resources are always seen as scarce and even though human resources are allocated by line managers, there is some internal competition between project leaders of getting people to their project. To try and deal with internal competition, TECHX have some general guidelines regarding prioritizing between projects, but no set way of prioritizing. Human resources are often re-allocated with short notice, which refers back to employees not always having a detailed schedule more than one week ahead. The constant matter of putting out fires in projects has been acknowledged by TECHX to have a negative effect on employee well-being. Employees get stressed as the pile of work keeps growing and not getting time to finish one task before starting another.

1.3 Problem discussion

The request from TECHX was for us to investigate how the working situation for employees involved in projects could be improved. Relating TECHX to these commonly appearing issues in literature on resource allocation in matrix organizations, it would not be hard to draw a line between the effects described by literature and perceived working conditions at TECHX. Managers and employees at TECHX have expressed a high level of stress in their working environment. Additionally, high uncertainty in their multi-project management is believed to contribute to difficulties of managing the human resource allocation, in turn making it hard to follow up on progress of employees within projects. This makes the issue of resource allocation, human resource management and management of the project portfolio highly relevant and will set the framework of this case study.

We were handed a problem description from the company together with a goal description on the wanted outcome of the research. This partly entailed that the authors would evaluate and present suggestions of improvement in the mechanical design department. Not long after the kick-off, it became clear that there were organization wide difficulties in the current state that in turn would prove problematic in the day-to-day processes of the mechanical design department. Therefore, we presented to TECHX the advantage and need of lifting the perspective over the whole organization in order to find the root cause behind the problem and identifying the right approach in addressing the problem.

The outcome was to focus primarily on resource allocation. Since TECHX in general lack the whole picture when it comes to dealing with human resource allocation, there was a need to include other major components affecting it. The project portfolio management, human resource management system and day-to-day planning are components which need to be understood and dealt with in a proper way to make the allocation of human resources work. The outcome of this then boils down to the purpose of this thesis.
1.4 Purpose & Research Question
This thesis will investigate the connections between project portfolio-, human resource management and day-to-day planning at TECHX, with the purpose to understand the effect project portfolio-, human resource management and day-to-day planning has on the current human resource allocation process and find room for improving the current human resource allocation process.

With the set purpose presented above, we formulate our research question as follows:

- How can the resource allocation process at TECHX be developed using principles of project portfolio management and human resource management?

1.5 Limitations
This report will focus on HRM, PPM and resource allocation on a general level. That means components of these three areas will not be studied in-depth. Strategy is an important aspect to consider when implementing a PPM, but TECHX’s strategy has not been studied because of the wish to study the problem on a general level. Other problematic areas such as culture and restructuring needs were identified during the thesis as well. But because of the limited time, this thesis intends to focus primarily on project portfolio and human resource management issues. This also helps to give a more concise analysis which the company in question can use. Due to time limitations, the suggested ideas will not be implemented but rather be given to TECHX as a set of guidelines on how they should deal with the defined problems. That means this thesis is limited to provide suggestions of improvements where a complete model will not be presented, neither will there be any form of implementation nor post-implementation evaluation.

1.6 Disposition
Chapter 2. Method - The method chapter presents the methodological choices made for this thesis. The first sub-chapters explain and motivates the choices made and details on the implementation of chosen methods. Chapter 2.8 will provide a critical view on the methodological choices made. The chapter also explains where this research stands from an ethical perspective.

Chapter 3. Literature review - This chapter presents central theories relevant to this study. Main topics being resource allocation, HRM, PPM as well as the matrix organization. To present connections between these theories, as initiated by the purpose and research question, an analysis model is available in chapter 3.5.

Chapter 4. Empirical data - Collected data will be presented in this chapter which is divided in three major parts; Organization, PPM and HRM. The collected data is a collection from interviews and own observations made during the study.

Chapter 5. Analysis - In this chapter an analysis of collected data is made in relation to the literature review, presenting connections and differences between empirical data and theory.

Chapter 6. Conclusions - By using the analysis model, conclusions is made in this chapter answering the research question.

Chapter 7. Reflections & Future research - In order to present an outro to the reader, this chapter presents potential subjects for future research. The chapter also raises issues found during the study which were outside of the thesis scope but highly relevant for the research question.
2. Method
The method chapter will bring up the methodological choices made for this thesis. The first sub-chapters will explain the choices made and some details regarding how it was carried out, and chapter 2.8 will provide a critical view on the methodological choices made. The chapter will be finished off with an ethical discussion.

2.1 Case study research
A case study can be seen as a study associated with a certain location; examples include organizations, communities or a single person (Bryman, 2016). Case studies are commonly used to answer research questions such as “how” and “why” (Yin, 2018), which is why they can be seen as leaning towards qualitative methods (Bryman, 2016). The reason for its existence is the need to understand contemporary problems occurring in the real-world, and through that build new theories to describe these events. Silverman (2014) see a case as an interactive unit, commonly organizations within business research. The organization provides numerous sources of information for data collection. Conducting a qualitative case research pose challenges for the researchers; it is time consuming and there is a need for skilled interviewers (Voss, et al., 2002).

This thesis was initiated by TECHX, who acknowledged a need for a third-party review of their organization. A case study is appropriate to do when studying a real-life problem (Silverman, 2014). The research question was formed around the word “how”, commonly connected to case studies as well (Yin, 2018). A case study also provides the authors to get a realistic picture of how certain theoretically described problems occur and how an organization deal, or not deal, with it. All this together formed the reason for doing a case study for this master thesis.

2.2 Research method
There is a distinct difference between, what in research method terms is known as qualitative and quantitative methods. While the quantitative approach seeks to deal with quantifying measures, focusing on answering research questions such as “how much”, “how often” and “to what extent”, the qualitative approach rather tends to seek out to identify perceptions, feelings and other non-numerical values (Nyberg & Tidström, 2012; Bryman, 2016; Silverman, 2014). If the intention of the research is to identify experiences of the participants and explore areas which have not received enough research before, qualitative methods are more suitable than quantitative (Corbin & Strauss, 2015). When conducting a case study, qualitative research is perceived as a more appropriate method (Silverman, 2014). This has to do with the flexible setup of the qualitative methods, as well as requiring “soft” data.

For this thesis, the authors chose a qualitative approach. Going back to the research question, the objective was to investigate how TECHX can develop their resource allocation. The word “how”, as opposed to “how much”, suggests a qualitative approach (Nyberg & Tidström, 2012). To answer such a question, the authors considered information regarding employee’s personal beliefs and experiences to be of importance, a view supported by (Bryman, 2016; Nyberg & Tidström, 2012; Silverman, 2014).

Chosen methods for collecting empirical data consisted primarily of observations and interviews. This choice was made to create a deep understanding of the organization and its activities, which deemed necessary in order to analyze the appropriate problem. Observations during meetings were used to understand the everyday working situation, and how the organization deal with issues which cannot be explained during interviews. Also, all situations occurring in the organization will probably not be brought up during the interviews. Interviews were instead used to deepen the empirical study and getting more specific answers on matters observed during meetings. Interviewees were also given the opportunity to elaborate on what they consider to be problematic in the organization.

2.3 Research strategy
The inductive approach is characterized by starting with observations or findings, and from those findings, build new theory. The opposite of induction is deduction, where theory forms a base for research and is
tested against observations or findings. The iterative strategy is a combination between deductive and inductive strategies, meaning the researchers will weave back and forth between observations and findings, and theory, see Figure 2 (Bryman, 2016). As more data is collected, the perception of where the actual problem occurs might change.

![Figure 2: The iterative approach.](image)

A similar approach is presented by Dubois & Gadde (2002) which they refer to as an abductive approach. It builds on systematic combining between the case, theory, framework and empirics, see Figure 3. By matching the four areas together, the researchers have the opportunity to find a clear direction in which to head, and it offers the ability to change approach if a dead end is identified. The approach is non-linear which mean the researcher can move between parts in desired way.

The authors have used the abductive strategy for this thesis, the main reason being that the study entailed high level of uncertainty. At the start, the intention of the study was not the same as it was a few weeks into it. The perception of what the problem actually was changed, and the authors had to adapt accordingly. The abductive approach provided flexibility in dealing with possible changes to the situation, which was needed.

![Figure 3: Systematic combining. Based on figure by (Dubois & Gadde, 2002, p. 555).](image)

The thesis started with a short pre-study, where data was collected through observations and semi-structured interviews at TECHX. This data was used to create an initial understanding of the current situation together with literature. Further on, an extensive literature review was carried out to deepen the authors’ knowledge of the problems identified at the pre-study. The collected information then led to the formation of the primary data collection, which used interviews as the way to collect information regarding the current situation. By going back to theory at this stage, the authors formed the analysis and discussion.

### 2.4 Collection of data

The collection of data was divided into two parts; primary and secondary data. Primary data refers to data collected at TECHX, such as observations and interviews. Secondary data was gathered from TECHX’s intranet.
2.4.1 Primary data
This thesis used two main ways of collecting primary data: participant observations and interviews. Each type provides a certain set of ways to collect information, were the idea was that they complement each other. Interviews can be used to collect data otherwise inaccessible by purely doing participant observations. While discussions occurring during meetings might be difficult for the researcher to completely understand, because of its internal language and context, interviews gives the opportunity for employees to explain the terms used to clear out misunderstandings (Wibeck, 2010). By using multiple types of data collection methods, a more complete set of data can be obtained and studied.

Participant observations can be seen as a way of gaining access to the case company’s daily activities, in order to give the researchers a better picture of their current state (Bryman, 2016). The extent to which the researchers are involved in the daily activities may vary depending on the desired outcome of the observation. From attending all core activities and basing the data collection purely on these observations, to having minimal interactions via core activities and mostly focusing on collecting data from interviews and data bases. Bryman (2016) also brings up the aspect of being either active or passive as an observer. Active observers tend to be more involved in the organization’s daily activities and help out where needed. The opposite can be said about passive observers who are not as involved in daily activities and therefore often take a step back. Taking a step back instead lets the researchers focus more on field notes during the session. Field notes can be collected in multiple ways; through jotted notes, mental notes and full field notes (Bryman, 2016). While mental notes suit informal gatherings such as lunch and coffee breaks, they are usually not sufficient when studying meetings. Full field notes are written as soon as possible and should contain all information needed to make it a main data source. Jotted notes however can be written down when the information is shared, during meetings and formal gatherings for instance. While not as detailed as the former choice, they provide insights to the actual meeting through quotes and key words used.

The second type of data collection method was interviews. Bryman (2016) distinguish between three types of interviews: unstructured, structured and semi-structured interviews. Unstructured interviews are as the name entitles, completely unstructured without time frames or set questions. This makes them difficult to use in all situations, especially in organizations where all employees have their schedule to follow and are not able to talk for too long, or want to know in advance what topics the interview intends to bring up, in order to prepare (Bryman, 2016). A more common approach is to use structured interviews. These interviews are well-defined on forehand and contain the same questions for everyone and strict time schedules. This helps when codifying the answers from the interview, making it easier to spot divergent answers, which might indicate a problematic situation for that person, a misunderstanding, a lack of interest in the interview or simply differentiating perceptions. The use of standardized questions makes it difficult to extract personal perceptions from the interviewee, their own viewpoints and such. Instead, structured interviews are well-suited for larger data gatherings, where lots of people are being interviewed (Bryman, 2016). To gather more personal perceptions, Bryman (2016) suggest the usage of semi-structured interviews. This type of interview has the formality from structured interviews of having an outline of what topics to discuss and a set time frame, but it gives the interviewer the opportunity to ask follow-up questions if he/she feels that there is more to that question than the answer given by the interviewee. In qualitative research, these types of answers bringing up the interviewee’s point of view, making semi-structured interviews suitable (Bryman, 2016).

For this thesis, the participation has been relatively low in the company’s core activities. Observations have mostly been done during meetings, where resource allocation, department related issues and RFQ related meetings have been central. The objective for the participant observations was to get an initial understanding of the current state rather than integrating too much with the group. The risk of being overly affected by some influential people could therefore be kept at a minimum, and at the same time, keep an external role to reduce internal blindness. Internal blindness in this aspect refers to being unable to see the problems within the organization, due of the time spent within it. The choice of having low participation goes in line with the chosen role of being passive during meetings and to just observe what is going on and how discussions are handled. Short, jotted notes were taken during meetings by both authors and then discussed.
afterwards to make sure there are not differences in how the collected data was interpreted. Both direct things which were said during the meetings but also personal reflections on meeting content and the decisions made.

Interviews were conducted with representatives from all parts of the organization, to give as many perspectives as possible. The interviews were made in two stages; pre-study interviews and main interviews. In the pre-study, a total of 13 interviews were conducted with interviewees mainly from the mechanical design team, but also senior managers and project managers as well, see Table 1 for details. The reason for interviewing mainly people from mechanical design was that they are a large department who are involved in most projects. The interviews were conducted in a casual manner, approximately 15-30 minutes in length and had a semi-structured character. Questions asked focused on matters on a general level, where the intention was to find out what their current working situation was like, in order for us to get an as accurate understanding of TECHX as possible. Interviewees were also asked to give some examples of things they thought did not work at the moment and also some which they thought did.

Table 1: List of interviewees during pre-study.

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical design</td>
<td>6</td>
</tr>
<tr>
<td>Project manager</td>
<td>2</td>
</tr>
<tr>
<td>Senior manager, R&amp;D</td>
<td>1</td>
</tr>
<tr>
<td>Senior manager, Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Senior manager, Project management</td>
<td>1</td>
</tr>
<tr>
<td>Senior manager, Sales &amp; Marketing</td>
<td>1</td>
</tr>
<tr>
<td>Senior manager, Production</td>
<td>1</td>
</tr>
</tbody>
</table>

The main interviews were held after the pre-study and literature review. Based on the information gathered from the pre-study and literature, an interview guide was formed. The interview guide focused on three major topics; the organization as a whole, the project portfolio and PPM, and human resource management related questions. The interview guides, both in Swedish and in English can be found in Appendix 1 and Appendix 2. The interviews were held at TECHX, in-person with the interviewees and also remote, via video link. The corona pandemic during the thesis meant that many employees worked from home, making in-person interviews impossible. This made the interviews a bit more complicated to conduct and coordinate, but no major differences were identified. In total, 14 employees on various positions within the company were interviewed, see Table 2. The participants were mainly chosen by us based on their position in the organization, where senior managers and department managers were deemed highly interesting. There were also three project managers included in the interviews. These were chosen by the senior manager at project management, where one participant had major experience in project management, one with medium experience and one who had only been a project manager for about six months. Even though there is a number of supporting line managers to that senior manager, the choice was made to leave these parts out of the study. The major reason for this was the tight time schedule set aside for interviews, but also their relative low level of participation in the projects.

The time frame of each interview was decided on beforehand to be around 45-60 minutes, with a few exceptions. The site manager was quite busy at the time of the interviews, meaning his interview was shortened a bit, and the Operations manager was not as involved in this area as others, meaning that interview was a bit shorter as well. The structure of the interview was based on a semi-structured interview guide, where there was an outline of questions which were asked to everyone, but also some questions which could apply for certain interviewees, depending on their position in the company. For employees more involved in the every-day working activities, questions regarding their meetings and communication paths had more focus. For employees at senior levels, questions revolved a bit more around strategic matters. In
the case of the HR-manager, the situation was a bit complicated. By the time of the interviews, the current HR-manager was on long-term sick leave, but the previous HR-manager, who occasionally helps TECHX with HR-related matters, agreed to be interviewed.

The authors’ plan, heading in to the interviews, was that one of us was responsible to conduct the interview and making sure the right follow-questions were asked, whilst the other had responsibility of actively listening, observing and taking notes on spontaneous reflections and interesting observations. The roles were constant throughout all interviews in order to maintain consistency making sure the questions were asked in the same way to all interviewees, and thereby reducing the risk of questions being interpreted differently between interviewees. Also, when interviews were conducted via video and the authors were located apart, it was easier to let one person be in charge. If needed, the author responsible for notetaking could also ask a follow-up question when necessary. Along with the notetaking during the interview, all interviews were also recorded with the approval of the interviewees. These recordings were transcribed where the entire conversation was written down. To support the transcribing process, the software Trint was used. Since the transcription of the Swedish language done by Trint was not perfect, the authors had to go through everything and correct incorrect sentences. Then, all interviewees were given the opportunity to read through the transcribed interview to partly approve that what they said is alright to use in the study and partly to make sure what we heard from the interviews was correct. All interviews were held in Swedish and the reason for this choice was to make sure the most reliable answers were given by the interviewees, considering they all had Swedish as their native language. The citations used in the thesis were translated into English by the authors. When the transcripts were done, all recordings were deleted as requested by TECHX.

Table 2: List of interviewees during main interviews.

<table>
<thead>
<tr>
<th>Position within the company</th>
<th>Date</th>
<th>Duration</th>
<th>Type of interview</th>
<th>Years at TECHX</th>
<th>No of subordinates/projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior manager R&amp;D</td>
<td>8/4 2020</td>
<td>48:15</td>
<td>In-person</td>
<td>23 years</td>
<td>5 [S]</td>
</tr>
<tr>
<td>Senior manager Quality</td>
<td>14/4 2020</td>
<td>50:32</td>
<td>Video-link</td>
<td>2 years</td>
<td>5 [S] + 1 [C]</td>
</tr>
<tr>
<td>Senior manager Project management</td>
<td>14/4 2020</td>
<td>43:05</td>
<td>Video-link</td>
<td>2,5 years</td>
<td>7 [S]</td>
</tr>
<tr>
<td>Project manager, medium experience</td>
<td>14/4 2020</td>
<td>44:54</td>
<td>Video-link</td>
<td>4 years</td>
<td>5 [P]</td>
</tr>
<tr>
<td>Department manager Product design</td>
<td>15/4 2020</td>
<td>44:17</td>
<td>In-person</td>
<td>3 years</td>
<td>15 [S] + 2 [C]</td>
</tr>
<tr>
<td>Department manager Systems engineering</td>
<td>15/4 2020</td>
<td>55:12</td>
<td>In-person</td>
<td>13 years</td>
<td>13 [S]</td>
</tr>
<tr>
<td>Project manager, senior experience</td>
<td>16/4 2020</td>
<td>43:09</td>
<td>In-person</td>
<td>32 years</td>
<td>5 [P]</td>
</tr>
<tr>
<td>Project manager, junior experience</td>
<td>16/4 2020</td>
<td>50:50</td>
<td>In-person</td>
<td>6 years</td>
<td>3 [P]</td>
</tr>
<tr>
<td>Operations manager</td>
<td>16/4 2020</td>
<td>37:28</td>
<td>Video-link</td>
<td>11 years</td>
<td>11 [S]</td>
</tr>
<tr>
<td>Senior manager Production</td>
<td>17/4 2020</td>
<td>51:56</td>
<td>Video-link</td>
<td>2 years</td>
<td>3 [DM] + 6 [S]</td>
</tr>
<tr>
<td>Site manager</td>
<td>20/4 2020</td>
<td>37:12</td>
<td>Video-link</td>
<td>6 years</td>
<td>129 [S]</td>
</tr>
<tr>
<td>Senior manager Sales &amp; Marketing</td>
<td>21/4 2020</td>
<td>55:31</td>
<td>Video-link</td>
<td>16 years*</td>
<td>5 [S]</td>
</tr>
<tr>
<td>Senior manager Engineering</td>
<td>23/4 2020</td>
<td>54:17</td>
<td>Video-link</td>
<td>34 years</td>
<td>2 [DM] + 10 [S]</td>
</tr>
<tr>
<td>HR manager</td>
<td>23/4 2020</td>
<td>46:40</td>
<td>Video-link</td>
<td>3 years**</td>
<td>0</td>
</tr>
</tbody>
</table>

[S] = Subordinates
[P] = Project
[DM] = Department manager
[C] = Consultant
* = Non-consecutive employment
** = Former employment

9
2.4.2 Secondary data
Secondary data was collected exclusively from TECHX’s intranet. This type of data was mostly of organizational character, such as the organization chart and how the decision gates and other processes were structured. This data was used by the authors to create an initial understanding of how TECHX is structured and how they work. Documents regarding resource planning and current project undertakings were also observed, but mostly as a complement to the primary data collection when needed.

2.5 Theory
Theory has been a substantial part to this thesis, and research papers and e-books have been the most significant types of theory used. Papers used in previous courses, related to the same issues as identified at the case company, were first brought in to give the authors a foundation on which to extend the literature base. The collected theory consisted primarily of research papers and some e-books found online via the Scopus data base. The authors found Scopus to be the most suitable data base to use because of its user-friendly platform. It is also accessed via Linköping university library, indicating it is a reliable source of information. Search words have been quite broad; “human resource management”, “resource allocation”, “matrix organization” and “project portfolio management” are the ones that have been used. The number of papers found was limited using the filter, where the subject area was narrowed down to “Business, management & accounting”. Then, papers were sorted after the “cited by” criteria, starting with the highest number of citations. This sorting process helped finding key literature within each research area, which the authors argue for was to reduce the risk of using less reliable theory. Papers which have been cited many times by other researchers can be seen as general and key literature, which is applicable in many settings.

2.6 Data analysis
The data analysis was a critical part to the thesis. Silverman (2014) stresses the importance of not deciding on an early hypothesis which would guide the researcher towards a subjective conclusion which in turn would negatively affect the validity of the research. The analysis should be started as soon as possible, to reduce the risk of the researchers not having the time to do it properly closing in on set time frame (Silverman, 2014). Last, Silverman (2014) also points out the positive effect created when starting with a small part of the data, and then test the results on the whole data set. Using this knowledge, the data analysis was based on two of Yin’s (2018) analysis methods: pattern matching and explanation building.

The pattern matching method was based on the researchers observing reoccurring information from the interviewees. By highlighting reoccurring information and identifying problematic areas brought up in the interviews, a more complete picture would be obtained. The pattern matching was in turn the input to the explanation building. Explanation building is connected to explaining the current state as the interviewees described it (Yin, 2018). By understanding the interviewee’s own perception and thoughts, the researchers are able to provide a true explanation of the current state, which is the intention of the qualitative research.

The data analysis during this thesis has been an iterative process, to support Silverman’s (2014) view of starting the analysis as soon as possible. After each interview, a discussion was initiated between the authors regarding what was said and how that correlates to theory. As more interviews were done, clearer patterns could be seen. To support the patterns which were noted during the interviews, the transcripts were read to reduce the risk of misunderstandings. All transcripts were gathered in a document to make it easier to compare what the interviewees said. This led to a more detailed analysis of the current state, where areas of interest could be identified. These areas were then compared to theory with the intention to find room for improvement.
2.7 Reliability & validity
In order to strengthen the outcomes of this thesis, it was vital to acknowledge the reliability and validity of the outcomes. These factors helped assessing the quality of the report (Bryman, 2016). Reliability and validity are separated into external and internal parts which made it easier to distinguish the differences between them. Bryman (2016) draw parallels between these four factors with the four factors concerning trustworthiness. Yin (2018) partly agrees with this view but adds another criterion by the name construct validity. This chapter will be divided into sub-chapters explaining parts which need to be taken into consideration when dealing with qualitative research.

2.7.1 Credibility
Credibility is connected to the acceptance of the end result among others. Factors affecting credibility consists of following good practice and getting confirmation from the studied population regarding the findings. From this, the link between credibility and internal validity is identified by Bryman (2016). The internal validity refers to the possibility of researchers conducting the study having different opinions on what theoretical conclusions can be drawn from the observations.

2.7.2 Transferability
Transferability and external validity are showing parallel meanings according to Bryman (2016), and they are sometimes referred to as generalizability, meaning to what extent the findings can be generalized into other settings. The statistical generalizability refers to how collected data can be seen as a representation of the industry, whereas analytical generalizability refers to how results can be analyzed in a general way. This, however, tends to be problematic for qualitative research since they often utilize a single case study at smaller companies, when only analytical generalizability can be applied (Bryman, 2016; Yin, 2018).

2.7.3 Dependability
While the former two parts focuses on outcomes of the research, dependability rather brings up the aspect of how the research is conducted on an operational level. That being, how data is stored and how it is being used. This can be assessed through auditing by external peers who have the power to critically view the research process. The dependability of a research study is connected to reliability, or the study's ability to be repeated. External reliability refers to the degree of the study’s ability to be replicated. While social studies are merely impossible to replicate because of the constant shifting environment, it is still possible to aim for such an outcome. Internal reliability is applicable if there is more than one researcher, and whether they agree on what is actually observed. Auditing of the research can be an effective tool for this type of problematic situations; however, they require a lot of time and commitment from auditors since data banks tend to get large (Bryman, 2016; Yin, 2018).

2.7.4 Conformability/construct validity
When conducting research, it is important to keep an objective mindset, and not draw conclusions based on own perceptions (Bryman, 2016; Yin, 2018) which can be difficult (Yin, 2018). The objective mindset correlates to credibility and transferability, where it should be possible for others to conduct the same research as the researchers have described and, in the end, arrive at pretty much the same conclusions (Bryman, 2016). It can be difficult for the reader to differentiate between objective and subjective conclusions made by the researchers, but to minimize the risk of subjective conclusion; Yin (2018) highlights the usage of multiple sources and having representatives involved in the study reviewing it along the way.

2.8 Critical view on methodological choices
There is no perfect methodological choice (Bryman, 2016), and sacrifices have to be made in order to find the right balance. Therefore, it was deemed important for this thesis that shortcomings were acknowledged and dealt with in order to keep the study as reliable and valid as possible.

Bryman (2016) criticize some parts of qualitative research. The most intriguing matter to discuss for this research of those is transferability, or generalizability. As mentioned previously, qualitative studies often use
smaller case companies for the data collection. Since the research was carried out at a single case company, the employees from whom data was collected cannot be statistically generalized, when employees of one company are not representatives of an entire population. The result is a negative effect on the study’s ability to be statistically generalized. During our research, this matter was discussed, and it was acknowledged that the results may not be entirely statistically generalizable. The outcomes should instead be seen as a framework which might work for certain businesses similar to TECHX. Seeing this as a contribution to existing research within the field provides a more complete picture. This view is shared by Yin (2018) who states that this is one way of generalizing. The analytical generalizability is considered to be good since the thesis has followed the methodological choices made.

The construct validity (Yin, 2018) and conformability (Bryman, 2016), referred to as lack of objectivity, is another reason for critique. Own perceptions influence researchers more than what is acknowledged and understood. Therefore, qualitative research tends to be more subjective than intended. Quantitative research as an opposite is guided by numerical data which is more difficult to have subjective opinions on, while qualitative research is guided by personal values and feelings. Hypothetically, some influential employees might try to affect the researcher to shift focus towards other areas which they think are more appropriate than what the researcher intends to study. That is why the decision of having a low level of participation was taken, to try and minimize the risk of being affected by some employee’s personal thoughts.

Qualitative research is quite difficult to replicate. Even if all steps of the study have been clearly defined and motivated, it is still highly affected by the researchers’ own thoughts and beliefs. Collecting data at participant observations for instance is typically difficult to replicate. A lot is being said and lots of information will not be retrieved from meetings. It is again a matter of subjective thinking when the researcher sifts through what is being said and take notes on what is believed to be the most important things. Another researcher might have different opinions on what is important for dealing with the research question, giving a different end result. To deal with dependability, the authors have both attended most meetings together, meaning more information can be gathered and through that, less information is lost. The collection of data has also been systematically structured to keep track of what is been said at different meetings, also to make sure data was not lost. The importance of note taking during meetings has been brought up, but it posed some challenges in terms of collecting all necessary information. The choice was made to take notes rather than recording, since it takes less time to prepare and, most importantly, to transcribe. Meetings containing up to 20 people makes it difficult to keep track of everything being said, and also being quick enough to write it down. To deal with this issue, we had a short discussion session right after each meeting to make sure the same phenomena was observed. By doing this, the risk of negatively affecting the internal validity decreases, since the authors make sure they understand each other.

The credibility of the research is difficult to assess because of the authors’ limited experience of conducting research. Both have a bachelor’s degree in mechanical engineering which means we have previously done a Bachelor thesis. To improve credibility of this thesis, the approach has been to be thorough in each step and take some extra time to think things through before starting something. We have also had close contact with our supervisor at the university who has guided us when needed. Methodological choices have been motivated to further support our approach.

All main interviews were recorded and transcribed by the authors. This was to structure the data collection and make sure no information from the interviews was lost. By having the interviewees read through and approve what was being said, the authors are able to increase the study’s dependability. Also, interviewees were given the opportunity to read through the combined outcome of the interviews and were allowed to give feedback on the content. This was mostly a way for the authors to objectively comment the results rather than giving them the opportunity to change things in their favor.

The data analysis has, as previously mentioned been an iterative process which has been going on during the interview period and then followed-up after all interviews was done. To draw some analytical conclusions along the way was considered beneficial for us, since there was less need to go back to the transcripts and
remembering what was said and by whom. While the authors had good track of the analysis, to further strengthen the outcomes, a more formal approach to notetaking of the analysis would have been beneficial for improving dependability. Most information was stored in our minds and in a notebook.

While the iterative approach provides abilities for adapting to certain changes, it also creates possible problems, such as the risk of creating an unfocused report. If conceptions are changed multiple times during the research, then the end result might lack the punch otherwise given in a more focused report. This has been acknowledged and the solution for this was the extensive pre-study undertaken. This gave us the opportunity to clearly understand the problem before the actual study was started. With a clear and unanimous perception, the baseline of the study was decided. This baseline has been held throughout the research, with only minor tweaks to the thesis content.

To overcome the challenge of the need for skilled interviewers, the authors conducted two rounds of interviews. The first round was the pre-study where general matters were discussed with the interviewees. Here, the authors reflected after each interview and took learnings from each session as well. Combining this with the outcomes of studying interview techniques and the authors consider their skills to be sufficient for the task. This however limits the credibility of the thesis when the interviewing skills of the authors might be seen as insufficient. It will also affect the conformability when interviews might not be conducted the same way by experienced interviewers.

It is also worth mentioning the fact that some interviews were done in-person and some via video. The extreme situation with the outbreak of the corona virus which occurred in mid-March meant there was no other choice than to conduct as many interviews as possible in-person and do the rest via video link. Even though there is still a difference, the authors acknowledged this and tried to make the video-interviews alike normal ones as possible. For instance, the authors insisted that interviews via link were done with video, to make the transition from in-person interviews as small as possible.

One of the interviewees, the HR-manager, did not work full-time at TECHX during the interviews. Since the authors wanted an HR-perspective on the organization and the current HR-manager who was on long-term sick leave was not available, the previous HR-manager kindly agreed to be interviewed by us. It is worth mentioning that we have acknowledged that since she has not been working full-time at TECHX in a while, the picture given might not necessarily reflect the exact situation at the moment. But since no other HR-manager has been there for an extensive period of time since she left, HR-related matters have probably been left unchanged.

2.9 Ethical discussion

Ethical dilemmas connected to this thesis are seen as minimal. The intention throughout this thesis has not been to put blame on one department or on single employees, but rather give an organization wide perspective on the current situation. The outcome will not lead to suggestions of termination of certain employees or restructurings leading to employees being transferred to other departments. Outcomes might suggest some employees should take on a role with added focus areas to what they previously have been responsible for. These focus areas will not be unfamiliar to the employees in question but rather act as a development of their role and to bring clarity towards who is responsible for what. Additionally, it has been the nature of this thesis to address problematic areas which in turn poses the risk of presenting TECHX, as a brand, in a negative manner. There has been no such intention. The authors have recognized strengths at TECHX which have not been presented as it has not been the intention of this thesis. Also, some positive outcomes are expected to take place from this thesis, from an ethical perspective. By raising areas which were problematic for TECHX, this thesis intends to provide suggestions of improvement with the potential to increase the well-being, reducing stress and increasing consistency.
3. Literature review

The literature review will be based around the concept of resource allocation. Resource allocation is seen as a central concept to this thesis and its connection to HRM and PPM is vital for its success. The matrix organization is seen as the context surrounding the main topics. A graphical explanation will be found in the analysis model in chapter 3.5.

3.1 Resource allocation

Previous research on project management shows that its success is dependent on multiple factors (Hobday, 2000; Schnetler, et al., 2015). One variable highly relevant when reviewing project management is quantity of projects. Managing multiple projects simultaneously opens up for increasing difficulties e.g. allocating resources (Engwall & Jerbrant, 2003). Further this allows for better understanding on how these differ depending on the project constellation. Resource allocation is a central part to project portfolio management, PPM, human resource management, HRM, and capacity planning. It is considered to be the most central part to theory and indeed the entire thesis. Resource allocation in this context refers only to human resources, limiting the literature review to focus on that.

Several organizations today are deeply influenced by multi-project environments. While these settings provide multiple advantages, it can also be destructive and pose challenges which are hard for companies to overcome. One of these major challenges is the allocation of resources. Scholars have identified that organizations are dealing with more projects than they can handle, (Engwall & Jerbrant, 2003; Jerbrant & Gustavsson, 2013), a problem defined as “project overload”, (Zika-Viktorsson, et al., 2006). Scholars, for instance Delaney & Huselid (1996), argue that the employees are a key to the organization and its ability to achieve outstanding performance. Resources have also been identified to be valuable (Killen, et al., 2012) and scarce (Blichfeldt & Eskerod, 2008; Hendriks, et al., 1999). From the relationship between trying to handle more work than possible and seeing employees as the most important resource the organization possess, a need for effective ways to allocate the available resources is seen.

The resource allocation has been determined through the work of Hendriks et al. (1999) to consist of three-time horizons; long-term, medium-term and short-term allocation periods, linked together to create a harmonious model, where outputs from the higher level of allocation time frames becomes inputs for the lower level allocation time frames, see Figure 4.

![Resource allocation time horizons. Based on (Hendriks, et al., 1999, p. 184)](image)
3.1.1 Long-term resource allocation

The long-term resource planning is a yearly occurring event where the current staffing needs being the agenda (Hendriks, et al., 1999). They propose a yearly interval of meetings, and a planning horizon of approximately five years. While hiring new employees is one way of dealing with future shortcomings of competence and resources, it can be seen that learning and competence development is another key area of consideration. Take for instance the work of Huemann (2010), who acknowledged the need for learning within the organization as an important part to HRM, a perception shared by Bredin & Söderlund (2011). Bowen & Ostroff (2004) adds to this the HRM’s responsibility to develop the employees’ knowledge, skills and to motivate them to the tasks in hand. Paired with Barney’s (1991) idea of seeing resources as a way of getting a competitive advantage, through hard-to-imitate processes which gives certain companies the opportunity to utilize resources more efficiently than their competitors, it can be seen that having the right resources and using them in the best way possible is beneficial (Bowen & Ostroff, 2004; Becker & Gerhart, 1996). This shows the connection between long-term resource allocation and HRM, and that it can be seen as a central part to the long-term resource planning. Through an understanding of what resource needs will be required in the future, depending on the organizations and development of technology’s direction, the organization need to adapt accordingly. Since hiring and training takes time, a longer time horizon for this is needed.

3.1.2 Medium-term resource allocation

Shifting focus towards the medium-term resource planning, and the preferred tool discussed by Hendriks, et al. (1999) is instead project portfolio management. The horizon of planning is shorter this time, approximately a year with meetings occurring quarterly. The plan of project undertakings should be based on the long-term plan of resources, in order to create a more detailed idea of how resources are to be allocated. Using day-to-day planning at this stage is not beneficial. Those types of plans are less stable than what is required at this stage (Hendriks, et al., 1999).

Two case studies conducted by Engwall & Jerbrant (2003) and Jerbrant & Gustavsson (2013) showed a clear similarity between the case companies investigated: they were lacking planning ability. When one project starts to fall behind, there will be resources moved over from a well-managed and on-time project to the problematic project. While this “putting out the fire” tactic (Jerbrant & Gustavsson, 2013) solves immediate issues in the critical project, it creates new ones as the smooth-going project instead loses momentum, and the snowball effect has started (Engwall & Jerbrant, 2003). This situation causes a lot of stress on employees, constantly moving from one project to another to meet deadlines (Blichfeldt & Eskerod, 2008). Hendriks (1999) point out that these types of day-to-day planning activities are undesirable in the medium-term planning phase. These problems occur due to the lack of medium-term planning ability, when it becomes impossible to meet deadlines based on the initially given time and resources to the project. Prioritizing between projects with changed prerequisites becomes crucial at this stage and it is important that managers have the right decision-making tools for handling such events (Hendriks, et al., 1999). Martinsuo & Lehtonen (2007) highlights the use of formalized and rational decision tools for achieving the best results at this medium-term resource allocation stage.

Blichfeldt & Eskerod (2008) identified that companies are experiencing problems in planning when informal, “corridor” projects, are undertaken by employees. These create a situation where only the individual employee has an understanding of how much work they actually have on their desk. Planning projects in these settings then become difficult. It is important for management to acknowledge the need for these small, informal projects and set aside resources for that as well. Usually, “corridor” projects are just as important as the ones formulated in the portfolio (Blichfeldt & Eskerod, 2008). To better keep track of who is doing what, Hendriks et al. (1999) suggested a rough-cut capacity plan, a graphical way of keeping track of employees’ assigned projects. As the name entitles, the rough planning can be changed depending on projects’ updated needs. As Blichfeldt & Eskerod (2008) brings up, it is not always easy to define which projects should be located within the project portfolio and which projects are not deemed large enough. Either, all projects, large and small, gets added to the project portfolio, or only larger projects are added to the portfolio and slack is given to employees to work on informal projects. The same tactics goes for the
3.1.3 Short-term resource allocation

The short-term resource planning is the third and last planning horizon brought up by Hendriks, et al. (1999). This planning horizon refers to the daily steering of allocating and reallocating resources between projects. They recommend that this is done within a time frame of about a month and is updated with a couple of week’s intervals. Hendriks, et al. (1999), proposed the rough-cut capacity planning model for allocating resources in the medium-term resource planning, and that this model would be the input for the short-term planning. The rough-cut capacity planning is translated to a capacity planning chart to be used in the planning horizon of a few weeks up to a month. At this stage, line managers and project managers solve day-to-day allocation with as little interference from senior management as possible. Not much steering is done at this stage but rather a quick adaptation to deal with sick leave for instance.

3.2 Human Resource management

The definition of what HRM is about is in some sense quite vague, and there are few definitions of what it should contain. Wright & McMañan (1992) and Guest (1997) divide HRM into four parts. While there are similarities, they are not exactly the same. Wright & McMañan (1992) for instance include the following four; selection, training and development, appraisal, and rewards. Guest (1997) agrees with three of them but change appraisal for career. As been previously discussed, selection, or hiring, and training and development are central long-term resource allocation methods, see Table 3. There is therefore a strong need for organizations to have sufficient knowledge on how to deal with such methods.

Table 3: Different definitions of HRM.

<table>
<thead>
<tr>
<th>Part</th>
<th>(Wright &amp; McMañan, 1992)</th>
<th>(Guest, 1997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selection</td>
<td>Selection</td>
</tr>
<tr>
<td>2</td>
<td>Training and development</td>
<td>Training and development</td>
</tr>
<tr>
<td>3</td>
<td>Appraisal</td>
<td>Career</td>
</tr>
<tr>
<td>4</td>
<td>Rewards</td>
<td>Rewards</td>
</tr>
</tbody>
</table>

The HRM is a complicated system, and it has been established that it should take care of a lot of aspects. Therefore, it is needed to clarify some roles within it. Bredin & Söderlund (2011) proposed the HR-quadiad model which describes the main components which should be in place in order to have a well-functioning project-based organization; line managers, project managers, project workers and HR specialists, see Figure 5. The line managers’ role has, in the transition from functional organizations towards project-based organizations, moved towards staffing and competence enhancement. This is because of the reduced interactions between them and their employees, when employees for instance are allocated to certain projects. Instead, project managers have become the project workers’ closest manager, which means they have more knowledge regarding the employees than the respective line manager. Due to the limited time the project workers are assigned to their specific project manager, the common outcome is to let the line manager be responsible for competence development and staffing. Project workers however should still be participant individuals of the HRM, and not act passive. It is required since HRM have become a decentralized part of the organization, and it requires several parties to engage in it to make it work. Having more involved parties have shown tendencies of problems being moved around and not handled by any of the participants of the HRM. This burden will mostly affect the individual employee who needs to take care of HR related issues by themselves. The HR specialist role has become, in contrast to the operational focus of the previously three components, more strategically oriented. This has led to HR service departments being centralized outside the organization, meaning the integration of HR specialists into the every-day routines has been lost.
This disconnection has the ability to negatively affect the sustained performance of the organization, when the distance between operational and strategic matters increases. This puts increased pressure on line managers and project managers who, commonly, lacks the knowledge of dealing with operational HR concerns (Bredin & Söderlund, 2011).

Figure 5: The HR-quadriad model. Based on figure by (Bredin & Söderlund, 2011, p. 2206).

While the previous paragraph is quite broad in its description of the different roles, Bredin & Söderlund (2011) found different characteristics at different project work settings. A distinction was made between inter- and intra-functional project work settings, and depending on which setting the organization has adopted, the role responsibilities differ slightly. The intra-functional project work resembles the project matrix structure described by (Hobday, 2000) and inter-functional project work resembles the project-led organization structure. By having this approach towards project work, Bredin & Söderlund (2011) mean that an organization can address certain settings within an organization such as core activities, characteristics of project commitment, affiliation and location of project-members, who manages problem-solving tasks and carries responsibility of personnel. To visualize this, Table 4 highlights the major characteristics identified by Bredin & Söderlund (2011).

Table 4: Characteristics of inter- and intra-functional project work (Bredin & Söderlund, 2011).

<table>
<thead>
<tr>
<th>Line manager</th>
<th>Inter-functional project work</th>
<th>Intra-functional project work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Almost entirely focused on HR.</td>
<td>• Strong technical role with HR being secondary.</td>
</tr>
<tr>
<td></td>
<td>• Less involved in daily technical development.</td>
<td>• Often lacks sufficient knowledge in HR-related questions.</td>
</tr>
<tr>
<td></td>
<td>• Long-term technical development and acquiring of competencies</td>
<td></td>
</tr>
<tr>
<td>Project manager</td>
<td>• Track projects’ work performance.</td>
<td>• Not as involved in the workers’ tasks.</td>
</tr>
<tr>
<td></td>
<td>• Are in close contact with line managers.</td>
<td>• Follow up for instance quality, time schedules and worker performance.</td>
</tr>
<tr>
<td>Project worker</td>
<td>• Co-located with project team.</td>
<td>• Located at line departments.</td>
</tr>
<tr>
<td></td>
<td>• Bigger responsibility for their own development.</td>
<td>• Fragmented project participation.</td>
</tr>
<tr>
<td></td>
<td>• Single-project focus.</td>
<td>• Learn from each other.</td>
</tr>
<tr>
<td>HR specialist</td>
<td>• Not so involved in daily activities.</td>
<td>• Lacks involvement in daily activities.</td>
</tr>
<tr>
<td></td>
<td>• Acquiring specialist competence when needed.</td>
<td>• Often centralized.</td>
</tr>
</tbody>
</table>

From Table 4 above, it is possible to see that the project worker’s daily work setting is highly affected by the type of project work. Inter-functional projects let project workers be co-located and only be assigned to one project at the time, at the expense of making them lose touch with their colleagues and less time for technology development within their departments. On the other hand, intra-functional project work often entails fragmented project participation and workers being located at their department. The fragmented participation is connected to what Hendriks, et al. (1999) call scatter factor, a numerical value showing the number of employees needed to fulfill one men year of tasks. A high scatter factor indicates a lot of employees are needed to fulfill one task, meaning the project team will contain more team members. A high scatter factor, or being scattered across multiple projects, will affect productivity negatively and affect the degree of project participation and devotion (Hendriks, et al., 1999).
The line manager’s role is one of the most difficult to handle of the four. When HR tends to be more centralized, a lot of HR related tasks are handed over to the line manager. Problems arise due to the line manager’s lack of sufficient knowledge within the HR field. And since HR is centralized and shift focus towards more strategic matters, information on how to deal with the raised problems might also be hard to obtain. A common perception of line managers, in the study conducted by Bredin & Söderlund (2011), is the missing link between them and the HR department.

Previous arguments show the importance of a well-functioning HRMS, and the fact it should not be underestimated. The positive connection between HRMS and performance has previously been well-covered in literature (Becker & Gerhart, 1996; Bowen & Ostroff, 2004; Delaney & Huselid, 1996). Adding to seeing HRM as a competence developing system and a possibility to create a competitive advantage, Delaney & Huselid (1996) found a strong connection between efficient staffing and training, and organizational performance. The knowledge of employees is created through sufficient staffing and training, and while this type of intangible resource is difficult to grasp, the importance of it is certain (Killen, et al., 2012). Intangible resources are even able to create larger possibilities for competitive advantage than tangible resources, because of its embeddedness within the organization (Killen, et al., 2012). While the term knowledge seems like a trivial concept, it needs to be understood more in-depth. While “knowledge” and “information” sometimes gets mixed up for meaning the same thing, Nonaka (1994) acknowledges a distinction between the two. Knowledge is rather a result of information streams, where it is created through information collection and interpretation. Knowledge is then shaped through the previous conception of the receiver, meaning the same information will lead to differences in perceived knowledge depending on the recipient (Nonaka, 1994). Information can therefore be seen as a collection data that needs to be interpreted to be useful. The stream of information is needed, together with previous knowledge, in order to take the right decisions (Archer & Ghasemzadeh, 1999; Cooper, et al., 2002). Martinsuo & Lehtonen (2007) instead identified information availability to be the most influential factor affecting the project portfolio efficiency.

The HRM has been established to be an important part to the allocation of human resources in the long-term. On an operational level, the outcome of the long-term planning becomes the input to the medium-term planning. The understanding of what knowledge is needed and how to retain it, either through learning or staffing, is then vital to successfully make the transition to medium-term planning. The medium-term planning, as established earlier, focuses on managing the project portfolio in order to not only managing the projects correct but also managing the right projects.

### 3.3 Project portfolio management

Cooper et al. (2002) makes a distinction between doing things right and doing the right things. Where a lot of emphasis is put on the first alternative, in this context project efficiency, the other part named project effectiveness, is often neglected (Cooper, et al., 2002). When dealing with multi-project settings, it is difficult to keep track of the current project undertakings, especially when the number of projects continues to increase as the company’s ambition to grow does the same. The ambition to take on more projects than the organization can handle is common (Jerbrant & Gustavsson, 2013; Engwall & Jerbrant, 2003) and therefore there needs to be mechanism to make sure the company focuses on project effectiveness. The project portfolio will be used as a base to describe how this can be achieved. To further study the phenomena of project portfolios, coming up are a number of identified definitions.

Enoch (2015, p. 1) define the project portfolio management as:

"…managing groups of projects, programs and operational activities /.../ that compete for scarce resources and that are conducted to achieve strategic business objectives”

The Enterprise Portfolio Management Council (2009, p. 3) define it similarly:

"…the concept of focusing on the selection and management of a set of projects to meet specific business objectives.”
A third definition comes from Kodukula (2014, p. 2):
“A project portfolio is a collection of strategically aligned, value-generating projects that help achieve organizational goals.”

Finally, Jonas (2010, p. 818) defines it as:
“…a group of projects that compete for scarce resources and are conducted under the sponsorship or management of a particular organization.”

For the purpose of this thesis, it has been decided, based on the definitions above that the characterizations of project portfolio management are the following:

- A collection of projects
- Competing over scarce resources
- Meeting strategic business goals

These three characteristics were also recognized by Martinsuo & Lehtonen (2007) as being essential for achieving project portfolio management success. This part of the theory chapter will therefore be based on these highlighted parts which have been identified to be central to managing the project portfolio. Three sub-chapters will follow defining each part and describe what literature findings can be connected to each of them. The areas will however cross into each other a bit since they are highly related.

3.3.1 A collection of projects

To start of this section regarding the collection of projects is the acknowledged importance of seeing the portfolio as a collection of projects and not as separate entities. In their survey-based study, Martinsuo & Lehtonen (2007) identified a relation between single-project management and firm size. When the company grows, the importance of portfolio management does the same.

With the definition of a project portfolio set for this thesis, the next step is to go through the three parts previously discussed. The first part, the collection of projects, is identified as a major part by most scholars. To give an introduction to how the collection of projects can be arranged, the work by Wheelwright & Clark (1992) will be used as starting point. They argue for a technology-based model where projects can be located within, to rank their different characteristics. The model contains two main dimensions of ranking; product change and process change see Figure 6. Each main dimension is scaled from incremental to new core type of process/product and depending on what the project attempt to achieve, is placed appropriately within the matrix. Consideration is taken towards separating between internal and external projects. Internal projects are usually R&D driven and pose no direct incomes to the company. As Wheelwright & Clark (1992) puts it, they offer the opportunity to use the findings in future external projects. The external projects are commercially driven and bring incomes to the company.

There are numerous ways of dividing projects into categories depending on their desired outcome. Cooper et al. (2004) divides projects into five categories; promotional developments and package changes, incremental product improvements and changes, major product revisions, products new to business, and products new to world. Wheelwright & Clark (1992) divides projects similarly in their aggregated project plan. Derivative-, platform-, breakthrough-, R&D-, and alliances & partnerships projects are their interpretation of how projects can be categorized. While Cooper et al. (2004) acknowledge the existence of as small projects as package changes, Wheelwright & Clark’s (1992) project portfolio contains a bit larger projects. Another aspect which separates the two is the inclusion of external partners by Wheelwright & Clark (1992). Because of the visual presentation of the aggregated project plan and since it was considered by the writers to be the most inclusive model, it is used as a base. Derivative projects sit in the bottom-right part of the matrix, indicating their focus is on small changes to the product. Usually, they are upgrades of products which are in the middle or end of their production life, and small changes are added to make them an attractive alternative again before bringing out a new product.
At the other end of the scale, \textit{breakthrough projects} affect the whole company and redefine the playground, not only for the company but sometimes even on a market level. These projects derive at a core process or product change which the company bases their future product development on. The \textit{platform projects} are larger undertakings than derivative projects but are not fundamentally changing the company. They create opportunities for increased incomes or decreased costs, but it is hard to distinguish where the line between derivative and breakthrough projects go, meaning platform projects are hard to define (Wheelwright & Clark, 1992).

The aggregated project plan provides a strong base for PPM and how to choose what projects should be undertaken. Along with Wheelwright & Clark (1992), Cooper et al. (2002) and Meskendahl (2010) agree that there needs to be a mixture of projects. There is not necessarily a correct mixture of projects but Cooper et al. (2004) argues that there should be a balance between, what Wheelwright & Clark (1992) defines as derivative, platform and breakthrough projects. In their study, Cooper et al. (2004) found out that companies who have a balanced mixture of projects perform better in New Product Development. This perception is supported by Meskendahl (2010) who states that focusing too much on incremental projects will lead to companies only pursuing short-term benefits while losing the ability to innovate. Blichfeldt & Eskerod (2008) explains this symptom as companies focus too much on their customers and not on future needs in terms of technology development. Also, having too many projects at the time has proved to be difficult, when employees have to move from project to project, decreasing efficiency (Hendriks, et al., 1999; Wheelwright & Clark, 1992).

Another problem identified by Blichfeldt & Eskerod (2008) was the fact that not all projects are formalized in the project portfolio. Some projects were started informally by individuals to investigate things which might be important to the project they are working on, but not a part of it. It is thought that these projects are needed, and they are therefore squeezed in, without managers knowing about it. Employees then suffer from dealing with small informal projects taking too much time. These projects do not go through the same screening process as the formal ones do, meaning they are not evaluated the same. Formalized decision processes have been identified by Martinsuo & Lehtonen (2007) to be an important factor for project portfolio management and this view is supported by Cooper et al. (2004) as well.
Jonas (2010) stress the importance of having a so-called project portfolio manager, who has an overview of all projects in the portfolio and is responsible for distributing knowledge onwards to senior management. Their responsibility is to be the interacting part between senior management, project managers and line managers when needed. As Jonas (2010) puts it, the project portfolio manager can have two major types of responsibilities. The administrator is responsible for distributing the right information to decision makers, with limited possibility to affect the design of the project portfolio. The shaper instead has more control over shaping the portfolio and can point out new opportunities and risks with the portfolio. By having a dedicated project portfolio manager, companies can better capture the possible value of the project portfolio and decrease uncertainty regarding how to deal with it (Jonas, 2010).

Apart from choosing projects after technological alignment, Cooper et al. (2002) stress the importance of taking economic consideration into the PPM. The aggregated project plan shows some weaknesses in economic selection. Projects can be selected based on their suitability towards the aggregated project plan, but the actual economic gains from their outcomes might be relatively low. Therefore, it is considered there needs to be an economic dimension to the selection process.

### 3.3.2 Competing over scarce resources

Human resources have been covered in previous chapters, but financial resources have been established to be of importance as well. The financial dimension towards project portfolio is highlighted by many scholars; (Archer & Ghasemzadeh, 1999; Cooper, et al., 2002; Martinsuo & Lehtonen, 2007; Meskendahl, 2010). Cooper et al. (2002) and Martinsuo & Lehtonen (2007) identified the most commonly used method in companies when deciding on which projects to pursue to be connected to financial methods. Therefore, this paragraph will focus on value maximization. Value maximization is achieved in different ways. Either, it is all about maximizing the gains from the project financially, and only going for projects with high Net Present Value (NPV). This method does lack the strategic dimension discussed earlier, when focus might shift purely towards prestigious projects demanding lots of resources. The NPV also lacks the dimension of risk assessment and assumes that higher value of the project yields more income. Another way of acknowledging value maximizing is through what Cooper et al. (2002) calls Expected Commercial Value (ECV). This considers not only the actual value of the project but also the commercialized value of the released product. Cooper et al. (2002) also introduces another way of looking at value maximization to this method. It takes consideration towards the resource input as well, meaning the monetary returns of the project divided by the resource input should be as high as possible. In other words, gaining as much benefits from as little resources as possible. This method has obvious flaws, foremost the extensive need for financial calculations and assumptions, making it unreliable. Because of these negative effects of ECV, the Productivity Index (PI) method is introduced. The PI acknowledges a probability factor to ECV, and divides that sum by resource input. The outcome can then be compared to other projects’ score and decisions can be taken accordingly. The last method described by Cooper et al. (2002) involves no calculations, but consists rather of an objective scoring system where projects are weighed against multiple factors which have the potential to influence the project. Projects with the highest score should then fit the project portfolio the best.

### 3.3.3 Meeting strategic business goals

Strategic alignment is, as mentioned earlier, key to PPM. Strategy has been widely discussed by scholars for some time, where one of the most recognized work was done by Porter (1985) with the introduction of differentiating, cost and focus strategies. These strategies pose different opportunities for companies. Differentiating yourself from your competitor is one, where the products are offered to a wide part of the market, and income is created through bringing a unique product to the customer. The cost strategy rather focuses on bringing products to the wide market and attracting customers by offering the lowest possible price for the product. Focus strategies are adapted to both differentiating and cost strategies, but instead focuses on a specific market segment (Porter, 1985). Strategies are introduced and used by companies in order to gain that important competitive advantage, where they are able to create more value to the customers than their competitors (Killen, et al., 2012). Meskendahl (2010) agrees with the importance of strategy, but as they put it, implementing a strategy is much more difficult than to develop it, and developing a strategy does not necessarily mean it will be used by the company. Mintzberg & Waters (1985) defined two main paths of how strategies emerge; deliberate and emergent strategies. The deliberate strategy is a direct
transformation from the theoretically defined strategy into implementation with no changes being made. The emergent strategy rather forms as a result of long-term consistency within the firm, where the strategy emerges from how the organization functions, without any strategic considerations. Since the two strategies are extremities, they are both highly unlikely to occur. As Mintzberg & Waters (1985, p. 271) puts it:

“… strategy formation walks on two feet, one deliberate, the other emergent.”

According to Meskendahl (2010), project portfolio management can connect strategy formation and implementation. Kopmann et al. (2017) linked deliberate and emergent strategies to the project portfolio level. They discovered that deliberate and emerging strategies are both important for achieving project portfolio success, and that they are rather a complement than working against each other. The choice of strategy will highly influence what projects to pursue and which to be deprioritized. As Meskendahl (2010) explains it, a risk-taking strategy might allocate huge resources into projects with high uncertainty in an informal manner, while an analytical strategy takes formal decisions and scans the environment before committing to certain projects.

### 3.4 Matrix organization

It has been suggested that project-based organizations are more suitable for managing increasing complexity, customer focused innovation and fast changing markets and general complex product system, CoPS, (Hobday, 2000). Viewing functional [A] and project-based organization [F], see Figure 7, as two opposite types of organization structure, there are multiple parameters separating them. However, the fundamental difference between the ideal-type organization forms is suggested by Hobday (2000) as the distribution in authority of personnel and resources as well as in which form major activities are carried out. Functional organization, where development tasks are divided into segments and assigned to relevant functional group, with the manager for the functional group in dominating authority on resource management, makes out one of the extreme ideal-type organization structure. In this organization type there are no, or very few, projects carried out, and if projects do occur it is in purpose of carrying out non-routine and internal tasks. On the other extreme ideal-type organization structure, project teams dominates the way of working with set of tasks and objectives where the project manager is the dominant authority over resources (Larson & Gobeli, 1989). In between these extremes, Hobday (2000) presents further variations of ideal-type structures. From the functional organization, the authority of the project manager in relation to the line manager will increase with every ideal-type organization. In an ideal-type organization, project matrix [D], the authority between the functions and projects are equal. The organization structures presented by Hobday (2000) are merely a theory-based ideal-type representation of reality, meaning that the reality can look very different from the theory. However, the importance of this model is to understand the integration between line- and project organization. And in order to evaluate, improve or conduct other organization development one must first truly understand the organization structures to further understand which adaptation or fit is most suitable for the intended outcome of the organizational activities by creating a fit between process and strategy, line and projects as well as internal and external context (Miterev, et al., 2017).
Since the 1960’s, the commonly known Matrix Organization Structure was widely adopted amongst companies developing new products and services (Laslo & Goldberg, 2001; Kuprenas, 2003). With an increasing need of project-oriented systems in a traditional functional organization structure, horizontal project teams were established over the traditional vertical organization. As an effect, many employees find themselves working under the line manager as well the project manager. Laslo & Zohar (2001) presents this organization transformation as the intention of retaining the up-to-date technologies and knowledge while still being agile and flexible in new product- and service development. The common perception was that this would allow for the optimal balance between the completion of products and retaining high technical performance. However, the past five decades have proved that the initial intention may have been optimistic as many matrix organizations today struggle with an effective management of resource allocation, long decision making and other parameters of organization efficiency (Laslo & Goldberg, 2001). This arguably would be the result of the two oppositions, being line manager & project manager, having an equal authority in claiming resources and prioritization. Traditionally in a matrix organization, the project manager is responsible in defining the wanted outcome of the project. The line manager manages the functional processes and resources, in turn defining how to reach the wanted outcome (Bernasco, et al., 1999). The roles of the line manager and the line manager may of course look different in a matrix organization. There are three types of matrix organizations according to Hobday (2000). Functional matrix [B] is the matrix organization with the strongest functional organization of the three. The projects taking part in this matrix organization are of non-routine character and for internal development processes. Additionally, the balanced matrix [C] provides a stronger project management authority, with a common occurrence of projects to obtain external customer deliveries. At the point where the project management and functional management share equal authority a project matrix [D] is provided.

A fundamental principle is to opt for a structure which allows the organization to meet set objectives as efficiently as possible. Fundamentally, it is required to empower those parts of the organization that needs empowering. The matrix organization is used as a tool to empower two types of temporary or permanent structures within an organization, generally with different assignments and responsibilities with the same source of resources. Therefore, how to empower the two, function and project, sufficiently for them to
managing their day to day work is a struggling task but when successful can contribute to major advantages, see Table 5 below. The matrix organization provides an environment where opportunities are connected to efficient use of equipment, human- and time resources as they are shared over projects and function. Further the matrix organization allows for increased flexibility as employees and managers cross-functionally are in frequent contact, allowing for a more effective decision making and more responsive to potential need of adaptation (Larson & Gobeli, 1987; Schnetler, et al., 2015; Ford & Randolph, 1992). However, insufficient management of a matrix organization can have a negative effect on the organization. Although the intention of the matrix organization is to reach a balance of managing technical expertise whilst meeting specific project requirements, the empowerment of both functional- and project management can create a power struggle between the two. The balanced matrix [C], with legitimized functional authority, manages conflicts better than the project matrix [D]. This is because the authority may be influenced by internal politics and creates an environment of credit and blame and in turn increased conflict. A matrix environment can also contribute to reduced reaction time caused by prolonged decision making. Apart from increased difficulty in monitoring progress and controlling of projects, a matrix organization may create increased experience of stress since employees tend to report to two or more authorities, as well as divided commitment between function and project (Larson & Gobeli, 1987; Larson & Gobeli, 1987; Schnetler, et al., 2015). Although this often can create stress, the opportunity to work on several products, interacting with other disciplines and employees over the function borders is argued to be a large motivation factor (Ford & Randolph, 1992).

Table 5: The advantages and disadvantages of a matrix structure.

<table>
<thead>
<tr>
<th>Advantages and Disadvantages of a Matrix Organization</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient use of resources</td>
<td>Power struggles</td>
</tr>
<tr>
<td>Project integration</td>
<td>Heightened conflict</td>
</tr>
<tr>
<td>Improves information flow</td>
<td>Slow reaction time</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Difficulty in monitoring and controlling</td>
</tr>
<tr>
<td>Discipline retention</td>
<td>Excessive overhead</td>
</tr>
<tr>
<td>Improved motivation and commitment</td>
<td>Experienced stress</td>
</tr>
</tbody>
</table>

The success of a matrix organization is not necessarily difficult to achieve. However, those processes and factors that needs to be addressed and improved in an unsuccessful matrix organization is much harder to identify due to its increased complexity (Schnetler, et al., 2015). And as claimed earlier; which type of matrix organization is preferable does not have a definite answer. However, Larson & Gobeli (1987) has presented empirical observations on which matrix organization show largest tendencies of each advantage and disadvantage, see Table 6 below, which helps to understand what effects certain structures potentially can use. The findings presented by Larson & Gobeli (1987) suggest that project matrix tend to provide the most efficient structure for project success. Despite this, the other two types of matrix organization are no less frequently used. The reasons for this is argued by Davis & Lawrence (1977) that matrix organizations tend to evolve over time and in order for a matrix organization to succeed it must grow to its necessary fit and not installed as a tool.
Table 6: The differences between matrix forms (Larson & Gobeli, 1987).

<table>
<thead>
<tr>
<th></th>
<th>Functional Matrix</th>
<th>Balanced Matrix</th>
<th>Project Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource efficiency</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Project integration</td>
<td>Weak</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Improved information flow</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Discipline retention</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Improved motivation and commitment</td>
<td>Uncertain</td>
<td>Uncertain</td>
<td>Uncertain</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power struggles</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Heightened conflict</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Reaction time</td>
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<td>Slow</td>
<td>Fast</td>
</tr>
<tr>
<td>Difficulty in monitoring and controlling</td>
<td>Moderate</td>
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</tr>
<tr>
<td>Experienced stress</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

3.5 Analysis model

To visualize how the chosen theory is connected, an analysis model is introduced, see Figure 8. The model uses the matrix organization structure as the specific context. The main components inside the context; HRM, PPM and capacity planning have been discussed in previous chapters. The dotted line suggests there are more components to consider in a matrix organization structure, but the authors have limited themselves to these three. A time line has been added to show the different time horizons used. It shows the horizon of resource allocation, where the long-term horizon stretches up to five years and the short-term down to a day-to-day resource allocation. This time line should be viewed as a logarithmic scale, where one unit of time represents a smaller part of the time line the further left it is viewed.

The HRM has been established to be focusing on long-term staffing and competence development, and also as being the main focus of line managers. In other words, this is where the supply of resources is created. To be able to satisfy the future needs of competence, there has to be a long-term vision of what competences are needed. The employees and competences created through HRM are then used to carry out the current projects, gathered in the project portfolio. The PPM set the demand of resources to the capacity planning as well. Projects might run into problems along the way, and there was a need for adapting accordingly. The capacity planning then sets the supply of resources to projects in need. That means resources are re-allocated to other projects with higher priority. Again, the connection between capacity planning and short-term resource allocation results in an overlap of resource allocation horizons here as well.

The subject of supply/demand is a fundamental phenomenon widely discussed in multiple areas, and here it forms the basis of resource allocation. In the long- to medium-term horizon, resources are allocated based on the demands set by the current projects, or they are allocated based on what supply is available. In the medium- to short-term horizon, demand and supply is dictated by prioritizing between projects. Resources might be re-allocated when needed and that means the resource allocation need to be updated.
Figure 8: Analysis model.
4. Empirical data

This chapter presents the most relevant findings from the interviews, in combination with our own observations made during the study. The chapter is divided into three major parts; Organization, PPM and HRM.

4.1 Organization

The organization has gone through major transformations over the years. Demand was at its peak the years around 2015 and during that period of time, TECHX did a lot of recruitment. The company has grown substantially, and a lot of new employees have been hired. A major restructuring of the organization was recently undertaken to cope with these new challenges. TECHX has transformed from a small, flat organization were all employees know each other well, and all were in some ways involved in all projects, to a hierarchical organization with three levels of managers. Projects are then running cross-functionally along the functional departments, from where projects draw their human resources. The site manager pointed out the underlying reason for moving towards this new organization structure:

*The goal with the organization today is to be able to grow. That means that we have slightly more managers per employee than would be considered normal, but the idea is that the departments are supposed to be bigger, to make sure we can handle larger projects.*
– Site Manager, 20/4 2020.

A number of employees pointed out this new situation. Most employees expressed that in general they found the current organization structure to work well for them. Some raised concerns regarding the added number of steps information has to travel before reaching the employees. One department manager commented on this specific situation:

*It made me lose quite a lot of information, the complete picture which I think is... Partly it is sad because, I am the sort of person who wants a lot of information and to keep track of things happening. But it is also sad that my coworkers, those in my team, lose information as well, when information needs to flow through multiple steps.*
– Department Manager Systems Engineering, 15/4 2020.

The increased steps for information to travel were raised by others as well. Some had other concerns regarding the organization structure. One senior manager said that:

*I think it is a bit too big for my liking, seeing what you get out of it/—-/ It needs another revision, it was a good idea from the start. Now we can see how it works, and what does not work. I think it would be good if you change a few things here and there.*
– Senior Manager R&D, 8/4 2020.

The organization structure the employees talk about is a form of matrix organization. All employees agreed that the new organization form was indeed a matrix structure; however, there are different conceptions of what level of matrix organization is used. Employees agreed that line managers had authority over human resources, but many also pointed out the importance of the projects and their ability to deliver products to their customers, both internal and external.

*The organization is constructed around the projects being quite strong.*
– Site Manager, 20/4 2020.

Historically, when the organization was flat and there were fewer levels of managers, projects were the driving force of the company. While this in some ways still applies, the projects get challenged by the line organization, who has gained authority over human resources. One project manager felt that, even though most of the time they possessed the appropriate amount of authority to carry out their work that, sometimes, they lacked the level authority to manage their work properly. When being asked about it, the reply was:
In some cases, I think so [about lacking authority]. /.../. Sometimes it happens that they [human resources] are taken away from me without my knowledge first, that has happened. So sure, it is not a perfect system.

Often though, it works well, I think.

– Project manager medium experience, 14/4 2020.

It was highlighted that the communication between line managers and project managers is lacking. While, in general, project managers stated that the communication towards the line managers were good and sufficient, line managers did not always agree. They thought that communication between them could be improved. At TECHX, the most common forum for interaction between line managers and project managers is Stinsen, a weekly meeting where projects are discussed and current issues within them are brought up. Prioritizing between which projects to focus on is carried out by the line managers only; a fact that one project manager pointed out.

We [project managers] are however present at this Stinsen meeting before so we have informed the line managers regarding what we need, so they can perform the priority meeting, but if we were present as well, there might be more precise information circulating in that meeting.

– Project Manager senior experience, 16/4 2020.

Employees do not share the same picture over authority between project managers and line managers. The site manager and the senior manager at Engineering both know that the role descriptions are written down regarding who does what, and they both acknowledged that these role descriptions are not communicated very well down to the other levels of management. Line managers and project managers in general found that role descriptions are somewhat vague. During the interview with one of the department managers, the matter of authority and role descriptions was discussed. When being asked if there was a clear role distribution between line managers and project managers, the answer was:

The more you ask about it, the more unclear it feels. So no, it is not so clear.

– Department manager Product design, 15/4 2020.

At this stage of the transformation from a flat to a hierarchical organization, most interviewees agreed that the organization is not set just yet and that it needs more time to function properly. There was still a lot of uncertainty regarding meetings; who should be present at which meetings and which information should be given to whom. The organization is still evolving, and one senior manager put it like this:

... we often work as a small company even though we are structuring ourselves as a large company and we have a hard time letting that part go; working as a small company.

– Senior manager Production 17/4

4.2 Project portfolio and PPM

In general, employees and managers experience a high stress level and lack of consistency in their work. This was expressed by the interviewees together with observations. Line members work in an environment where they are split and torn between different projects and the tendency of project managers as well as sales pushing on short notice tasks disrupting the consistency. To project managers and line managers, this is not a surprising occurrence and explained as the result of a struggling prioritization. With approximately 30-40 ongoing projects and 9 active project managers, prioritization between these is made once a week by the senior manager at project management and line department managers. Most of these projects are customer projects which have an external delivery. Previously, TECHX has focused on external projects in the project portfolio but has in recent time started to map internal development projects as well. Input to this priority meeting is the output from the meeting called Stinsen. A name referencing the traditional train station operative titled Station Inspector or Stins. Not unlike the responsibilities of the Stins, communicating information and delegating activities to the train station employees, the meeting aims to communicate current progress, obstacles, needs and time prognosis for each active project from a project- and line management perspective. The senior manager for project management is the leader of this meeting.
and is responsible for updating the file. An example of what the Stinsen file looks like can be seen in Figure 9. Green refers to a project on-time, yellow highlights a project which might be delayed, and project marked red will be delayed unless actions are taken. Apart from that, it is an open climate where all are allowed to make their voices heard.

<table>
<thead>
<tr>
<th>STINSEN</th>
<th>Design</th>
<th>Quality</th>
<th>Production</th>
<th>Operations</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example project 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example project 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example project 3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 9: Example of Stinsen structure.

The output from this meeting, being if there is lack of line resources in any project, is then translated into a prioritization. Apart from a few fundamental and informal priority policies, such as not postponing the customer’s final delivery due to internal delays, customer priority and other considerations such as time and cost, the revelation that there is no formal and clear prioritization model became clear. As an effect, this opens up for unstructured reasoning and argumentation on the priority with the risk of heavy influences of internal politics, informal leaders steering the decisions to a certain direction and dependency of meeting presence and participation. The senior manager of engineering is responsible for the priority meeting, but there is an open discussion where everyone is involved. Observations showed that the priority would be updated every week, where projects would either be added to or removed from the priority list as well as increasing or reducing the priority, depending on the current project situation and presented arguments during that meeting. The result of the new priority is then communicated via a meeting protocol to the rest of the organization. However, some employees find this type of communication lacking considering that the protocol does not raise reasons behind the new priority and often not viewed. Others however, more senior employees, showed an independent attitude, finding the necessary information and updates needed in their day-today work.

Whether there is a thought behind it or not, and regardless of how well managed, it is safe to say that TECHX has a project portfolio. A constellation of projects (project portfolio) is the common nature of a multi-project environment. In the context of mapping the general understanding of the project portfolio, the interviewees were asked if they knew the quantity of ongoing projects at the moment. The given answers varied from interviewee to interviewee. Also, the source where the interviewees would find this information varied. For the line-managers, the Stinsen seemed as a natural source as it being the used tool of weekly project follow-up. Beyond Stinsen, other project compilations became apparent from observations and interviews. Other tools or channels than Stinsen; project-website and the ERP-system IFS were not mentioned. With varying purposes of the different project-compilations one interviewee, particularly prepared for the interview, explained how the compilations differed when asked how many projects TECHX has:

Well I thought this was the best question on the entire questionnaire, I believe. I went to check out, I started on the website, there are projects, and I believe I counted to 35. Then I checked out Stinsen. There it is 41. However, there are some internal projects added at the moment. And then I checked in the prognosis from IFS in April which projects my team is to work with, and there I found 31. So, nothing really matched. But then, in the prognosis there is no development projects added. There are some of those differences, but I did not have the time to make an extensive analysis where the big differences lie.

– Department manager Systems engineering, 15/4 2020

Whereas another interviewee had a more limited insight:

I can’t tell you an exact number. The list is long, nonetheless. There are around twenty projects. But the Stinsen is what we rely on. If it is not listed there, then I have no insight in it.

– Senior manager Quality, 14/4 2020

When the question was asked to the project management side, they tended to be less reliant on Stinsen to get an overall view of the project portfolio. They rather expressed themselves as the source of information
through the company intranet and project-websites, further with no need of a general view of the project portfolio except their own projects. A senior manager expressed this as a cultural aspect to how the project managers act:

One thing I thought about which we have always wanted from the line is this, which you talked about, to balance the projects against each other, think a bit strategically and making it work in the machinery. Perhaps it’s beginning to turn around a bit but we have still not found the shapes for it, but it has been too much of each project manager managing their own project and should push it forward and live up to its milestones and so on without coordination with the others. And this has actually earlier even been stated that it should be that way. You should manage your projects and so on. This does not become especially good when it requires the same resources to different projects and so on, there becomes no coordination.

– Senior manager Engineering, 23/4 2020

Project managers are responsible to update a project-website on the company intranet with information such as project-ID, project name, responsible project leader and other information on the project they manage. From several interviewees the project-website were described as inconsistent and many times not up to date and therefore not always a reliable source of information. When a project manager was asked questions on their insight on the general outline of the project portfolio the response was:

I believe as project manager we have most insight in our own projects where we are invested towards the customer, which contracts we have also working close with the salespersons in order to know what is about to come in maybe. A bit like that, but you get a bit of the whole picture from the colleagues, what is going on in projects and so on, but it is not something which we have a specific channel for it is rather on department meetings where to each other explain and discuss what is going on.

– Project manager medium experience, 14/4 2020

Concerns were raised towards the Stinsen meetings in general. Interviewees agreed that the current way of conducting the meeting is dysfunctional and is not an ideal forum at its current form. Some felt that discussion often swayed from what was supposed to be discussed and brought up things which there are other forums for. One project manager brought up the fact that they occur only once a week. When projects run into problems which may require more resources, project managers have to wait up to a week to solve the issue, if following the formal routine. This opens up for solving issues through informal communication ways, such as emails and corridor talk. This was conceived to further complicate the human resource allocation.

Initial discussion on the project portfolio showed how diverse the general understanding of it was. Naturally, most of the interviewees could familiarize themselves with ongoing projects on a basic level; understanding the customer, general scope and a perspective on project size. Observations during interviews showed how the communication of the project portfolio is on a need-to-know basis, potentially circumstantial and not necessarily an established philosophy within the company. The department manager of product design expressed from a design perspective that the project portfolio understanding revolves primarily around type of product technology and resource demand. Beyond that there is no need to further understand the project portfolio from a strategic standpoint, other than trusting the judgment of senior management, according to department manager of product design. The department manager continued the reasoning with:

But what I am in need of is to actually get much sooner feedback on what [which projects] is to come. Because that is not visually clear. It is manageable, if you want to, to really check and look in graphs and calculations to understand how many hours are presented here and there. But I have myself never calculated on prognosis and quotations and calculated on how many hours are needed and therefore not invested in the system. Then I receive graphs once every quarter where there it says: “this is believed to come in”. Then it is such that, they have guessed either a hundred or zero percent on the probability of incoming business deal.

– Department manager Product design, 15/4 2020
The understanding of strategic value of a project, how that strategic value is defined and put against other projects as well as other strategic reasoning towards incoming projects was a large topic during the interviews. To start off with subject of responsibility it became apparent that, formally, there is no designated management team responsible to strategically design the project portfolio. The driving force of incoming projects is naturally the sales department. Observations during interviews showed that there is a strategic reasoning of incoming projects, however with tendencies of being very limited. From a small organization with a very clear product portfolio, which changed very little over the decades, the company has the past years expanded into markets they yet have no experience in. Therefore, as the senior manager of Sales & Marketing explained, the strategic reasoning of incoming projects revolved primarily around choosing products and type of work which fits naturally in their existing expertise or future market entries. The phrase “no-brainer” was used in interviews and in meetings, on which we participated, to describe projects which are to the instinct obvious to bring in.

*Does this fall within what we as a business unit would do? Is the answer no to that question, then the response will be no on the quotation. We will not proceed with the business proposal.*
– Senior manager Sales & Marketing, 21/4 2020

Additional observations were made regarding the subject of project portfolio management. The forum in which this subject is addressed is a decision gate meeting attended by senior department managers, site manager and head of sales accompanied with salespersons involved in the potential business opportunity. Discussing the characteristics of the business opportunity; who the customer is, expected start and time duration, type of product solution and general financial profile would result in a decision whether or not to proceed with the business opportunity. Observations during this meeting showed that decisions were heavy influenced by the sales department, without checking the current and future capacity in the organization. The progress of potential business opportunities is further communicated to functional- and project managers with an excel sheet presenting current and potential future projects and their estimated time-duration and capacity needs. These estimations are further translated to a capacity prognosis which line managers use to advocate necessary recourses for that upcoming period. The experience of the used method expressed by line managers is that the estimation is rarely insightful. Estimated starts of projects are often changed and estimated capacity requirement divergent making the prognosis obsolete. Observations during a decision gate meeting showed that an incoming “no-brainer”-project was accepted without further investigating its relation towards available resources and the other 30-40 ongoing projects. This observation was also supported by the findings from the interviews. When asked about matching incoming projects to available resources some interviewees answered:

*The projects come in regardless. I would like to say. Then you will have to try and adapt the resources accordingly.*
– Senior manager Production 17/4 2020

*The projects come in regardless. Whether we have the resources or not.*
– Senior manager Quality, 14/4 2020

*If the project in question lies within the framework of what we intend to do, then yes, then it is that I now must... We need to take this in order to monitor our market position. This is the right product, staffing will be hard, well then, we will have to solve that with the staff. In that sense, yes there is a mentality of: “We will handle the issue of resources”.*
– Senior manager Sales & Marketing, 21/4 2020

Several more interviewees also expressed that it is a rare sight of turning down business opportunities. The sales & marketing department has a set goal for order intake. They have a financial value of quotations they have to reach each year, in order to fulfill company goals. The value is based on how much the deal is worth, rather than profit margins. Interviewees brought up some historical examples were projects have been brought in which have high value in terms of the contract, but at the same time have small margins. It was by some considered necessary to bring in these projects despite low profitability, since it gave them the
opportunity to reach new markets. When explaining the definition of supply and demand, in the context of this thesis and further asking which is the ruling part of resource allocation the answer was unanimous. There was no hesitation behind demand being the ruling part of resource allocation and that the company brings in as many projects as possible with the mindset of in turn adjusting the work force (supply) accordingly.

Further understanding the roles and responsibility, it was clear that the top management group, consisting of senior managers, was pointed out by the interviewees as responsible for the project portfolio as them being participants of the decision-gate meeting where decisions on incoming projects take place. By top management, interviewees referred to the site manager and senior managers at sales & marketing, project management, and engineering. When addressing the senior management with the question on strategic value of each project an answer was:

*If there is someone who should have insight on the project portfolio then it should be me primarily, in my own opinion. The one who should be able to answer the question in the sleep basically, but it hasn’t been entirely easy to find on your own, in my experience.*

– Senior manager Project management, 14/4 2020

A few interviewees felt that the absence of the site manager and senior manager at sales & marketing was problematic. They expressed that their knowledge of the project portfolio was needed in order to make the right decisions.

### 4.3 Human resource management

The matter of human resource management was the last of the three topics discussed with the interviewees. Since all were not completely familiar with the term, a brief introduction to the subject based on the literature review was given to all interviewees before questions were asked. The Site manager felt that the description given applied to TECHX, but that there were some differences:

*TECHX separate those two parts [resource allocation and competence development]. One part is what we call People Net where matters such as employee development, recruitment and those things are dealt with. This differs from resource planning in projects. It is not under the same hat so to speak but it is instead up to project managers and line managers to deal with it in a completely different way.*

– Site manager, 20/4 2020

Adding to this, the HR manager further mentioned the basic HR steps at TECHX:

*...you usually talk about; attract, recruit, develop, retain and exit, that is our five main steps.*

– HR manager, 23/4 2020

The stage where the quotation and later the contract between TECHX and the customer becomes a project is through a decision gate, named DG4b. A project manager is assigned by the senior manager at project management to the specific project. From the specifications given by the sales department, the project manager has to assess how much resources are needed in the project, using the ERP system IFS as a tool. This resource assessment becomes part of a resource curve which includes all projects and human resource needs. That means the line managers can keep up with current and future resource needs in the projects. The project manager then requests human resources from the line organization. Often, they request certain competences and sometimes even specific employees for their projects. Knowledge is often connected to certain employees with experience in certain fields. This is considered problematic for line managers for two reasons; projects requiring certain employees are less flexible, and less experienced employees tend to be left out of complex and high-prestige projects, which have a negative effect on their knowledge development. Based on the requests from the project manager, it is then up to the line manager to allocate available resources to that project. Most of the time, it is possible to satisfy the project managers’ needs, but not always. One department manager experienced difficulty when project managers request decimal resources, for instance 1.35 employees for one project. That means two employees need to be assigned, with 0.65 of one employee’s time becomes free and difficult to allocate to some other project.
...I have to constantly solve the puzzle to make the minor things done... it is easier with those who are allocated 100% to a large project with several product designers.

– Department manager Product design, 15/4 2020

Line managers deal with resource allocation differently. In general, line managers with a greater number of employees tend to have a system for tracking employee’s work load on a weekly basis, while managers with fewer employees keep track of them in their head. This in terms results in different strategies when delegating tasks to employees. Most use a system of checking which employees have time to take on another project, one way or another as previously mentioned. Based on this, the line manager contacts the best suited employee to discuss the situation. Another method which was brought up was based on letting employees be self-going in their work and when new projects reached the line manager’s table, employees were asked who could take on this project.

Going back to tracking the employees’ work situation; there is no set method for doing this. Some line managers have their own-developed Excel sheet to deal with this while other do not have it. The basic idea is the same, where one department manager used a scale from 1-5 for employees to describe how busy they were, while another department manager used colors; green, yellow and red. By doing this, the line manager could identify which employees had some extra time to spend, and who were in need of help. A senior manager expressed that:

... looking at my small department, I have a task to create some sort of planning tool or similar to be able to visualize or to see where it gets tough.

– Senior manager Quality, 14/4 2020

The way project managers request resources is not always a formalized process. The collected picture is that they estimate how much resources are needed and then individual communication to each line manager regarding their needs. The estimations are based on input from the sales department; however, these are not always accurate, and project managers have different solutions for dealing with uncertainty in planning.

They [resource prognosis] are based on my gut-feeling. I account for everything; all information I have about the project, both customer wishes and what we have promised and how many people are available and so on, I try to boil it together so to speak to this prognosis to make it as accurate as possible.

– Project manager, senior experience 16/4 2020

So, one way is to add a bit more, overestimate in the time plan from the start. To account for future changes and that sometimes people gets switched out from the projects and then you need some change-over time for handovers to someone else, etc.

– Project manager, medium experience 14/4 2020

The project manager with junior experience expressed another view on dealing with planning of resources. Focus shifted a lot towards team member involvement, where they played a more active role in estimating the time taken for certain tasks. Based on this, a more detailed plan could be made. All three interviewed project managers expressed that planning is difficult and that technical prerequisites often change. The Sales & Marketing manager explained a scenario where:

“So, now we have a large amount of potential businesses here and they end up over there... Okay that will work well since we have these projects which will end and so on...” /-----/ That is how it works in an ideal world, but that never happens, and projects tend to be delayed or cost more to do. Then we have customers who get involved late in the process, they ask late and are hurried... Then they [projects] are to be prioritized and that is tricky when you have limited resources that need stretching to cover a certain number of projects.

– Senior manager Sales & Marketing, 21/4 2020
A strong sense of uncertainty permeates TECHX when it comes to planning of resources. This combined with unclear prioritizing becomes an issue for employees, when they are re-allocated to different projects, sometimes on short notice, which increases uncertainty for them. All interviewees agreed that employees occasionally feel stressed and that stress has a negative effect on them. When situations occur that employees are getting stressed and exhausted, managers are very determined to help that employee to make sure the situation does not worsen. One example of how to deal with signs of employees getting stressed described by the sales manager:

Very responsive, when things like that happen you act the way you should to see that person, support that person, remove them [from the project], help them so they get up and running again partly for the person themselves but partly for the others. There is a large symbolic value to handle your personnel in the right way and respect the fact that they have been working hard and that you are feeling bad. Then you need help.
– Senior manager Sales & Marketing, 21/4 2020

One of the department managers lifted another perspective, where sometimes, it is difficult to know who are working more than they should and are, because of that, running a higher risk of being stressed. There are some ways to see tendencies; looking at time reports and use the previously mentioned Excel sheets, but most important is that employees are transparent and talk to their line manager when situation becomes too much. The HR manager also pointed out the importance of co-workers seeing early signs of stress amongst others.

When it comes to what actually causes stress, the HR manager and the site manager lifted an interesting perspective:

...there is not necessarily a connection between working many hours and feeling stressed.
– HR manager, 23/4 2020

When you investigate how employees work, it is apparent that there is almost no one who works a lot of hours. It is a factor for stress, but we believe that the major factor for stress is what we call, so to speak, the situation where you cannot influence your situation, or not being in control of your situation. A sort of frustration is built up, it is quite harmful actually when you add stuff to your work list, and you cannot get rid of them.
– Site manager, 20/4 2020

If you have high demands but you are in control, then you will not get as stressed. /———/ One example to overcome this is to have regular meetings.
– HR manager, 23/4 2020

The fact that there was a problematic situation regarding the HR department when the study was conducted was lifted as well. The former HR manager (our interviewee) quit about 6 months prior to this study and TECHX did not have a HR manager at the company between September and January, when a new HR manager was hired. However, this HR manager then went on long-term sick leave, meaning they were without HR personnel again. Luckily, the former HR manager has been present for a limited time to help with HR related matters. This has had an effect on one of the department managers:

I think that there are a lot of questions where I as a new manager really would have needed support to understand how things are supposed to work /.../ I have called the HR department at the sister-site quite a lot and I feel that I have... when I have had urgent questions I have got really good support from them, but in minor questions I have received no support.
– Department manager Product design, 15/4 2020

A similar situation was expressed by the senior manager for Quality and the senior manager for Production, who both also were quite new to the job.
At approximately the same time I started the HR manager quit [at the studied site]. So I have not had HR present. I got help from a HR at the sister-site when I needed to recruit, but as a line manager you have a huge responsibility, HR responsibility.

— Senior manager Quality, 14/4 2020

So, we got to do a lot by ourselves when it comes to recruitment and those parts and that is what you hope to get. Usually, HR is involved in that process. It is a very important role. We utilize HR in other matters than just resource planning so to speak.

— Senior manager Production 17/4 2020

The department manager at Systems engineering, who had previous experience in managing a department before the restructuring occurred, had a different view of HR when being asked about their role in resource planning:

Well, it is when I see these IFS graphs, that they do not add up; either that we are too many or too few. Then I contact HR and say that I need to expand, or I need help to lend people out.

— Department manager Systems engineering, 15/4 2020

This view was shared by the HR manager when being asked about how resources are handled. This would indicate that this is in line with reality, but since the HR manager left before the new managers were assigned at their positions; it is difficult for them to know the process behind the curtains.
5. Analysis
The analysis will be centered on the most significant findings during the interviews putting them against the literature review.

5.1 Resource allocation
Competing over the same resources is a common occurrence in a matrix organization (Engwall & Jerbrant, 2003). The same can be said about the matrix organization structure at TECHX. The empirical findings showed a clear distinction between increasing project quantity and increasing scarcity of resources as well increasing difficulties with managing projects. This phenomenon is typical for growing organizations as suggested by Engwall & Jerbrant (2003). As TECHX grew with increasing project quantity, product- and technology diversity and increasing staffing, the processes of managing and allocating resources between projects has arguably not followed the necessary development in order to provide clarity and structure. The reflection from an interviewee that TECHX is a large organization acting like a small organization has become apparent. The findings suggest that there are no available tools to maintain a sustainable and consistent planning and allocation of resources. With Stinsen and the ERP system, IFS, working as the main, official, tools of resource planning-, and allocation, it is clear that TECHX lack the varying time-horizons needed in a sustainable resource allocation processes as suggested by Hendriks et al. (1999). Such time horizons vary from long-, medium-, to short-term resource allocation with inputs and outputs connecting the different time-horizons.

5.1.1 Long-term resource allocation
Comparing the time-horizons to the ones active at TECHX, there is need of reviewing the long-term horizon in their resource allocation process. This is also the foundation in a functioning and sustainable resource allocation process, a foundation TECHX arguably has neglected in their expansion. By adapting to this time-perspective, TECHX can proactively address the issue of staffing as suggested by Hendriks et al. (1999) with a multi-year horizon in mind, yearly reviewed and updated. Because of the previously recognized connection between long-term resource allocation and HRM, focus for this sub-chapter will be to describe what can be done to establish a long-term resource allocation at TECHX. The human resource management system is divided, as mentioned earlier, into two parts; resource allocation and competence development. In analyzing HRM at TECHX, focus will be on long-term resource allocation, but the subject of competence development will be brought up as well.

When studying the HRM system at TECHX, the HR manager explained the general steps of dealing with employees; attract, recruit, develop, retain and exit. These five steps take into consideration the entire process of employees, from attracting people to work for TECHX to the phase when they are leaving the company. The definition of an HRM system given by Guest (1997) and Wright & McMahan (1992) given earlier only considers the time of employment, and how employees are handled during that period of time. As shown in Table 7, there are clear similarities during the employment stage. The term selection used by Guest (1997) and Wright & McMahan (1992) has a clear connection to TECHX’s term recruit. The term retain as TECHX uses, goes hand in hand with the stages of appraisal/career and rewards. Based from this, TECHX’s way of dealing with employees, there is a clear connection to the definition given in this thesis, suggesting a correct approach by TECHX.

Table 7: Differences between HR system at TECHX and definition of HRM system (Guest, 1997; Wright & McMahan, 1992).

<table>
<thead>
<tr>
<th>TECHX’s HR system</th>
<th>Definition of HRM system</th>
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<tbody>
<tr>
<td>Attract</td>
<td>Before employment</td>
</tr>
<tr>
<td>Recruit</td>
<td>Selection</td>
</tr>
<tr>
<td>Develop</td>
<td>Training &amp; Development</td>
</tr>
<tr>
<td>Retain</td>
<td>Appraisal / Career</td>
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<tr>
<td></td>
<td>Rewards</td>
</tr>
<tr>
<td>Exit</td>
<td>After employment</td>
</tr>
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</table>
What has been seen as a major problem for TECHX is the lack of integration between the parts in what Bredin & Söderlund (2011) calls the HR quadriad. The most prominent problem at TECHX considering HRM is the absence of a full-time HR manager. This function has previously been in place and working very well, but not since right before the restructuring. That means that the employees who were assigned to line manager positions have not had proper support from HR since their admittance. This shows the quadriad connection between line managers and HR managers is not in place, and while line managers could contact the centralized HR center at the sister-site concerning bigger problems, the every-day operational problems had to be solved without support. The newly appointed line managers have gone from a role where they previously have been involved in technical work tasks and moved towards staffing and competence development instead, areas where they have limited knowledge in. This has led to a situation where these new managers have come up with their own solutions to the problems which they have faced during their first six months on the job. One example is the tracking of employee’s working situation, which some have done, and some have not. Additionally, those who have done it have their own version of it rather than having an organization-wide tool. This was expressed as an issue and we agree that TECHX needs to focus more on standardized tools, such as the tracking of employees.

The physical distance between the project management office and the engineering office was considered an influencing factor, since they are on different floors in different buildings. Projects are run on the project management floor, while engineers and line managers are located on the engineering floor. The lack of physical interaction with the project combined with the number of projects each team member has ongoing, about 2-5 at a time, the project participation becomes fragmented. The scatter factor, as described by Hendriks et al. (1999), at TECHX is high because of the number of projects the team members are involved in. But it is not only project participation from project members that is affected by the scatter factor; it is also the project managers. Their tracking of individual project members becomes difficult when handling up to 5 projects at the same time. Instead, they focus more on the project team as a whole and their work, focus on dealing with deadlines and make sure the customer is satisfied throughout the process. The responsibility for employees has been assigned to line managers, who have started to lose their technical role in the organization and now focusing more on HR. Their role is to make sure the projects have the needed resources and in the long term, ensure new competences are hired if needed.

Looking at the differences between inter- and intra-functional project work, as described by Bredin & Söderlund (2011); TECHX cannot be purely defined as one or the other. Characteristics of both inter- and intra-functional projects have been identified during the study and it pose a complicated situation. The role of line managers at TECHX go hand in hand with the role of line managers in an inter-functional project work, as described by Bredin & Söderlund (2011), and most projects which are carried out have cross-functional teams, with expertise from multiple areas, also suggesting an inter-functional project work. But project members are located together with their line department and only interact with the rest of the team at meetings, and project leaders focus mostly on following-up projects. Also, project members are involved in many projects at the same time, which would suggest they work intra-functionally. It has become a confusing situation where organizational walls have been built up around each line department, when what is actually needed is more collaboration to deal with the complex projects. This has led to a situation where new organization form has not yet worked in TECHX’s favor. What is recommended to TECHX is to acknowledge the difference between inter- and intra-functional project work, and what characterizes the two. Project team members should at least have the opportunity to be co-located with each other, to share experiences and through that, take more responsibility towards their own knowledge development. Project managers and line managers need to develop their communication and talk to each other more, another characteristic of inter-functional project work. Often, inter-functional projects utilize 100% resource allocation, meaning team members are only allocated to one project at the time (Bredin & Söderlund, 2011). At present, this is not possible considering the number of active projects at TECHX, but from an HRM perspective, it can be seen as beneficial to reduce the number of projects in order to work inter-functionally.
Beyond staffing, TECHX would further benefit from managing a long-term perspective on the level of competence development. Competence development, as suggested in the literature chapter, is a long-term investment (Bredin & Söderlund, 2011; Huemann, 2010) but also crucial a part of HRM, in turn resource planning, and allocation. Not only is this relevant for TECHX considering their expansion and the introduction of less experienced employees, but also from a competitive perspective where it is necessary to build competences towards markets TECHX desire to enter. Bowen & Ostroff (2004) argue that having the right resources and using them correctly will increase competitiveness, a necessary prerequisite when entering new markets. These literature perspectives sheds light on the empirical findings suggesting the need of considering which resource are needed, not only how much resources are needed. Project managers at TECHX expressed during the interviews that it is not always enough to receive resources; but instead to receive the appropriate resources. Line managers instead described how key competences within the organization can be especially burdened compared to other resources suggesting that training of less experienced employees is crucial. Furthermore, long-term planning and allocation of resources is foundation that TECHX needs of extracting the benefits of matrix organizations, making efficient use of resources in turn creating a competitive advantage (Bowen & Ostroff, 2004; Becker & Gerhart, 1996).

The distinction was made between information and knowledge by Nonaka (1994), and the role of information in order to take the right decisions was highlighted by Archer & Ghasemzadeh (1999) and Cooper et al. (2002). At TECHX, a clear difference was identified between employees who had been working there for a long time and employees with less experience. Based on the pre-study interviews, employees with more experience expressed that information was not always given to them; if they needed to know something, they had to look it up themselves. Less experienced employees expressed that information regarding projects or processes was insufficient, and that affected them in their work. There is a difference in perceptions of how the organization is supposed to be, where experienced employees still see it as a flat organization without boundaries, and they know how to gather the necessary information. Less experienced employees see the organization as a line organization where information is gathered within the line department, where things connected to other parts of the organization is not their responsibility. Nonaka (1994) expressed the need for information to create knowledge, and based on this, new employees have difficulties in developing their knowledge base when the appropriate information is considered hard to find. This connects back to the inter-functional project work, where co-location of project teams can be seen as having a positive effect on knowledge development. Knowledge is crucial to organizations and a way of gaining a competitive advantage (Killen et al., 2012). Therefore, it should be in TECHX’s best interest to make sure the HRM system supports new employees in their competence development and that they are able to affect their situation and receive support in knowledge developing activities.

Adding to retain is also the stage of rewards, which is an aspect of interest. It was discovered at the pre-study and the interviews that rewards, in the shape of monetary bonuses, were handed out to some parts of the organization, depending on their results. Bonus programs could be a problematic area, and there is the risk of it being unfair. If sales managers get a bonus based on how much they sell, they are motivated to sell as much as possible. Eventually, there is a risk of too many projects being brought in because of this, and project managers and engineers will not cope with the situation, employees who have no bonus programs. Since this topic has not been of major concern in this research, it is difficult to draw any conclusions based on this, but it is worth mentioning.

The long-term resource allocation could at present be considered quite weak because of its low integration towards HRM. The recognized connection between HRM and long-term resource allocation has not been acknowledged by TECHX and this is seen as a major reason for its unsucces.

5.1.2 Medium-term resource allocation
With the lack of integration between HRM and long-term resource allocation in mind, there is in turn need of the ability to deal with the need for medium-term resource allocation as well, again referring back to a functioning project portfolio management as discussed in previous chapter. Arguably, addressing a long-term perspective in resource planning, and allocation together with managing the project portfolio with an
established system would reduce the tendency of dealing with staffing-problem once a project has started, as the findings suggests is the case at TECHX. The resource allocation process at TECHX can further be compared to the three time-horizons in resource allocation suggested by Hendricks, et al., (1999). Using the ERP-system IFS as tool in planning and estimating resource demand of the upcoming year, it is clear that the intention and ambition of TECHX is to obtain a medium-term horizon in their resource planning-, and allocation. Reviewing and updating the prognosis each quarter also falls in line with what is expected from a medium-term perspective. Therefore, there are resource allocation tools as literature promotes should be available, at least the fundamental principles of time-horizons in resource allocation process. There are however indications that despite having tools in place, the medium-, to long-term resource allocation process at TECHX is insufficient at times and not the supporting tool as intended. Viewing the possible effects of an insufficient planning Engwall & Jerbrant (2003) and Jerbrant & Gustavsson (2013) have presented the risk of constant re-allocation of resources between projects. Such indications were raised by the interviewees. At TECHX it is common to re-allocate resources, sometimes on a weekly basis, between projects in order to meet set deadlines. This is undesirable, causing stress amongst employees and constant movement between projects. Blichfeldt & Eskerod (2008) argue that such a situation is the cause of stress amongst employees, and Engwall & Jerbrant (2003) says that frequently switching between projects is halting the momentum of already functioning projects. There are multiple potential reasons for such re-allocation to take place. In development of high-complex products and systems unexpected complications can occur, naturally requiring reallocation of resources. However, considering the answers given by the interviewees, further supported by our own observations, the re-allocation is a reoccurring phenomenon and it is more likely that projects do not have the appropriate initial prerequisites needed to meet project objectives. This is an effect of a weak medium-term resource planning (Jerbrant & Gustavsson, 2013). Planning and allocating resources amongst multiple projects is challenging (Engwall & Jerbrant, 2003), the fundamental principle however is to balance available resources with quantity of projects, avoiding project overload (Zika-Viktorsson, et al., 2006) which has been an obvious challenge for TECHX in their expansion whilst managing not only a larger quantity of projects and diverse technology but also a larger quantity of employees in a empowered line organization.

What has been regarded to be the most significant finding in the medium-term resource allocation is that TECHX has not adopted a formal project portfolio management system. This was expressed by the site manager and his concern regarding it was obvious as well. TECHX proceed with all projects they are offered and then try to solve the issues afterwards. It has rarely happened that they have had to decline an RFQ from a customer due to limited resources. Taking on whatever is given creates obvious problems which was brought up during the interviews; uncertainty, unexpected technical challenges and constantly being reactive rather than proactive in human resource recruitment. This puts pressure on employees when more resources might be needed but are not brought in at the right time. The pre-study showed that employees are allocated to between 2-5 projects each, which could lead to a situation where employees have to deal with more projects than they are capable of. Managing too many projects is problematic since it makes resource allocation more difficult (Engwall & Jerbrant, 2003) and Zika-Viktorsson et al. (2006) highlights that managing too many projects is one reason for project-overload. A similar situation has been identified at TECHX, when projects are squeezed in and employees have to adapt accordingly. Reducing the number of active projects employees are involved in could potentially increase employee efficiency (Hendriks, et al., 1999; Wheelwright & Clark, 1992). This suggests that TECHX should try to slim down the number of active projects, to create a situation where employees focus on fewer projects at the time and, on a management level, decrease uncertainty in the medium-term resource allocation.

In general, employees had a decent perception of how many on-going projects TECHX had and a basic idea of each project’s intended outcome. But no apparent employee, with an overview of all ongoing projects, was present at the Stinsen and priority meetings. Jonas (2010) stresses the importance of having a project portfolio manager who is in charge of the portfolio of projects in some way. At TECHX today, there is no employee with responsibility towards the project portfolio. The senior manager at project management stated that she should have a thorough understanding of the portfolio, but sadly she has not. This employee is in continual contact with project managers and also responsible for the Stinsen meetings. We suggest that this employee should be given the responsibility of managing and prioritizing the project portfolio. An
empowered project portfolio manager could assist to capture more value from the project portfolio (Jonas, 2010). The authors argue that this is one component to the introduction of a PPM at TECHX. It will also reduce uncertainty towards responsibility of the project portfolio, which is experienced today. The suggested role is to be an administrator as explained by Jonas (2010), where focus is on making sure the right information is distributed onwards to the decision makers rather than being responsible for shaping the project portfolio. There are two main reasons for this choice of role; first, the senior manager at project management has only been at TECHX for a few years and there might be a need for adapting to this new role. Second, the products TECHX develops are so complex that it is not considered reasonable for one person to make decisions on what projects to proceed with.

Projects always run the risk of being delayed, and because of this TECHX have a way of prioritizing between them. First, TECHX does not want to cause postponement of their customer’s final delivery. Second, they do not want to miss a delivery to the customer. These two time-based factors have been informally decided to be what TECHX prioritize against, but it has not been written down or made into a formal prioritizing routine. Arguably, this is an effect of not managing the project portfolio from a strategic perspective. Wheelwright & Clark (1992); Meskendahl (2010) and Cooper et al. (2004) argue that the strategic aspect of PPM is important. As Killen et al. (2012) puts it, strategy is essential to gaining a competitive advantage. Considering the absence of the site manager and sales & marketing manager on the priority meetings, and the lack of a project portfolio manager, suggests that formalized, or what Mintzberg & Waters (1985) calls deliberate strategy, is not always being considered when prioritizing. The senior manager at engineering who is responsible for the priority meetings is also involved in the strategy formation, but the orientation towards the deliberate strategy during these meetings have been observed to be somewhat lacking. Instead, there are signs suggesting that an emergent strategy is appearing, where line managers who are not as involved in the deliberate strategy, influence the prioritizing and through that, affect TECHX’s strategy. Whether this is a positive or negative situation for TECHX is difficult to say. However, Kopmann et al. (2017) suggests that a combination of deliberate and emergent strategy is beneficial meaning that the deliberate strategy at TECHX should not only be better communicated throughout the organization but there should also be guidelines available as how to deal with emergent strategies in the environment in which TECHX is active.

The analysis presented above overlap and boil down to the need for a formalized project portfolio management. Two of the three suggested components of PPM (a collection of projects and meeting strategic business goals) were brought up and discussed. To continue on this matter, we suggest that TECHX should develop a project portfolio management suitable for their needs. If the aggregated project plan developed by Wheelwright & Clark (1992) or the model developed by Cooper et al. (2004) are the most suitable for TECHX is difficult to say but they could be a start. For TECHX, it would be beneficial to clearly define projects based on a model that will make it easier for employees to understand each project’s importance and through that, increase transparency. Letting project managers focus purely on their own projects without taking consideration to others has previously been an established method at TECHX, a way of working which needs to stop in order to utilize the advantages of a project portfolio management system. Not only that, a PPM can also assist in highlighting what types of projects are being carried out at the company. Cooper et al. (2004) argues that a well-mixed PPM leads to increased innovation, and Blichfeldt & Eskerod (2008) and Meskendahl (2010) argue that focusing too much on customers leads to reduced innovativeness. The “take what is given” strategy could therefore be costly in the long-term since it provides less space for internal development projects. Therefore, highlighting internal projects and adding them to the PPM is considered beneficial. Today, TECHX focus on tracking external customer projects at the Stinsen meeting, and internal projects are not tracked as thoroughly. Some internal projects are brought up at Stinsen, but not all. There has been a shift towards including internal projects as well, but it is still some way to go. Blichfeldt & Eskerod (2008) highlight that resource allocation is increasingly difficult when no established way of how to map projects have been defined. By including the internal projects, a clearer picture of resource needs in the medium-term time horizon can be achieved. As explained by Blichfeldt & Eskerod (2008), having informal projects parallel with the formal ones locks up resources and employees are not necessarily as available as thought, an effect observed at TECHX as well. There are rarely available resources to manage informal projects at TECHX resulting in internal projects being delayed or halted as formal projects towards external

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customer are prioritized. Therefore, the analysis show that there are two ways of addressing the issue. Either all projects are included in the project portfolio, formal as informal, allowing every project work to undergo the necessary screening process with a satisfying allocation of resources as well, or informal projects are excluded from the project portfolio as a conscious decision to reserving a buffer of resources to manage the informal projects. However, as TECHX already is struggling in their medium-term resource allocation processes the first alternative would be preferable in order to build a consistency in their medium-term resource allocation process.

The financial part has not been widely analyzed in this thesis, but it is still important to bring up some aspects regarding it, since it is a part of the definition of PPM. Some expressed that TECHX has been taking on projects which might not be very profitable but create an opportunity for future business. As brought up by Martinsuo & Lehtonen (2007), financial methods for project selection is widely used amongst companies, and the NPV method described by Cooper, et al. (2004) is one way of doing it. The downsides, such as lack of considering strategic- and risk dimensions, are obvious, and through that, there could be a changed mindset of how to value projects. If projects are brought in based on the Productivity Index (PI) instead, which also acknowledge resources needed and probability factor in the calculation, TECHX has the opportunity to be more profitable from their projects.

5.1.3 Short-term resource allocation
Further reviewing the time-horizons in TECHX’s resource planning- and allocation, the Stinsen meeting occurs in frequency of what is usually intended for short-time horizons however with the actions in line with medium-term horizon. Such important strategic planning should, according to Hendricks, et al., (1999), be a part of a long- to medium-term planning. Instead, this should be the channel of raising urgent matters as unpredicted incidents that may endanger meeting project objectives, daily or weekly employee absence or other short-sighted issues. We argue that Stinsen is in between the time horizons of medium and short term. These meetings occurring weekly are arguably too frequent, considering the content of the meeting; allocation strategies in line with medium-term. However, Stinsen does not give room to address urgent issues which would require a daily platform. This results in managers going through informal channels due to the simple fact that the issue cannot wait until the following week. There are tools in place at TECHX, with potential need of adaptation, to improve the short-term planning. The resource prognosis used by TECHX is in line with what Hendricks et al. (1999) describe as capacity planning chart, which in turn could pave the way for a functioning day-to-day allocation and reallocation managed by line managers and project managers.

5.2 Available tools
Beyond the fundamental time-horizon principles of resource allocation, there is more to say about TECHX’s resource allocation process than what has already been analyzed previously. It is not only the choice of tools with the appropriate time-horizons which will help TECHX in the further development of the resource allocation process. The interviews and our own observations indicate that there is lack of commitment towards, and confidence in tools already in place. Line managers suggesting that the resource prognosis is rarely insightful and requires recalculations and gut-feeling adaptation, resource prognosis calculated different depending on who the project manager is, individual developed planning tools, Stinsen often not updated as expected has shown indications that small but crucial details in their process goes through informal processes. Martinsuo & Lehtonen (2007) raise the importance of formalizing clear, structured and rational tools of handling different parts the resource allocation process. This is arguably a fundamental shortcoming of TECHX’s expansion. In order to keep up with increasing projects and staffing TECHX can no longer rely on informal processes as previously occurring in a small and flat organization. There is a need for universal, organization-wide tools in the resource allocation process to reach a common understanding and agreement through which channels and tools they should act.

Observations during prioritization meetings showed that there are no tools, method, or official guidelines on how to prioritize, making room for unstructured and subjective discussions on priority of resources between projects. Even though there is clearly a chain of thought behind the discussion, it is clear that these are
informal aspects to a prioritization which has grown with the culture and easily applicable at times when TECHX had fewer and less diverse projects. Now however, the mentality of informal guidelines to support priority reasoning can allow for uncertainty and confusion with increasing complexity of the project portfolio. This has been observed during the meetings and was also raised in the interviews and pre-study that focus tend to shift, often leaving project manager and project members uncertain on what to do. Especially the fact that it is not uncommon that project managers go through informal channels to get the job done when the priority is not in their favor raises concern that the priority model is insufficiently established. Informal processes usually take place when established processes are not as supportive as needed and when planning is lacking (Blichfeldt & Eskerod, 2008). It is difficult to draw definite conclusions on the working conditions created for the employees as a result of this prioritization process at TECHX. However, it is reasonable to hypothesize on its effects such as a disruptive resource allocation process which in turn reflects poorly on the working conditions of employees. Furthermore, with the analysis up to this point we argue that such way of working creates lack of transparency in such processes in place at TECHX.

5.3 The organizational context

In the context of understanding the organization that is TECHX, own observations on the line- and project interaction was put against the perception of the interviewees. Observations supported by the interviews showed that TECHX currently is structured as a Balanced Matrix when comparing to Hobday’s (2000) matrix types. The line organization has total authority over resources and is responsible for allocating them to projects. Yet, deliveries and value creation are performed mainly in projects with the project managers as a total authoritarian in processes which regards customer deliveries. The empowerment of the line organization is the result of restructuring of organization. This restructuring has naturally changed the role of the project organization and that of the project managers. The empowerment of the line organization has been well adopted throughout the organization. The line of authority is clear; when in need of resources, turn to the line manager. When asked whether any parts of the organization are in need of more authority, especially considering the authority distribution between line- and project organization, there were no answers suggesting that anyone lack authority, or have too much. Beyond that, the roles and responsibility, in varying tasks and processes, are experienced as less clear.

Whether this restructuring falls in line with the intended outcome or not falls outside the scope of this thesis. However, it is clear that the aftermaths of this restructuring are still ongoing. The point being that in this analysis it is important to bear in mind that an organization still in change with a trial-and-error mindset, is in the process of finding the right fit, as they should (Davis & Lawrence, 1977). Naturally, this poses a strain on employees and managers as all changes do, and in turn creating a potential reason behind the experienced difficulties in a sustainable resource allocation and a stressful environment (Schnetler, et al., 2015; Larson & Gobeli, 1987). Schnetler et al. (2015) suggests that increased complexity in the organization structure, processes and tools in need of improvement, become increasingly difficult to identify and further improve. It is clear, after learning more about the organization from the interviewees, that many of those challenges experienced with the current organization structure are typical for matrix organizations. Therefore, in this context it is important for TECHX to familiarize themselves with the typical advantages and disadvantages of a matrix organization, allowing them to recognize pitfalls that may occur and adapt accordingly rather than looking for alternative processes or additional restructuring.

The obvious reason behind opting for a matrix structure is to make efficient use of resources, a typical advantage of the matrix organization, but when not managed correctly, shared resources can create power struggles (Hobday, 2000). However, the interviews presented no signs of such power struggles taking place. Observations showed that there is not necessarily a struggle of power, as to whom or which part of the organization has authority, but instead tendencies of non-hostile competition over resources. Viewing the advantages and disadvantages of matrix organization, this would further create heightened risk of conflicts and conflicting use of resources, a part of project integration (Larson & Gobeli, 1987). Another clear disadvantage of matrix organization experienced by TECHX is the difficulty in monitoring and controlling. Despite having tools in place to follow up projects and resource planning, both projects and resource planning have tendencies of working with a short time horizon, creating a “putting out the fire” environment. A clear
aspect to the environment at TECHX, which is also a typical disadvantage of matrix organization as argued by Larson & Gobeli (1987), is experienced stress. Many of the employees at TECHX enjoy the opportunity to have a diverse working environment, challenging themselves in a variety of projects over time. Despite this there is still experienced stress pointed out during the pre-study by employees and during the interviews by line- and project managers. Whether it is the sheer work load created by the large quantity of projects at TECHX or the uncertainty in their day-to-day created by unclear tools and processes, as explained by the site manager and former HR manager, is hard to draw conclusions on. Probably, both aspects contribute to straining working environment for the employees in the high complex matrix organization at TECHX.

It was expressed by the two department managers that it is difficult to allocate resources to incoming projects. At present, potentially incoming projects are not sufficiently communicated to line managers in regard to need for resources. While the sales department cannot tell whether the quotation will be accepted or not by the customer, the line of communication between them and the line managers should improve. When the environment is as uncertain as it is at TECHX, communicating information becomes increasingly important, in order to make the resource allocation as accurate as possible. It is suggested that line managers and sales employees have more contact regarding potentially incoming projects; through specific meetings or other already existing forums such as Stinsen. This refers back to the importance of managing clear and formalized tools and processes (Martinsuo & Lehtonen, 2007). Viewing Hobday's matrix structures (Hobday, 2000) one can argue that the organization structure itself only paves the way for the fundamental interaction between line- and project management. Having paved the way, there is still need of clear rules, roles and common understand, and sometimes paving new ways as the structure needs revision and updates which TECHX arguably have neglected during its expansion. The new organization structure has paved way for a new interaction between an empowered line organization and the project organization but TECHX are in need of further revision of the restructure with additional formalization of roles and responsibility.
6. Conclusion

Looking back at chapter 1.4 Purpose & Research Question, the purpose of this thesis has been to find room of improvement in the resource allocation process at TECHX by understand the effect project portfolio- and human resource management has on such processes. Therefore, this thesis has studied two topics; the interaction of HRM and PPM and how it affects resource allocation. Furthermore, referring back to the research question being:

- How can the resource allocation process at TECHX be developed using principles of project portfolio management and human resource management?

It has been identified that TECHX, which has been growing for a few years, have reached a point where it becomes increasingly difficult to, on an organizational level, keep up with the growing work force. Systems previously not considered by TECHX, such as project portfolio management and resource allocation methods have not been adapted to the new organization. The result is a lot of confusion and uncertainty regarding how to handle projects, ranging from allocation of human resources to prioritizing between them. Informal processes have been developed to cope, but if TECHX’s intention is to continue to grow and bring in larger and more complex projects, these informal processes are inadequate.

Presented below in Figure 10 are the key findings from the thesis at TECHX. The major difference between the current state and the analysis model is the absence of a PPM. At present, a project portfolio exists but has multiple platforms such as Stinsen protocol and project home page on the intranet. The lack of management over the project portfolio has proven to create uncertainty regarding resource allocation. Resource allocation forecasts lacks precision, something which has been accepted amongst employees. This makes coordination between other activities increasingly difficult. The HRM system which focuses on long-term resource allocation is therefore quite weak. Efforts have been made to strengthen knowledge development, but TECHX still rely heavily on some key-employees for the many tasks to be completed. Therefore, the supply of skilled employees from the line departments needs to increase, as well as the trust in less experienced but capable employees. The equivalent of capacity planning activity is where most focus towards resource allocation is put at the moment. There is a constant “putting out fires” approach and this is seen as a lack of sufficient planning done in the medium- and long-term resource allocation stages. Focus need to shift from short-term allocation towards medium- and long-term allocation and through that, identify projects which run the risk of being delayed at an earlier stage. Here, resources can be re-allocated in a proactive rather than reactive way, affecting other projects as little as possible. Resource re-allocation is inevitable for TECHX, especially considering they are dealing with a vast number of active projects. The list of active projects requires high levels of project integration, something TECHX historically actively has worked against. This view is loosening up but in order to have a functioning matrix organization, project integration and cooperation between project managers should be in the best interest of the organization rather than for themselves.
TECHX need to focus on taking control over their project portfolio. That means management need to acknowledge that portfolio management is important and that not enough attention is directed towards it today. At present, it is regarded that the employees with most insight in the portfolio is not present during the Stinsen meetings. The role of project portfolio manager should be handed over to the senior manager at project management, and that role should be clear to all employees. This employee needs to have the right information to make decisions regarding which projects to be prioritized. Adding a project portfolio management model such as the aggregated project plan to the time-based prioritizing used today is seen as advantageous to provide the right information to the project portfolio manager. The aggregated project plan for instance adds a strategic dimension to prioritizing and resource allocation, a key aspect to project portfolio management. Since the strategy has not been studied, it is difficult to say whether the aggregated project plan is the right way to go, and TECHX need to clarify their strategy to make the strategic dimension to prioritizing work. Because of the added strategic dimension to prioritizing, the priority meeting after the Stinsen meeting could be made redundant, providing the project portfolio manager role is implemented correctly. The suggested implementation is an administrator role where the shaping of the project portfolio is done by senior management and the project portfolio manager is in charge of providing necessary information for decisions regarding that.

The reason for moving towards a matrix organization is to make better use of available resources. To have the projects work intra-functionally when the organization has a matrix structure with projects running cross-functional is not considered to be a way of achieving efficient use of resources. More interaction between the departments is needed to get rid of the invisible organizational walls built up around departments. There are signs suggesting that departments have little insight in other departments’ situation, which could lead to departments blaming each other for problems, another common attribute of matrix organization. There is a strong need for an open landscape where employees from different departments are seated together in their project constellations rather than at their respective line departments. This will increase understanding of what the others are doing, to reduce conflicts and encourage knowledge and experience sharing. This has been considered to be a key aspect of inter-project work, but other things need to be changed as well. The interaction between, what has been defined as the quadriad, need to be more prominent. A prerequisite for inter-functional project work is a close dialogue between line- and project managers. We have concluded that there is a need for a closer collaboration between the two, in order to know what is going on in the project through follow-up on time frames, needed and unneeded resources, and technical obstacles. To deepen the dialogue will decrease uncertainty and unexpected events, which cause problems today. Setting aside time where line managers and project managers can meet and discuss such issues would be of interest. Time which was earlier used for the priority meeting could instead be set aside for line managers and project managers to meet. HR also needs to be more involved, especially in supporting line managers in their every-
day activities. This will help line managers develop their skills in resource allocation and employee
development, important tasks for line managers in matrix organizations. TECHX do not have a full-time HR
manager at present, a major flaw in their organization. The losers of this weak quadriad are the team
members, who struggle in their daily work when information is scarce and require time and effort to find.

The outcome of this thesis is regarded to be a suitable approach for TECHX. The problematic areas brought
up regarding project portfolio management and human resource management are in this case specific to
TECHX; but that does not mean it is possible to draw the conclusion that only TECHX are faced with such
issues. The literature review brought up similar issues such as the ones experienced at TECHX, suggesting it
occurs in other organizations as well. Other companies going through the same transformation from a strictly
project-led organization towards having structured line departments could be faced with similar issues. One
of the drawbacks with conducting a single case research is that it is difficult to draw a statistically
generalizable conclusion from it. Focus for this thesis has, because of this, been to improve the analytical
generalizability instead, through following the decided methodological choices.
7. Reflections & Future research

It is a challenge indeed, to observe an organization in a short and intensive time period to further analyze it and draw definite conclusions on room of improvement. Naturally there are many moving parts in this machinery that is the organization of TECHX. Furthermore, the limitations and delimitations set to this thesis limit the context of the subject in order to ease the analysis for the reader. Yet, there are many aspects in the findings in this research which has shown to be of large importance but outside of the scope. Therefore, we intend to raise these aspects in purpose to open up for a reflection to the reader in turn suggests areas of interests for future research.

With the purpose of finding room of improvement in the process of resource allocation at TECHX, the general tone of this report has been to raise areas that are problematic or challenging at TECHX. Also, the interviews conducted with managers at TECHX were designed to give them the opportunity to reflect on just such areas. Apart from this, it is natural that potentially bad experiences of what a matrix structure can contribute with outweigh good experiences. As viewed in the literature chapter a matrix structure can, when functioning properly, create a healthy and sustainable working condition not only for the employees but also in turn create a competitive advantage for the organization. However, when failing to meet the advantages of matrix organizations the disadvantages can be dominant in the experience of the general employee and/or manager. Therefore, it may not be too surprising that discussion on further restructuring of the organization takes place.

The initial idea of change at TECHX was the possibility of implementing agile working methods. An agile approach had been introduced at the sister-site about a year before this thesis was initiated, and there had been some internal talk regarding an introduction of it at the studied site. This was further suggested as a potential research topic to this thesis. However, we acknowledged relatively short into the thesis that an agile approach was not necessarily the right way of addressing the experienced difficulties at TECHX. TECHX had however already decided to have an introduction seminar to agile methods done by Combitech, who came twice to TECHX to explain what could be done. Top management seemed tempted to introduce it to the site and immediately decided to initiate a start-up. This was rather quickly dismissed because of the incompatibility with the entire organization. The same conclusion had already been made by us, and instead the thesis focused on resource allocation.

The idea of an agile approach was brought up by one of the interviewees during the main interviews. This manager stated that agile methods would be beneficial to that department and much could be gained from it. It was acknowledged, both by us and the manager in question, that agile methods is suitable for certain parts of the organization, but not for all. In a department such as R&D, agile methods could be beneficial because of the task clarity when having scrum meetings. However, agile methods are not applicable at the production department where they work in a completely different way. Other departments such as mechanical design and quality are somewhat in between; there could be some benefits but there are also some challenges which need to be overcome. Furthermore, addressing the fundamental principle of agile methodology comes down to an issue of resource allocation, where 100% allocation of resources to a certain task or project is seen as optimal, further working on one task or project at a time. This thesis has raised the issue of resource allocation in a multi-project environment, in this case in a functional- or balanced matrix structure. There are therefore lessons to be learned from this thesis in which TECHX can further take with them in future implementations of agile methods, which in turn requires future research on the topic of implementation.

Recently undergoing an extensive organization restructure, the recommendation is however to stay committed to these changes. Naturally, one must continuously review changes and analyze what works and what does not work. Considering the organizational changes needed for an agile implementation the risk for tool fatigue is high. In a situation where the aftermaths of a recent organization restructuring are still in place it might be safe to say that further extensive changes will not be well received. Instead we suggest incremental changes, making small but necessary changes in order to address the right problem with the right solution, furthermore, listening to employees allowing changes to be initiated by them. The organization
structure must grow into the right fit, and not installed or implemented as a tool. Allowing this thesis to change course as the understanding of the problem grew, indicates that TECHX are well within the right path and committed to creating a sustainable working environment.

Culture has been an obvious point of interest which adds further uncertainties within the organization. TECHX has experienced changes in ownership, changes in organization structure and changes in staffing. This has led the culture to grow into the walls within the previously small and flat organization. Having clear directives from new owners have shown tendencies of creating chafing between two ethnic cultures. Furthermore, introducing the organization to a new generation of employees further differentiates the culture between the seniors and the juniors within the organization. Lastly, creating a new interaction between project- and the line organization has put the organization in self-identification crisis. The empirical findings supporting this claim is naturally limited and well outside the scope of this thesis, it is however crucial that even soft values such these are addressed by TECHX in the near future. The complexity of culture suggests that there is room for future research.
8. Reference list


Appendix 1
The interview guide in Swedish.

Intervju-guide TECHX

Allmän information:
Följande intervjuguide är till för att stöta dialogen mot rätt riktning. Då intervjun är tänkt att ha en semi-strukturerad karaktär finns det möjlighet att dialogen fortpantar sig bortom intervjuguiden beroende på de svar som ges. Denna intervjuguide är tänkt att enbart ge en överblick över vad som komma skall. Inga förberedelser är nödvändiga och vi ber intervjuguiden att inte diskutera några av nedanstående frågor med andra kollegor. Vårt intresse ligger i er individuella uppfattning. Syftet och frågeställningen nedan är enbart till för att ge intervjuguiden kontext till frågorna och inget som du behöver reflektera över.

Purpose:
This thesis will investigate the connections between project portfolio-, human resource management and day-to-day planning at TECHX, with the purpose to understand the effect project portfolio-, human resource management and day-to-day planning has on the current human resource allocation process and find room for improving the current human resource allocation process.

Research question:
With the set purpose presented above, we formulate our research question as:
- How can the resource allocation process at TECHX be developed using principles of project portfolio management and human resource management?

Namn:
Roll:
Erfarenhet:
Ålder:

Organisationen
- Hur bedriver du din verksamhet?
  o Berätta om ditt ansvarsområde
- Hur ser du på organisationens utformning?
  o År den fördelaktig eller destruktiv för din del?
- Hur ser informationsflödet ut mellan avdelningar, alternativt mellan linjechef och projektledare?
- Hur upplever du auktoriteten mellan projektledare och linjechefer?
  o Tydlig rollfordelning?
  o Konflikter?
  o Upplever du någon gång att du saknar tillräckligt med auktoritet över resurser för att framgångsrikt bedriva din verksamhet?
  o Upplever du någon gång att andra delar av organisationen bör ha mer auktoritet över resurser för organisationens bästa?

Projektportfölj
- Hur många pågående projekt har TECHX just nu?
  o Hur får du tag i den informationen?
- Hur insatt är du i organisationens projektportfölj?
  o Beslut / avtal
  o Antal
  o Variation
  o Kapacitet
  o Planering
  o Framgång
- Hur ser ansvarsfordelning ut i utformandet av projektportfölj från ett strategiskt perspektiv?
- Berätta om ett projekt som har gått bra.
o Vilka förutsättningar bidrog till framgången?
• Berätta om ett projekt som har gått dåligt.
  o Vilka förutsättningar bidrog till svårigheter?

Human resource management
• Hur hanterar du dina resurser, när nya projekt startas och andra får problem?
• Beskriv de verktyg som finns tillgängliga för planering / fördelning av resurser
  o Vilken tidshorisont jobbar ni utifrån?
  o Vilken roll har HR i detta arbete?
• Styr efterfrågan eller utbudet av resurser vilka projekt som startas?
• Brist på resurs / Överbelastning
  o [PM] Händer det att du inte får de kritiska resurser som behövs för att nå projektets mål? Hur agerar du i sådana fall?
  o [LM/andra] Händer det att anställda är arbetar i överkapacitet för att möta projektens behov? Hur agerar du i sådana fall?
  o Berätta din uppfattning om hur man övervakar kapacitet inom organisationen.

Övrigt
• Vad tror du skulle behöva göras på din avdelning för att förbättra arbetssituationen?
• Vad tror du skulle behöva göras generellt i organisationen för att förbättra arbetssituationen?
Appendix 2
The interview guide in English.

Interview guide—TECHX

Purpose:
This thesis will investigate the connections between project portfolio-, human resource management and
day-to-day planning at TECHX, with the purpose to understand the effect project portfolio-, human resource
management and day-to-day planning has on the current human resource allocation process and find room
for improving the current human resource allocation process.

Research question:
With the set purpose presented above, we formulate our research question as:

- How can the resource allocation process at TECHX be developed using principles of project portfolio
management and human resource management?

Name:
Role:
Experience:
Age:

The Organization

- How do you manage your organization?
  - Explain your field of responsibility?
- What is your opinion on the current configuration of the organization?
  - Does it provide advantages in your field or is it counter-productive?
- How does the information flow look between divisions, between function managers
  and project managers?
- How do you experience the authority between project managers and line managers?
  - Are the roles clear?
  - Conflicts?
  - Do you experience lack of authority over resources in order to successfully
    manage your organization?
  - Have you ever experienced that other parts of the organization should have more authority
    over resources in order to create the best circumstances for the organization?

Project portfolio

- How many ongoing projects does TECHX manage at the moment?
  - How do you gain this information?
- How invested are you in the organization’s project portfolio?
  - Decisions / contracts
  - Quantity
  - Variation
  - Capacity
  - Planning
  - Success
- How does the distribution of responsibility look like in the management of the project portfolio
  from a strategic perspective?
- Please tell us about a project which was successful.
  - Which circumstances contributed to its success?
- Please tell us about a project which was not successful.
  - Which circumstances contributed to its difficulties?
Human resource management

- How do you manage your resources?
  - When projects are started.
  - When other parts of the organization experience lack of resources?
- Describe the tools available for planning and allocation of resources.
  - From which time horizon to you plan and allocate resources?
  - Which role does HR have in this management?
- Does the demand or the supply rule which type of resources is kicked-off?
- Lack of resources / over-load
  - [PM] How do you act when and if critical resources are not available?
  - [LM/other] How do you act when and if employees are allocated tasks over their capacity in order to meet project objectives?
  - How does the organization monitor the capacity within the organization?

Other topics

- Which changes within your division / department do you believe are necessary in order to improve the working environment?
- Which changes generally in the organization do you believe are necessary to improve the working environment?