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UNIVERSITY OF VAASA

Simon Kanckos

Identifying Inefficiencies in a R&D Project Handover Process: A Case Study of the Mirka Power Tools Unit

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Author: Simon Kanckos
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ABSTRACT:

This Master's thesis was commissioned by the research and development unit Power Tools at Mirka Ltd. Mirka is a world leader in surface finishing technology and the Power Tools Unit develops and produces inter alia electrical and pneumatic sanders and polishers.

The purpose of the thesis was to find inefficiencies in the project handover process, the process in which the responsibility of maintaining the product design is handed over from the Development Team to the Product Life Cycle Team within the Power Tools Unit. The process is only vaguely described in the product development process description and this has impacted the efficiency and quality of the project handovers negatively. The Power Tools Unit has experienced large growth during the latest years, and it is of high priority to ensure efficiency and quality in their processes.

The study was conducted with a qualitative approach. The literature review discusses different aspects of process improvement methodologies with a focus on efficiency and quality in processes in R&D environments, and tools and methods to improve such processes. Semi-constructed interviews with 13 stakeholders were conducted with the goals to gain an understanding of the process, to find the factors negating the process efficiency and quality, and to be able to suggest improvements to the process.

In the results section of the thesis, the issues and the inefficiencies with the current state of the process are listed. The major issues with the process were found to come from the earlier stages in the product development process and to be the results of the lack of standardization. This caused inefficiencies in the form of burdensome handover of documentation, immoderate information intake for the Product Life Cycle Team, and unclarities such as who handles project residues. Other factors also affected the handover process, such as the individuality of the projects and the organizational culture to some degree.

SIPOC and Swimlane Flowcharts were used to visualize the current and a proposed future state of the process. Improvement suggestions were given based on the Lean process improvement methodology and the interview findings. A proposal to a project handover checklist is also included in the thesis. The Power Tools Unit may choose to adapt and standardize the proposed process and handover checklist, and the results from this thesis may also be used as material for eventual analysis of the entirety of the Power Tool Unit's product development process.

KEYWORDS: Case Study, Process Improvement, Product Life Cycle, Project Management, R&D

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1 Introduction

Business processes are a key factor to organizational performance (Malik, Khan, & Mahmood, 2021) and research and development (R&D) activities are essential for a company's growth, and largely affect its competitive edge (Keeeun, Yujin, & Byungun, 2017). However, technological progress and economic growth might not be achieved if R&D resources are used inefficiently (Carrilo, 2019). Inefficiency in R&D projects can take as many forms as there are R&D processes, there can be unclear or changing requirements, lack of coordination, unutilized resources, and correction of errors to name a few (Belvedere, Cuttaia, Rossi, & Stringhetti, 2019). Evaluating R&D activities can be done in many ways, for instance with a number of process inputs such as money and manpower being transformed to produce a number of R&D outputs (Carrilo, 2019). It is difficult to evaluate these kinds of activities due to the complex nature of risks, uncertainty, lengthy development, identification of tangible outputs, and the existence of various output parameters (Hoseini, Fallahpour, Wong, & Antucheviciene, 2021), but important. Even though it is difficult to achieve, without possessing a successful R&D process the organization risk their chances of delivering new products and services and may cause grave failures in later product life cycle stages such as in mass production. Furthermore, even small defects in the R&D process may cause design errors, delays, and overpaying costs as well as lack of consensus between other functions regarding e.g., process criteria and expected outputs of the R&D project (Keeeun, Yujin, & Byungun, 2017).

This thesis is a case study and focuses on a specific part of a R&D process; the sub-process when it is time to hand over the R&D project. At the case company Mirka Ltd., at the R&D organization the Power Tools Unit, the responsibility for maintaining the product design is transferred from the Development Team to the Product Life Cycle (PLC) Team within the Unit when a new product reaches the start of sales and serial production. The current project handover process is on a general level defined in the product development process description, but it is now the hypothesis that it is not defined well enough since the handovers have variated heavily in efficiency and quality with several different adaptations of the process. The Power Tools Unit has experienced significant growth over the past years and more and more projects are coming each year. This thesis topic was given with hopes of having the current project handover process analyzed to identify the inefficiencies leading to poor process quality and provide a proposal of a standardized, improved handover process.

1.1 Research Question, Objectives, and Scope

This thesis aims to provide the case company with a clear picture of the current situation and to provide proposals for improvements that may be implemented and standardized for future handovers, which hopefully will help the case company to thrive.

The research question for this thesis is; *What are the inefficiencies in the current project handover process from the Development Team to Product Life Cycle Team at the Power Tools Unit at Mirka Ltd.?*

The objectives to complete to fulfill the purpose of this thesis are 1. *To find the factors negating efficiency and quality in the current process* and 2. *To suggest an improved handover process to standardize based on data gathered from the case company, and literature.*

The scope in this thesis is solely the project handover process from the R&D Team to the PLC Team at the Mirka Power Tools Unit, not the entire product development process. No other departments' corresponding processes are analyzed. Due to the time limit, the practical implementation and evaluation of the suggested improvements will not be included in this thesis.

1.2 Structure of the Thesis

This thesis is divided into six chapters: Introduction, Literature Review, Study Methodology, Description of the Case Company, Results, and Conclusions. The thesis has a theoretical part and an empirical part. The theoretical part consists of chapter two, in which a literature review on aspects of process improvement and process mapping is conducted, and chapter three, which discusses the methods used in this thesis. The empirical part also consists of two chapters. Chapter four describes the case company that the study is conducted for and the current state of the process that is to be improved, and chapter five presents the results.

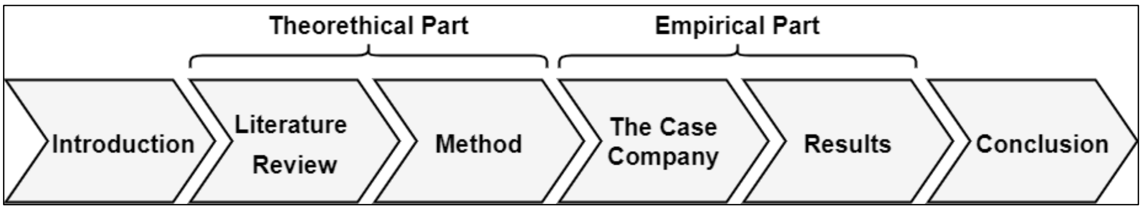


Figure 1. The structure of the thesis.

2 Literature Review

This chapter of the thesis presents academic and scientific literature related to the research question and the research objectives. Aspects of several process improvement methodologies are reviewed along with different types of process mapping. The chapter ends with a summary.

2.1 Aspects of Process Improvement

Within all organizations, all functions achieve their goals by organizing resources such as people, equipment, systems, and buildings into individual processes. A process is an arrangement of activities and resources that transform inputs into outputs that satisfy internal or external customers' needs (Bergman & Klefsjö, 2002). As an example, the marketing function produces sales forecasts and marketing plans, the human resources function produces development and recruitment plans and the accounting function produces budgets; every part of any business is concerned with managing different processes. And all processes no matter how well managed are capable of improvement (Slack & Brandon-Jones, 2018).

Improvement is the activity of eliminating the distance between the current state and the desired future state of a process, and it is more and more seen as the main objective for all operations and process management activities. With process improvement methodologies, models and standards can assist in developing high-quality processes, reduce development cost and time, and increase things such as user satisfaction (Khan, Keung, Niazi, Hussain, & Ahmad, 2017). For process improvement, many methodologies have risen and been tested, of which the most utilized and popular today are for example Total Quality Management (TQM), Lean, Business Process Re-Engineering (BPR), and Six Sigma to name a few (Slack & Brandon-Jones, 2018). What all these have in common is their focus on processes (Oakland, 2014). They involve assessing the gaps between the current and desired future state of processes and their performance and balance the use of continuous improvement and breakthrough improvement while adopting suitable improvement techniques to ensure that the momentum of improvement does not decline over time (Slack & Brandon-Jones, 2018).

So, breakthrough improvement and continuous improvement are two improvement paths that represent different philosophies of improvement. The breakthrough improvement philosophy has radical characteristics and requires innovation in the management of company processes and resources, and has greater risks due to its characteristics. BPR is an example of typical breakthrough improvement (Malik & Ernawati, 2021).

Continuous improvement on the other hand means improvement of processes on an ongoing basis, with small and incremental improvements that may be learned, realized, and applied continuously. By implementing small doses of improvements over time the stability of the process is still withheld (Aguanno & Schibi, 2018). Lean is an example of continuous improvement, and Six Sigma is a methodology that brings many existing ideas together from both of these philosophies (Slack & Brandon-Jones, 2018).

When improvement has been made a challenge is to preserve improvement momentum. One factor that prevents improvement from becoming accepted as a regular part of operations and process activity is the emphasis on the fashionability of new improvement methodologies. One must come to realize that most new improvement ideas contain worthwhile elements to some extent, but none will provide the ultimate answer. Therefore, overall management of the improvement process is essential so that the best of each new idea can be absorbed. This involves emphasizing the importance of an improvement strategy, top-management support, and training (Slack & Brandon-Jones, 2018). Success means continually changing to meet the expectations of the customers and not stopping to pursue perfection (Nash & Poling, 2008).

2.1.1 Total Quality Management

TQM is a system of practices, tools, and training methods meant for managing organizations to increase customer satisfaction (Rashid & Ahmad, 2013). It is organization-wide and involves all employees and managers, and it can be used in most types of organizations (Nasim, Sikander, & Tian, 2020) and aim for long-term success that shall benefit all members of the organization as well as the customer. It sounds great in theory and major companies such as 3M, Toyota, and Ben & Jerry's have achieved great success through TQM, but it is needed to be mentioned that >75 % of TQM initiatives have failed according to statistics. This is mostly because of poor adaptation, and some suggest that TQM's "one best way" emphasis is its biggest issue and that it is not the right solution for all organizational problems (Helms Mills, Mills, & Dye, 2009). Lack of top-down and high-level management involvement and commitment, inadequate use of statistical methods, and general, as opposed to specific objectives, are also pitfalls to be aware of (Oakland, 2014).

2.1.1.1 Deming's 14 Points for TQM

TQM is based on W. Edward Deming's philosophy and has evolved to what it is today based on 14 points that Deming listed for achieving TQM, along with 7 deadly diseases (Helms Mills, Mills, & Dye, 2009).

1. **Create a constancy of purpose towards improvement of product and service** – Continuous improvement helps the company to become competitive, to remain in business, and provide more jobs. However, this type of constancy requires strategic planning.

2. **Adopt a quality philosophy** – Times are constantly changing, and companies must accept this challenge, lead the change, and learn their new responsibilities.

3. **Cease dependence on mass inspection** – Quality must be built in the product from the beginning and quality shall not require mass inspection for quality control.

4. **End the practice of purchasing at the lowest price –** Reducing the number of suppliers and end rewarding the lowest price will minimize total cost.

5. **Improve constantly and forever –** Organizations cannot stand still, and change is inevitable. Processes must continuously be evaluated and improved. Continuous improvement through continuous change.

6. **Institute training on the job** – Make people part of the quality process, employees are key to quality. Employees are not costs that should be minimized whenever possible. Employees should be engaged in the process of continuous improvement and investing in the people will lead to higher quality, lower costs, and better overall total performance.
7. **Institute leadership** – Management should aim to aid the people and the machines to do better. Leadership should be more of a supportive role.

8. **Drive out fear** - Rid the organizations of mechanisms that create fear, including coercive management styles, punitive mechanisms, and organizational-wide beliefs that it is not okay to fail. People cannot work efficiently if they are afraid of committing mistakes.

9. **Break down barriers between departments** – For the organization to function effectively barriers must be removed between departments. Cross-functional communications are essential for quality.

10. **Eliminate slogans, exhortations, and targets for the workforce asking for zero defects and new levels of productivity** – Quotas and management by objectives

can both be replaced with good leadership. Slogans and goals aimed at the people only cause adversarial relationships, most causes of low quality come from the system.

11. **Eliminate numerical goals for hourly workers** – Quotas rob the employee of workmanship pride, if the goals are centered on numbers of output, quality is almost certain to suffer.

12. **Remove barriers to worker pride** - Remove management by objective and merit pay.

13. **Institute a program of education and self-improvement** – Continuous training, growth of employees, and self-pride are essential for quality management.

14. **Put everybody to work to accomplish the transformation** – Transformation is everybody's job (Helms Mills, Mills, & Dye, 2009).

2.1.1.2 Deming's 7 Deadly Diseases

1. **Lack of constancy of purpose** – Everyone in the organization must focus on quality.

2. **Emphasis on short-term profits** – Investing in research and development, customer satisfaction, and training is a short-term cost necessary for providing long-term gains.

3. **Evaluation by performance, merit rating, or annual review of performances** – These things only get in the way of making quality products and services. By basing rewards on making employees create a certain number of widgets in a certain time, quality will suffer, and fear will build up. Focus on the individual's achievements will make the teamwork suffer.

4. **Mobility of management** – Managers need to spend a considerable amount of time and commitment in an organization to fully understand it. Managers should not be seen as easily transferable.

5. **Running the company on visible figures alone** – Customer satisfaction, employee satisfaction, and turnover, and other "invisible numbers" should not be ignored for the sake of share prices, profitability, or return on investment, these numbers does not tell the whole story.

6. **Excessive medical costs for employee health care** – Stress the importance of safety and health at work. Deming also called for the transformation of the American Healthcare system.

7. **Excessive costs of warranty –** Do not focus on providing great warranties, if TQM is implemented properly warranty costs should drop. Focus on producing quality (Helms Mills, Mills, & Dye, 2009).

2.1.1.3 Quality and Processes

Quality begins with understanding customer needs and ends when the needs are fulfilled. Quality is often used to mark a product or service's excellence; in manufacturing environments, the word quality may be used to indicate that a component or material conforms to a specific physical dimensional characteristic according to a specification. If quality is to be defined in a way useful for its management, then it should be to meet the customer requirements. Another important term in TQM, reliability, is the performance of continuing to meet these customer requirements continuously. In all organizations, in all departments, and all processes, there are a series of suppliers and customers, and there are series of quality chains of customers and suppliers that may be broken at any point by one person or piece of equipment not meeting the customer requirement, internal or external. The concept of internal and external customers-suppliers forms the core of TQM (Oakland, 2014). TQM aims to improve the processes to exceed both current and future customer needs (Yu, Park, & Hong, 2020).

A process is the transformation of a set of inputs into outputs that satisfy customer requirements in the form of products, services, or information. By analyzing the inputs and outputs some actions necessary to improve quality can be determined. The output from a process is that which is transferred to the customer, and to produce an output that meets the customer requirements it is necessary to define, monitor, and control the inputs to the process, which may well be supplied as output from an earlier process. A fundamental requirement for a good process is to hear the voice-of-customer (VOC), and the voice-of-process (VOP) can provide the key feedback to the supplier side of the process equation. Right suppliers and correct inputs lead to correct outputs and satisfied customers, and this is in TQM known as SIPOC – suppliers-inputs-process-outputs-customer. Once it can be stated that the process can meet the requirements, the need arises to monitor and control the process and by this, process errors can be prevented instead of detected (Oakland, 2014).

2.1.2 Lean

In Lean, the goal is to eliminate waste or non-value-adding activity as it is often called. A misconception is that Lean is only used with manufacturing processes and companies tend to disregard non-manufacturing or non-material processes (such as many business processes) when it comes to implementing Lean principles. One of the major challenges when implementing Lean principles in non-material processes is difficulties adapting system thinking when trying to identify value, waste, and flow. But organizations may use value-stream mapping (VSM) and Lean principles for non-material processes in the same way as on the production floor, Keyte & Locher states. By doing this they can visualize the process, pinpoint its issues, and focus on how to steer it up into a Lean Operation. As in many other process improvement methodologies, a current state map is made for understanding the process followed by a desired future state map, followed by an action plan and implementation (Keyte & Locher, 2008).

2.1.2.1 Waste in Processes

Lean is about reducing waste in processes, and there are typically seven or eight types of waste depending on who you ask, or which industry is in focus. As an example, the types of waste can be defined in office environments, as seen in the table below (Table 2).

Table 1. The eight types of waste in office environments (Keyte & Locher, 2008).

Type of waste	Examples in an office environment
1. Overproduction	Processing paperwork before the next person is ready for it, purchasing items before they are needed.
2. Waiting	Approvals from others, information from customers, system downtime, system response time.
3. Transportation	Walking to/from the copier, central archiving, other offices.
4. Extra processing	Unnecessary or excessive reports, re-entering data.
5. Inventory	Tasks stacking up, filled inboxes, batch processing reports, and transactions.
6. Correction	Order entry errors, design errors and engineering change orders, invoice errors, employee turnovers.
7. Excess motion	Excessive email attachments, multiple handovers, multiple approvals.
8. Unutilized people	Limited employee responsibility and authority for basic tasks, managements control and command, inadequate business tools available.

And for New Product Development (NPD) the types of waste may look like this (Table 3).

Table 2. The eight types of waste in NPD (Rossi, Kerga, Taisch, & Terzi, 2011).

Type of waste	Examples in NPD
1. Overproduction	Producing earlier or more than the next process needs. Common when processes are not synchronized across functional organizations, such as tasks are completed before the next step is ready to process it.
2. Waiting	Waiting for decisions, information, or materials. Typically, some important tasks that the engineers should be working on but cannot since they do not have what they need to proceed.
3. Transportation	Moving information or material from location to location. Information changing hands in form of face-to-face meetings or by pictures or data exchange.
4. Extra processing	Doing unnecessary work on a task or doing an unnecessary task. This includes engineers' errors or system flaws. It can also consist of re-design of components instead of using carry-over or establishing a new manufacturing process for each time instead of working to achieve a standardized manufacturing process.
5. Inventory	Existing information or material is not being used. In manufacturing, it's the direct result of overproduction, and in R&D it can be designs waiting for the next available resource.
6. Correction	Inspection to find quality problems or fix already made errors. In product development means to made program audits, testing new components instead of reusing already tested and approved ones, late engineering changes, and all forms of rework.
7. Excess motion	Excess activity or motion during task execution. This occurs when people attend unnecessary meetings and project reviews or by creating redundant status reports.
8. Unutilized people	Bad management of people's capabilities. Knowledge is not being shared between employees, or when no responsibility is being given to people makes them feel unmotivated.

When this interpretation of waste in NPD by Rossi Et Al. was used in practice in recent research, Belvedere Et Al. used it to map wastes in complex Lean Product Development (LPD) projects with the research question "*What types of waste, reported so far in the academic literature on LPD, are experienced by employees involved in complex projects*".

Most of the inefficiencies in their case study were consistent with the NPD categories by Rossi Et Al. with a total of 41 inefficiencies of which 28 fitted into the NPD waste categories, and 13 did not (Belvedere, Cuttaia, Rossi, & Stringhetti, 2019). These 41 inefficiencies found in that case, can be seen in Table 4.

Table 3. Examples of waste in NPD (Belvedere, Cuttaia, Rossi, & Stringhetti, 2019).

Type of Waste	Waste description
Correction	Tests are frequently repeated.
Correction	Analyses are repeated because controversial results cannot be traced.
Inventory	Similar projects of data analysis with the same scientific objectives are carried out in parallel without any coordination.
Inventory	The lack of financing leads researchers and technicians to always be in “proposal mode”.
Inventory	Projects are often not completed.
Inventory	Projects with similar objectives are carried out simultaneously without any coordination.
Excess motion	The fragmentation of research among different centers involves many transfers.
Excess motion	Physical meetings are preferred to virtual ones (e.g., videoconferences).
Excess motion	Meetings take place too often compared to the real needs of the project.
Overproduction / Processing	Excessive requirements are set compared to the real needs of the project.
Overproduction / Processing	Requirements are frequently changed throughout the project.
Overproduction / Processing	Requirements are too generic.
Overproduction / Processing	Emails do not report complete information.
Overproduction / Processing	Hardware tests are performed even when they are not strictly necessary.
Overproduction / Processing	Requirements are not adequately formalized.
Transportation	Hardware is frequently moved among different laboratories.
Unutilized people	Similar research is carried out by different groups without proper knowledge sharing.
Unutilized people	People are not assigned to a project because of their competencies but because at that moment they are available.
Unutilized people	The lack of a database on the organization's internal competencies does not allow for the full exploitation of the human capital.
Unutilized people	It is impossible to retain young researchers and technicians.
Unutilized people	The managerial competencies gained by researchers and technicians are not adequately remunerated.
Unutilized people	Roles within the team are not well defined.
Unutilized people	The compensation system at INAF does not incentivize employees' commitment.
Waiting	Hiring procedures are slow.
Waiting	Funds for hiring are inadequate.
Waiting	Bureaucracy is too slow compared to the needs of the projects.
Waiting	Funds obtained through a tender are not delivered quickly
Waiting	Procurement procedures are too slow.
Other	The activities in a work plan are not defined correctly.
Other	Emails are sent to people not in charge of the activity that the information refers to.
Other	The resources available to acquire new staff are scarce.
Other	Travel arrangements are delegated to the researcher.
Other	The management of all bureaucratic aspects of a project is delegated to the researcher.
Other	Project milestones are frequently postponed.
Other	Decisions are postponed until the approach of project milestones.
Other	There is a lack of decision-making power inside the project team.
Other	Too few meetings take place compared to the real needs of the project.
Other	The number of participants to project meetings is excessive.
Other	Competition among different groups does not allow knowledge sharing.
Other	Lessons learned from the project are never shared.
Other	The organization does not exploit the lessons learned from the projects.

While many of these examples of waste are prone to exist in most NPD organizations, it needs to be stated that they are all only gathered from a single organization and therefore it may look significantly different in another organization and waste may of course appear in different forms and amounts depending on the organization's individuality.

2.1.2.2 Eliminating Waste in Processes

Once a process has been mapped one can begin to search for opportunities for improvement. One method to generate improvement ideas is to have the dedicated improvement team hold a brainstorming session, this is effective because one team member's idea might spark ideas for the other members, but standard rules for brainstorming must be applied – no idea is to be criticized or vetted for feasibility, since it can hinder the input of more timid team members, and without a constructive atmosphere that invites to participation a brainstorming session cannot succeed. Vetting ideas for feasibility can be done in a later stage, and ideas that might sound infeasible is not to be ignored, since often ideas that seem crazy and infeasible might be the best option, but none dare to try them because the ideas are killed from the start based on a negative approach early on. Even if infeasible, they might lead to more feasible ideas after some thought and discussion. For the brainstorming, a more systematic approach can also be chosen with more focus on process steps, to find the process steps that have the most opportunity for improvement, to see where e.g., long waits or long lead times exist (Bradley, 2012).

So, even without formal Lean tools, people can often generate good ideas and improvement suggestions, but still, a familiarity with the common tools can provide even greater chances of improvement. Bradley (2012) states that the categories of tactics for eliminating waste and reducing lead times fall into the following categories:

- **Simplify -** Eliminate process steps, simplify procedures, tools, equipment, jigs, fixtures, and procedures.

- **Streamline -** Apply 5S methodology, create and analyze spaghetti diagram.

- **Standardize -** Dictate order of process steps, order of tasks within process steps, define when a task is completed successfully.

- **Visualize -** Map the current state, desired state, and who does what and when.

- **Mistake-proof product designs and processes -** Design products and processes so that mistakes are hard to make rather than easy, detect and implement preventive measures against errors.

- **Synchronize -** Use pull systems, sequentialization of process steps, and tasks.

- **Collocate -** Collocate people and processes with same or joint operations or process steps either on a permanent or temporary basis.

- **Reduce changeover time -** SMED methodology, decrease inventories, reserve time to respond to changeovers, document each task necessary for changeover (Bradley, 2012).

These tactics are not locked to the types of waste, but instead, any action falling within these categories of tactics can reduce several types of waste (Bradley, 2012).

2.1.3 Business Process Re-Engineering

BPR has been referred to as a radical re-design of processes to gain significant improvements in cost, quality, speed, and service. BPR is meant to improve products and increase customer satisfaction. The BPR way is to neglect all existing structures around procedures and processes and invent new ways to accomplish work and do so in record time. Before commencing re-engineering, the process first has to be understood, as re-engineering is renewal with not taking anything for granted (AbdEllatif, Farhan, & Shehata, 2018).

2.1.3.1 Main Principles of BPR

BPR itself does not offer a solution to achieve "the one best way" it advocates (Helms Mills, Mills, & Dye, 2009). But the main principles have in theory been summarized with four steps as follows (Slack & Brandon-Jones, 2018):

1. Rethink business processes in a cross-functional manner that organizes work around the natural flow of material, information, or customers. Organize around outputs of a process instead of around the process steps.

2. Aim for drastic improvements in performance by radically rethinking and redesigning the process.

3. If possible, have those who use the process' output perform the process. Check to see if all internal customers can be their own suppliers in the process rather than depending on other business functions so act as the supplier, which takes longer and separates the stages in the process.

4. Assign the decision points where the work is performed. The ones who perform the work and those who control and manage the work should not be separated,

control and action are one type of supplier-customer relationship that can be merged.

2.1.3.2 Techniques and Tools for BPR

In BPR there is a toolbox of techniques that can be used to analyze and radically alter organizational processes. They fit into the following categories that can be seen in the table below (Table 5) (Helms Mills, Mills, & Dye, 2009);

Table 4. BPR techniques and tools (Helms Mills, Mills, & Dye, 2009).

Category	**Tool(s)**
Project management	PERT, Gantt
Problem-solving and diagnosis	Cognitive mapping
Customer requirement analysis	Benchmarking, focus groups
Process capture and modeling	Flowcharting
Process measurement	Activity-based costing, time-motion study
Process prototyping and simulation	Roleplaying
IS systems analysis and design	Software re-engineering
Business planning	Value chain analysis
Creative thinking	Out-of-the-box thinking
Organizational analysis and design	Employee attitude assessment, teambuilding techniques
Change management	Assumption surfacing

2.1.4 Six Sigma

Six Sigma or 6σ is a set of practices that combines management training and statistical techniques to improve processes in the form of cost minimization, increased product quality, schedule adherence, A the number of opportunities that may result in defects (Antony, 2006). It has been used by many world-class organizations such as General Electric, Motorola, ABB, and Sony (Antony, 2006). With the Six Sigma methodology the goal is to achieve a defect level of 3.4 mistakes per million opportunities, and not only in manufactural processes but to any process critical to the organizational outcomes. To achieve Six Sigma requires significant commitment and training and should be seen as a goal and not a target for realization since even if not the desired defect rate of Six Sigma is not achieved it will still lead to massive improvements (Helms Mills, Mills, & Dye, 2009). For example, in Motorola's case where the high warranty claims were the issues, the efforts were not just to achieve Six Sigma quality level there, the focus was rather on overall reducing defect rate in processes through the effective utilization of statistical tools and techniques (Antony, 2006).

In the Six Sigma methodology, a defect is seen as nonconformity of a product or service's specification in any aspect of customer satisfaction. In Six Sigma everything is seen as a process, and all processes have inherent variability. To understand the variability, data is used to ensure backed-up process improvement decisions, and that is also the key point of the entire Six Sigma methodology – to find the best ways through statistics. In a normal distribution 68 % will likely fall within one standard deviation (σ), 95.5 % within 2 σ and 99.7 % within 3 σ and 99.99966 % within 6 σ – so with Six Sigma applied to our process the output is defect-free in 99.99966 % of the cases (Helms Mills, Mills, & Dye, 2009).

2.1.4.1 The DMAIC Process Improvement Model

To improve existing processes a five-stage project model called DMAIC is used. DMAIC stands for Define, Measure, Analyse, Improve, and Control. Every stage is originated through statistical and qualitative tools to accomplish the objectives. (Kumar, Singh, & Bhamu, 2021). The stages can be described as:

1. **Define –** The specific problem is identified, and customer requirements and goals are defined. At this stage, the current state of the process is usually mapped. A well-performed define stage makes the work easier later. Techniques used in this stage can for example be process mapping.

2. **Measure –** In the second stage of the process improvement project, all relevant data is collected for upcoming analyses and/or comparisons of the process that is to be improved. Tests such as measurement system analysis and Gauge R&R (repeatability and reproducibility) are conducted to ensure that the measurement system is accurate and trustworthy.

3. **Analyze –** In the third stage the data collected is analyzed to understand the problem. The use of tools such as statistical charts and methods such as process capability analysis is done at this stage, to get an understanding of the problem.

4. **Improve –** In the fourth stage the now measured and analyzed process is improved through suitable methods for the specific process. This stage involves process optimization and confirmation experiments.

5. **Control –** In the fifth and last stage of the process improvement project, the goal is to control the now improved process and ensure that any potential variances are corrected before they result in defects. Control plans are made to ensure that the improvements are permanent (Kaushik & Khanduja, 2009).

For the DMAIC improvement project’s success, some factors are crucial. In the Define stage, it is important to have a scope, and the goal cannot be general; “reduce customer complaints” is not enough, instead “reduce customer complaints by 43 % in 18 months” is a better description. In the Measure stage, it is important to make sure that the measurement systems are accurate through Measurement System Analysis (MSA), otherwise, a lot of time may be wasted by measuring device inaccuracy or errors. In the Analyse stage, it is important to know how and when to use which statistical tool, and that the statistical testing alone may not point towards the root cause and other quality tools may also be needed. When the causes are found however and it is time for the Improvement stage, it is important to be aware of unintended side effects of the improvements to be implemented. When reaching the Control stage control plans are a must, either to be created, or updated if already existing, and the knowledge achieved through the DMAIC project, good or bad, is to be documented in a “lessons learned” manner for upcoming projects (Barsalou, 2016).

2.1.4.2 Roles in Six Sigma Improvement Projects

In Six Sigma projects, several specified roles operate and possess knowledge on different levels. Some of these roles only have awareness of the basics of Six Sigma while others are highly trained in the methodology. The roles are specified with “belts”. A person with a Six Sigma Master Black Belt is a person is that is highly experienced with Six Sigma that masters required statistics and serves as a mentor and trainer for Black belts and Green Belts. A person with a Black Belt is trained and certified in the use of Six Sigma methodologies and statistical methods and leads Six Sigma projects themselves or provides guidance to less trained actors of Six Sigma. A person with Green Belt serves as a project member or leads smaller Six Sigma projects. A Green Belt usually has other full-time responsibilities and dedicates only approximately 20 % of their time to Six Sigma Projects. Yellow and White Belts exist unofficially but are uncommon and not used in many organizations, and if used they are typically awarded internally by the organization. They get trained in a broad overview of Six Sigma and serve as a project member under the guidance of Black or Green belt actors (Barsalou, 2016).

Besides the project members, there is a role called Champion, which is a designated member of management who supports a Six Sigma project. The team reports regularly to the Champion who then in turn clear obstacles for the project team by providing resources or handling resistance to change within the organization (Barsalou, 2016).

2.2 Process Mapping

Process mapping is a useful process management tool used widely for finding best practices for processes. It happens too often that managers believe they know their processes when in reality most managers do not understand at all whether they can be simplified or otherwise improved, or even eliminated. Process mapping is used to both give a clear picture of the current process, improve the current processes, and implement new ones (Hunt, 1996). With process mapping, you can troubleshoot and compare the current process with the desired one and highlight the necessary changes.

2.2.1 Flowcharts and Swimlane Flowcharts

A flowchart is constructed of different shapes that that are used to denote different types of operations, a good flowchart can be followed easily and quickly (Chaudhuri, 2020). In flowcharts, a circle is used for the process starting point, rectangles are used for process steps (operation), parallelograms for information, diamonds for decisions, and an oval for the ending point. Arrowed lines are used to connect symbols and to indicate the direction of the flow. A process mapping with flowcharts is not complete if all process steps and decisions are not connected by pathways from the starting point to the ending point, and in that case, the process is not fully understood (Oakland, 2014).

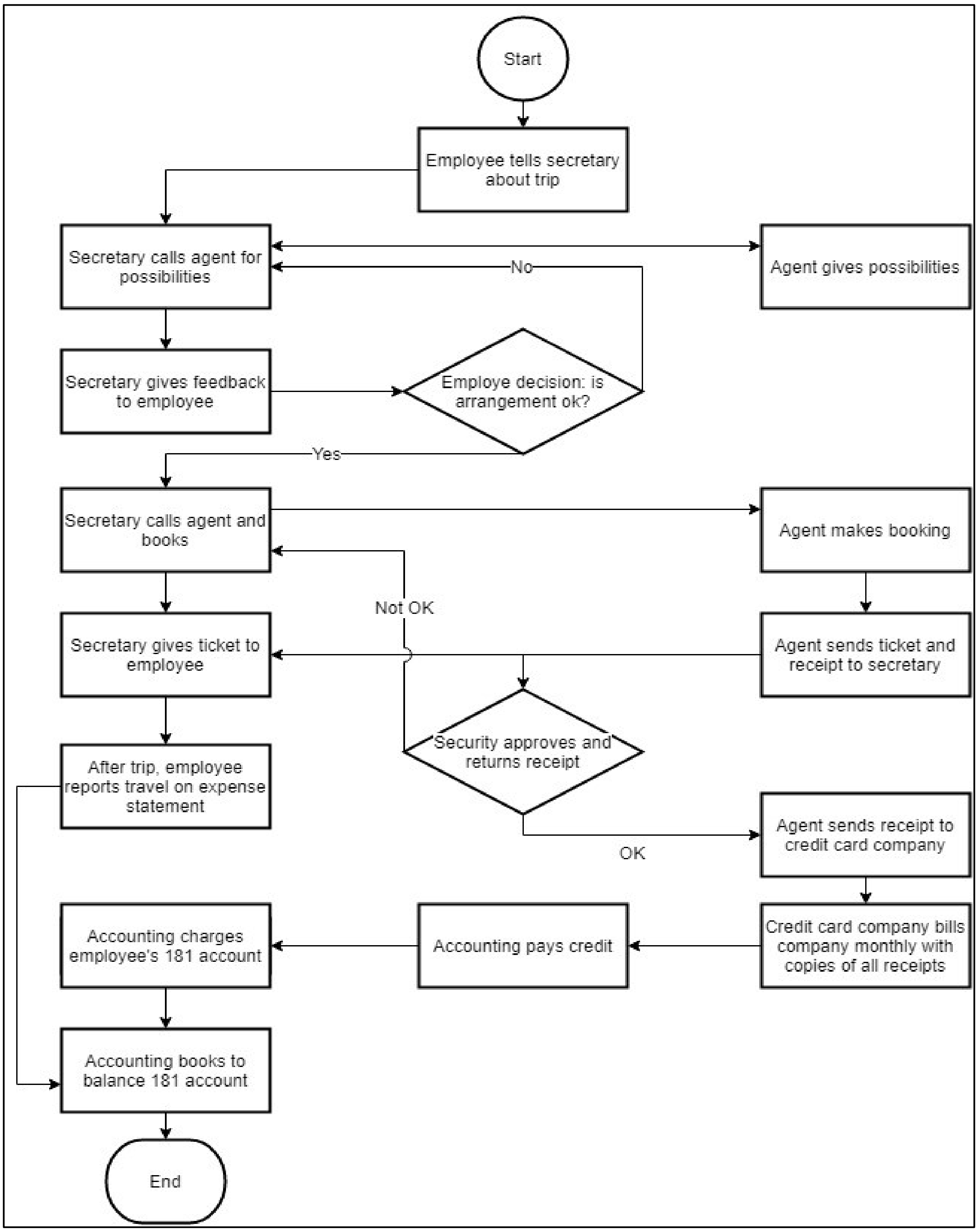


Figure 2. A Flowchart example of an employee travel procedure. Adapted from *Total Quality Management and Operational Excellence* (Oakland, 2014).

Flowcharts can also be used with so-called swim lanes, making it a Swimlane Flowchart. This is especially useful for defining workflow across functional roles (Oakland, 2014).

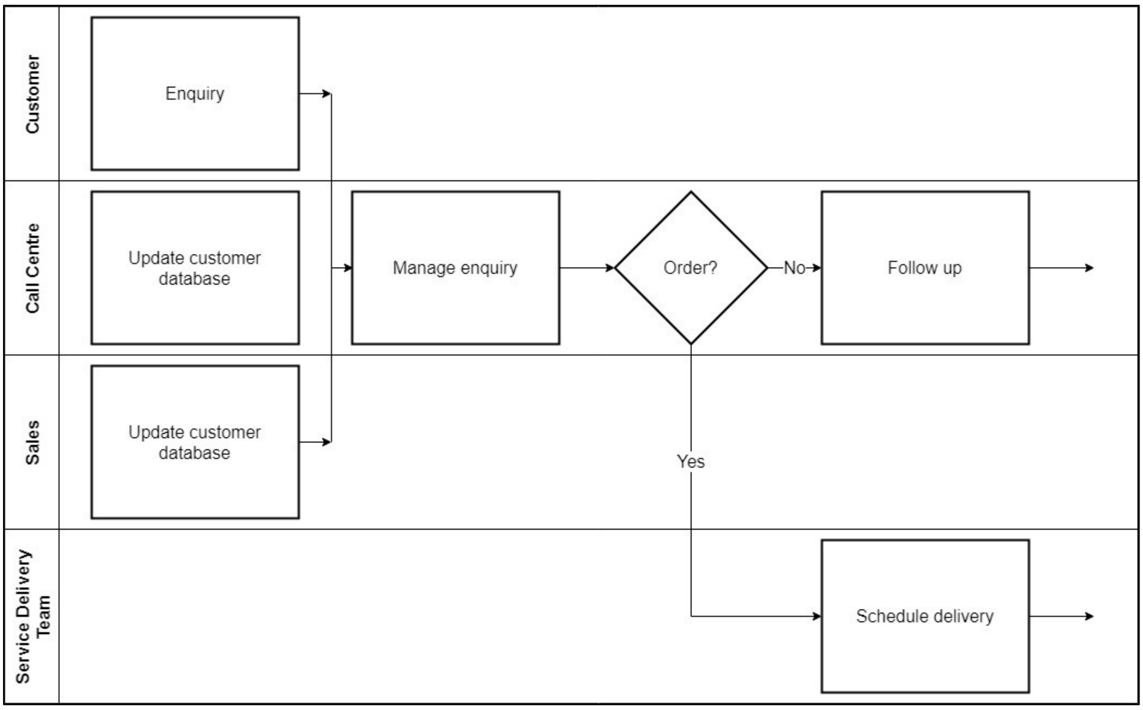


Figure 3. An example of a Swimlane Flowchart, of a service delivery process with multiple functions. Adapted from *Total Quality Management and Operational Excellence* (Oakland, 2014).

2.2.2 SIPOC Chart

SIPOC stands for suppliers-input-process-output-customers and is a common tool in process improvement. The theory behind SIPOC is that every organization is a system built up by the suppliers, inputs, process outputs, and customers. The five parts of the SIPOC system are interactive and interrelated. The SIPOC Chart can be used as a framework to outline business processes by demonstrating a set of activities across the boundaries of functional departments (Cao, Zhao, Yang, & Xiong, 2015).

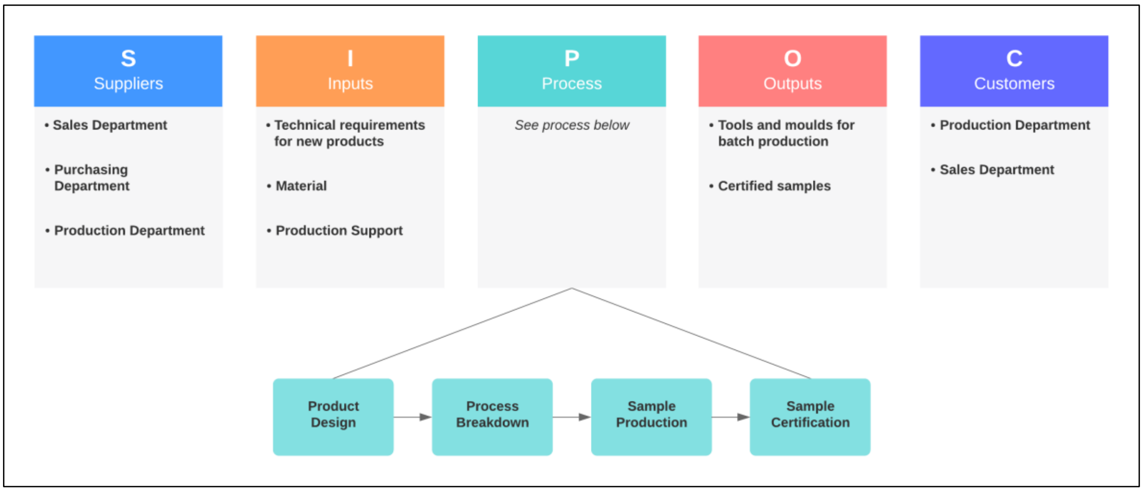


Figure 4. An example of a SIPOC Chart for an R&D Department. Adapted from *Constructing the integrated strategic performance indicator system for manufacturing companies* (Cao, Zhao, Yang, & Xiong, 2015).

The Supplier part of SIPOC lists those (e.g., organizations and departments) that provide the process with key information, materials, or other resources. The Input part shows the resources provided by the suppliers. The Process part lists the set of activities that make inputs change into outputs. The Output part shows the product or services produced by the process. The Customer part shows the person, organization, or process that receives the output, and can be either external or internal (Cao, Zhao, Yang, & Xiong, 2015).

2.2.3 Value Stream Map

A VSM is used to perceive the cause of waste and reduce cycle time by unraveling problem areas in processes (Patel, Mistry, & Shah, 2021). A value stream can be described as the process flow from the point of requested need, to the closure of all activity after the product or service has been provided. The icons used in VSM are many, and some examples can be seen in the figure below. There are icons for process steps, data, inventories, different types of flow, communication, signals, people, and transportation, to name a few. The VSM also shows e.g., cycle times, value-added time, and changeover times for the process steps (Nash & Poling, 2008).

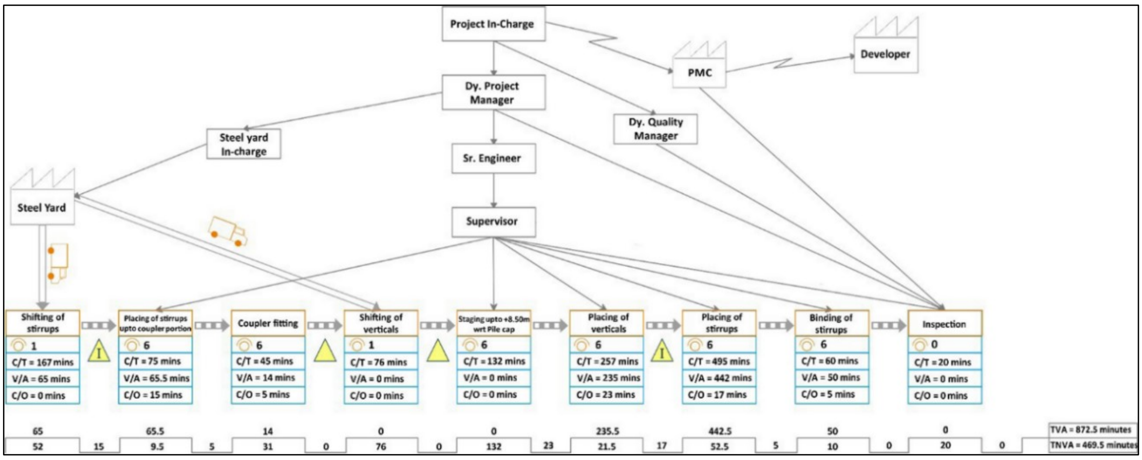


Figure 5. An example of a VSM of a infrastructure project, from *A process improvement methodology for effective implementation of value stream mapping integrated with foreman delay survey* (Patel, Mistry, & Shah, 2021).

In VSM, communication appears on top, process or product flow appears in the middle and is always flowing from left to right, and travel distance and timelines are shown at the bottom.

2.3 Literature Review Summary

This was the literature review part of the thesis. Different aspects of process improvement were reviewed to provide needed knowledge for the researcher to answer the research question and achieve the objectives of the thesis, as well as to give the reader an overview of the methodologies and possibilities when performing a process improvement project.

For the improvement of the project handover process, the Lean methodology was chosen. Lean was deemed most suitable of the reviewed methodologies based on the characteristics of the process, and since the case company already is familiar with Lean. For process mapping, SIPOC and Swimlane Flowcharts were chosen because of the characteristics of the process, and because of their simplistic visualization which will ease the standardization.

3 Study Methodology

This chapter describes the methods used in this thesis. To answer the research question for this case study and achieve the objectives, a qualitative approach was chosen.

3.1 Data Collection

The data for this thesis was collected through semi-constructed interviews with 13 operative stakeholders in the project handover process. A preliminary informal interview was made with the contact person at Mirka to determine which persons were essential to be heard to get the complete picture of the current state of the process, to identify the issues, and to receive maximum inputs for potential improvements. They were chosen based on their different positions in the organization and their work experience with this and similar processes. The work titles of the interviewees are listed below. Several of the interviewees have worked in different roles within the organization and therefore have experiences from multiple viewpoints of the process in focus.

Table 5. The work titles of the interviewees of the study.

The Interviewees of the Study	
• After Sales Manager • Compliance and Documentation Specialist • Compliance Manager • Continuous Improvement Manager • Head of Project Management • Product Development Manager • Product Life Cycle and Quality Manager	• Product Life Cycle Engineer • Product Life Cycle Technician • Project Manager • Senior Product Life Cycle Engineer • Strategic Sourcing • Unit Manager

Next an interview guide was made, which is included in this thesis (Appendix 1). The interview questions were designed to get a complete understanding of the current state of the handover process, the interviewees' perception of the process and their role in it, identification of inefficiencies, and potential improvement suggestions. The interview guide was approved by both the university and case company supervisors.

The interviews were conducted from March to April 2021 through Microsoft Teams, one at a time, and the interviewees were not shown the interview questions beforehand, they were only briefly informed about the interview topic. The interviews lasted between 32-94 minutes, they were recorded, and then manually transcribed during September and October 2021.

3.2 Data Analysis

The data analysis process of the transcripts was made with a so-called thematic approach and was performed with the help of the book *Mastering the semi-structured interview and beyond: From research design to analysis and publication* (Galletta, 2013). The data was organized and thoroughly read, and ideas that emerged were labeled as codes. Ideas could be in the form of sections, sentences, phrases, and words. Ideas and matters that were considered relevant to code included direct and indirect answers to the research question in form of re-occurring information, unexpected information, matters stated as especially important by the interviewee(s), and information matching scientific literature. Some codes had relationships with other codes and were identified and were placed under categories and sub-categories. The analysis was ongoing and was facilitated by frequent close reading of the interview answers and by looping back through the answers repeatedly.

3.3 Reliability and Validity

The findings from the empirical part of this thesis are presented clearly and transparently. All interviews were recorded and transcribed to ensure that the data could be analyzed professionally and academically. To ensure validity all interviewees were experienced or in other ways highly relevant to include in the process improvement, and all literature used in this thesis are from well-known and trustworthy academic sources.

4 Description of The Case Company

This chapter of the thesis describes the case company and how the project handover process is currently structured. This chapter is mainly based on the interviews and material provided by some of the interviewees.

Mirka is a world leader in surface finishing technology with 18 subsidiaries located in Europe, the Middle East, North and South America, and Asia. The headquarters and production are located in Finland. Over 97 % of the products are sold through export to over 100 countries. The products consist of all types of sanding solutions for the surface finishing and precision industry such as abrasives, micro finishing products for optimized engineered surface finishing processes, polishing compounds, and advanced sanding and polishing machines. Mirka also delivers complete dust-free solutions for each customer’s individual needs (Mirka Ltd., 2021a).

The Power Tools Unit is divided into smaller teams, the Development Team, Compliance Team, Test Team, PLC Team, Quality Team, and After Sales Team. Resources from all these teams become a project group for the new product development project, save the PLC Team that instead have the role to take over the responsibility of the product design from the Development Team, and conduct product care once the new product development project reaches its end. The projects are led and coordinated by a Project Manager.

The Mirka Power Tools product development process follows the Waterfall model with eight stages with gates. With the Waterfall model projects run in a sequential fashion through the various functions of the organization (Bessant, 2017). The gates all have a checklist that is to be completed before moving on to the next stage. Other functions are also involved directly and indirectly in the product development process, such as Sales, Marketing, Production, and Strategic Sourcing.

The entirety of the product development process is not within the scope of this thesis, but the events referring to the project handover process in the product development process today are marked with red in the image below.

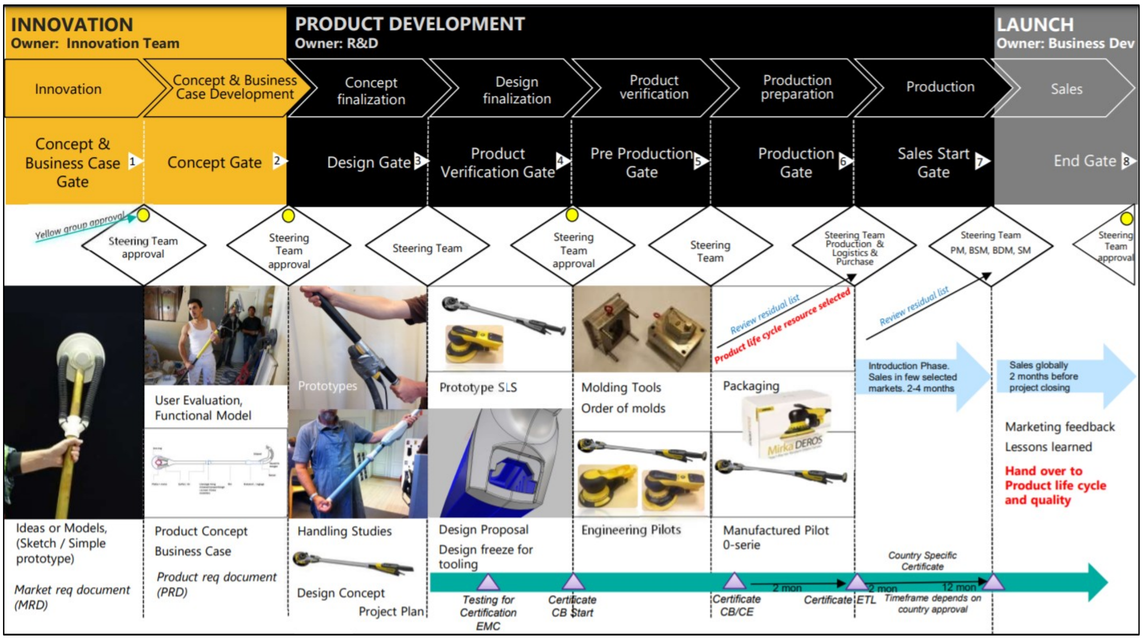


Figure 6. Mirka Power Tools product development process (Mirka Ltd., 2021c).

4.1 Current State of the Project Handover Process

The project handover process is not standardized or officially described in any way today. It has new adaptations for each project; therefore this is not an accurate description of the process for all handovers made at the Power Tools Unit. But this is a compilation of the interview data and an example of how the current handover process can look like, on a step-by-step level. It is described with text and a SIPOC chart further below in this chapter and visualized with a Swimlane Flowchart (Appendix 2). The issues with this state of the process and explanations for variation in efficiency and quality will be discussed in chapter *5 Results*, as this chapter only describes the current state without further analysis.

The following events are meant to happen within six months, with the start being the 0-series product release, in the Production Preparation phase of the Power Tools product development process. These six months are meant for market analysis and to discover eventual flaws with the product appearing when mass-produced, but in practice, the actual amount of time of this have varied heavily with rarely succeeding within six months, and in cases, it has lasted up to 18 months and counting.

1. **A resource from the PLC Team is chosen**
   - The product development project reaches 0-series product release. The Project Manager discusses with the Product Life Cycle and Quality Manager who could be a suitable candidate for this handover. The resource is chosen based on their experience with similar products, their familiarity with the main suppliers for the product, and the PLC resources' current workloads.

2. **Briefing**
   - When the PLC resource is chosen, the Project Manager invites the PLC resource, the Development Engineer(s), and other relevant members of the project group for an initiating handover meeting. During this meeting, the PLC resource is briefed about both the product and the project. A preliminary plan with a timetable for the handover is also made here. The plan includes an agreement if the PLC resource or the Development Engineer(s) shall handle the remaining issues with the product until handover.

   - From this point forward the chosen PLC resource starts participating in the product development project's frequently occurring short status meetings called pulse meetings.

3. **Handover preparation / Closure of the project**
    - After the briefing meeting, the PLC resource compiles a checklist in Microsoft Excel over everything that needs to be in order before the PLC resource accepts the handover. Mainly documentation and other critical tasks remaining in the project. The Development Engineer(s) finishes their project tasks and prepares for handover in co-operation with the other members of the project group and other functions such as Production and Strategic Sourcing, and the PLC resource has helped in some cases.

    - If new issues arise with the product during this stage the PLC resource and Development Engineer discusses who handles the changes or improvements if they are non-critical. If critical issues arise the handover is put on hold and the project group continues with the work and the project lives on.

4. **Handover meeting(s)**
    - When the Development Engineer(s) have everything ready for handover, a meeting is scheduled with the PLC resource. During this meeting they go through the PLC resource's checklist, with the Development Engineer(s) showing e.g. that every document exists, is in the right location and is the right version. The PLC resource acts as a critical reviewer and asks questions.

    - If everything is in order the handover proceeds, otherwise the handover preparation continues, and a new handover meeting is scheduled.

5. **Official handover**
    - With the agreement that everything is in order, the responsibility for the product design is handed over from the Development Team to the PLC

Team. Eventual residues from the checklist will be fully handled by the PLC resource and upcoming changes such as quality improvements, new features, or other changes to the product are made by the PLC Team until the product reaches the end of its life cycle.

- The Power Tools Unit and stakeholders in other functions are informed that the product design is officially handed over.

Up until the official handover the project group works on finalizing their parts of the product development project, these activities are not a part of the project handover process per se, but they shall be completed before a handover is made, or more specifically most of these activities should be completed in good time before the launch of the 0-series products but usually, there are some residues or need of corrections.

The meetings in the handover process usually take place face-to-face or through Microsoft Teams. Communication happens through the meetings but also with emails, calls, and face-to-face discussions. The process steps can be described with a SIPOC chart as follows:

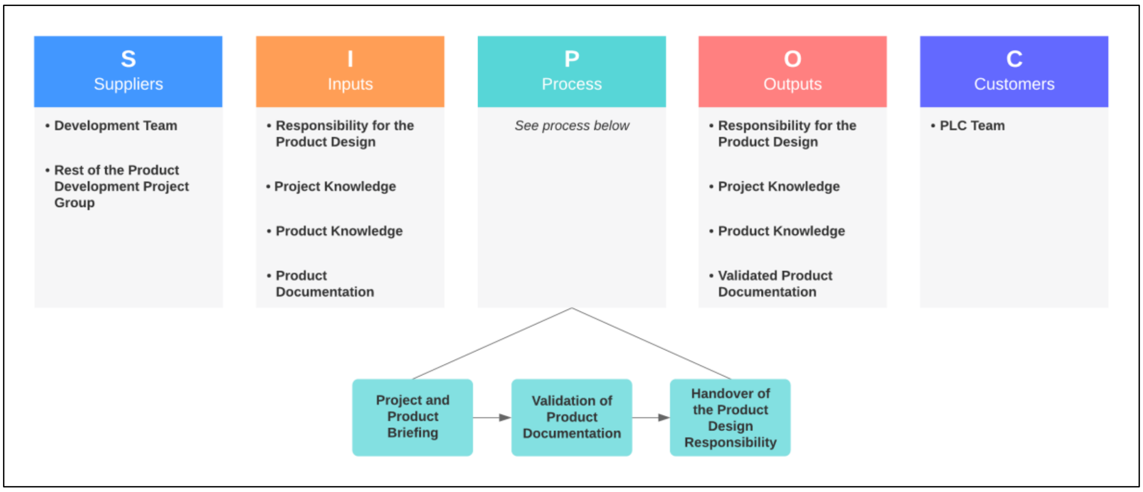


Figure 7. A SIPOC chart of the project handover process.

5 Results

This is the results chapter of the thesis that lists the findings of the study. First, the issues with the project handover process are thoroughly described. Then the non-value adding activities that result from the issues of the process are compared with theory. This is followed by suggestions on how the project handover process can be improved, based on the findings of the interviews and the Lean methodology. Lastly, a proposal for a standardized improved project handover process is described.

5.1 Issues with the Project Handover Process

The study shows that the main causes for variation in efficiency and quality come from earlier stages of the product development process and that the success of the handover reflects the success of the product development project. The major issues found during the interviews will now be listed.

5.1.1 Documentation

A major issue when it comes to the handover is that documentation for the product is not completed, or faulty when the project reaches its end. When the product development project reaches the end and the handover is initiated, the documentation is then often faulty or incomplete and in the worst-case scenario, the documentation does not even exist for one or more components. The following list is based on comments by the PLC resources on what needs to be verified to be completed and well-made to be able to take over the responsibility successfully, and comments by other teams and functions on what they wished the PLC resource would have better knowledge on upon handover;

- **Specifications** - Specifications for every single component of all versions of the new product need to be uploaded in the right places (in Microsoft SharePoint and Mirka's own system called MissWin). If a component also exists in older products, it should also exist a verification that their specifications are in order and provided with a reference or information where they are found. While specifications may look very different the common factor is that they need to be as specific as possible. Tolerances, torques, material specifications, how the material is treated, etc. need to be clearly stated. The specifications should have a revision number and brief comments regarding the revision history.

- **Drawings** – This also applies to every single component of the product, that the 3D and 2D drawings are in order and in the SolidWorks product documentation management system (PDM). The same rules apply to the drawings as with the specifications.

- **Supplier documentation** – Where to find supplier deals, confirmation that the suppliers have the latest specifications and/or drawings.

- **List of standards, directives and certifications** – What standards, directives, and certifications apply to the product and confirmation that all is up-to-date.

- **Risk analyses, Q-documents and control plans** – Where to find risk analyses performed during the project and control plans and other eventual documentation regarding product quality and risks.

- **Reports –** Where to find reports made during the project, such as test reports from external sources, Engineering Pilot and 0-series reports.

- **Technical Construction File –** Confirmation that the Technical Construction File, the document that links to much of the documentation listed here, links to the right documents and right versions of documents.

To sort these things out at the end of a project is time-consuming and causes a delay in the project handover process. This issue starts already at the beginning of the product development project, where the Project Manager fails to clarify and underline the importance of well-made documentation to the project group and what is required by the end of the project, or by not reminding about the product development project gate checklists. The problems increase if the product development gate checklists are not followed up well enough, and tasks pass through several gates unfinished, this causes tasks to pile up towards the end of the project. A project is not done if the documentation is incomplete or has flaws, and it is not the PLC resource's job to finish the project for the project group, but in history, the PLC Team has been used as a "junkyard" for unfinished projects when other projects have become more urgent, and while this has been improved over the latest years, it still lives on in the organizational culture to some degree.

These are not the only reasons for deficient documentation, however. The role descriptions are not clear enough and therefore people do not know what is expected of them and the ways of working at the Power Tools Unit are overall quite free; the Project Manager and the product development process description do not go into every detail of the project steps. This means that the employees have a lot of responsibility for their assignments and while this is a good thing both for employee satisfaction and for innovation, the personality traits of the Development Engineer(s) also impact the quality of the documentation and therefore the handover process. Some persons prefer systematic ways of working and enjoy the documentation part of the job while others prefer the practical aspect of it and excel there instead. Here the Project Manager has an important role also to follow up on the project group's progress and know what to prioritize.

The deficient documentation does not only complicate the work for the PLC resource but also all the other stakeholders at the Power Tools Unit. For example, for the After Sales Team it may cause errors when creating service manuals, for the Compliance Team it can cause the Technical Construction File (TCF) to be faulty, at the production unit they cannot check if the components fulfill their requirements upon delivery and Strategic Sourcing cannot file complaints about faulty components or products if they are not specified well-enough. All these matters of course create a lot of problems also for the Quality Team.

5.1.2 Immoderate Information Intake

The next issue with the handover process today is that the information intake for the PLC resource becomes too massive. At the handover, the PLC resource is briefed about the project and the product. This includes everything that has happened during the project and how the product is designed, what problems have occurred, what has been tried and failed, what standards and directives the product follows, and so on. The documentation helps but even if the documentation were flawless, it is still a massive amount of information for a person to take in a relatively short period, and since the PLC resource might have several handovers and other time-consuming assignments ongoing there is a high risk of missing out on information or getting overwhelmed with work. The information intake is especially tough if you are less experienced or entirely new in the role. There have been cases where the PLC resource have started to work with an improvement to a product and put a lot of time and effort into it only to be informed after some time that the Development Team already tried that during the product development project and it was found to not be possible to improve the product that way, but that information was lost in the sea of information to take in at the handover.

The handovers in which the satisfaction was highest within the PLC Team were the ones where they were early involved in the product development project. They got to gradually familiarize themselves with the product and hear live from the side-lines which problems occurred and with this information they knew what questions to ask during the handover meetings such as "*have this problem been fixed, and how was it fixed?"*. They were more involved with all aspects of the product including certifications and standards that the product followed which then, in turn, eased their work later on since they knew which directives and standards the product has to follow.

5.1.3 Management of Residues

There are usually some residue tasks when a product development project reaches its end such as minor issues that have appeared with the product when beginning to mass-produce it, and, naturally, these residue tasks should fall on the PLC resource's table since they are changes to a product already on the market. However, there has been a lot of uncertainty about whether the PLC resource should handle the residue tasks or the Development Engineer(s). There are several reasons for this, the major reason being that the situation has been evaluated and it has been deemed that the product and project are not ready for handover - that there are still major flaws or more resource-consuming tasks to yet be done that would be too consuming for the PLC team, and therefore it has been deemed that the project is to live on.

Another reason is that there has not been an available PLC resource in time for handover which has made the project live on even though it otherwise would have been ready for handover. There have also been cases where hesitation on deciding if the project is to be handed over or not has caused a situation where the product development project has lived on while simultaneously being a product care project also, erasing the handover. It has happened that the project has lived on over one and a half years after the PLC resource joins the product development process and instead of being a passive bystander taking in information about the product to get ready for the handover the PLC resource has instead become a part of the project group with a developer role.

These things cause a lot of confusion for the PLC resource and the Development Engineer(s) regarding who does what, what has been done, what are the latest versions of the documentation, and so on. This also applies to the other functions in the Power Tools Unit, the other Teams and other eventual functions do not know who to turn to with their problems, and it causes uncertainty if their documents for the product (manuals, service manuals, specifications) are the correct version and/or still valid due to these late changes.

5.1.4 Not Announcing Handovers

After a handover is officially done and the responsibility for the product design is officially handed over to the PLC Team, a common issue has been that it is not announced to the rest of the Power Tools Unit and other necessary stakeholders. This has caused unnecessary confusion on who is to be contacted regarding the product.

5.1.5 Project Variation

Project variation is not an issue, but rather a factor that also greatly impacts the handovers. The product development projects are very individual since as previously mentioned, the project descriptions are defined on a general level, the products are of different types, the products are developed entirely in-house or in co-operation with other manufacturers, there are different suppliers, and so on. The projects are simply very different from case to case, and this also causes the handovers to variate.

5.1.6 Failure to Consider Resources

There are two aspects of this. The first one is that people do not consider that there are many ongoing projects at Power Tools and therefore does not consider that it can emerge delays in the projects by having to wait for test equipment, people, or other resources, and therefore timetables for both projects and handovers can become too optimistic. The second is to not use existing resources – A product development project is complex, and each stakeholder in the development process has its specialties. Yet during the project and the handover process, the step to seek help from the other functions is sometimes unnecessary high in the organizational culture today. Both the Development Engineers and the PLC resources do not lightly seek help from the other functions, such as the Compliance Team regarding documentation and conformity issues. This particular example has caused faulty documentation or unnecessary processing and work for people, and can in the worst-case scenario make the product no longer fulfill requirements by laws or standards when the person simply could have reached out for help by people with more experience with a certain task.

5.1.7 Lack of Standardization

Lastly, the lack of standardization of the project handover is, as it was hypothesized from the start, another major and perhaps even the biggest issue with the handovers today, and a reason for several of the already listed issues. While the free ways of working without micro-management are one of the biggest reasons for the Power Tool Unit's success in innovation and employee satisfaction, the lack of standardization of the project handovers has caused many of the already discussed problems due to the stakeholders not knowing what steps to take and what is required from them upon reaching the handover. The handover process then has to be re-invented each time and varies heavily depending on who are the stakeholders.

5.2 Non-value Adding Activities

From the issues with the process, the following inefficiencies arise as a result, here categorized as non-value adding activities or waste according to the Lean methodology.

Table 6. Found waste in the handover process.

Type of waste	Found waste in the project handover process
Correction	1. Project group having to fix incomplete/missing documentation. 2. Correcting errors caused by faulty documentation.
Excess motion	1. Adapting a new handover approach each time. 2. Unnecessary handover meetings when project work is not complete.
Inventory	1. Handover postponed due to project not finished. 2. Handover postponed to lack of PLC resources.
Overproduction / Processing	1. Immoderate amount of information changing hands too fast. 2. PLC resource finishing project tasks (PLC used as junkyard). 3. Unnecessary work is being made due to missing/lost information/knowledge. 4. PLC resource and project group working on the same project residues. 5. Work caused by project goals changing during the project. 6. Review of already handed over documentation because of expectation of errors.
Transportation	-
Unutilized people	1. Stakeholders find out work responsibilities on the go. 2. Project Manager not coordinating handover enough / having the tools to successfully do so 3. Not utilizing existing resources.
Waiting	1. PLC resource waiting on incomplete/missing documentation. 2. PLC waiting for the project group to finish the product / their tasks. 3. Waiting due to priority of other/newer projects/tasks over handover.
Other	1. Stakeholders having to investigate who currently has responsibility for the product. 2. Decisions are postponed due to hesitation.

The literature review of this thesis included a study of a new product development process that was analyzed to find waste (Belvedere, Cuttaia, Rossi, & Stringhetti (2019)). A total of 41 non-value-adding activities were found in their case, and in the project handover process, 20 were found. The chart below shows the distribution of the waste found in their study versus what was found in this study.

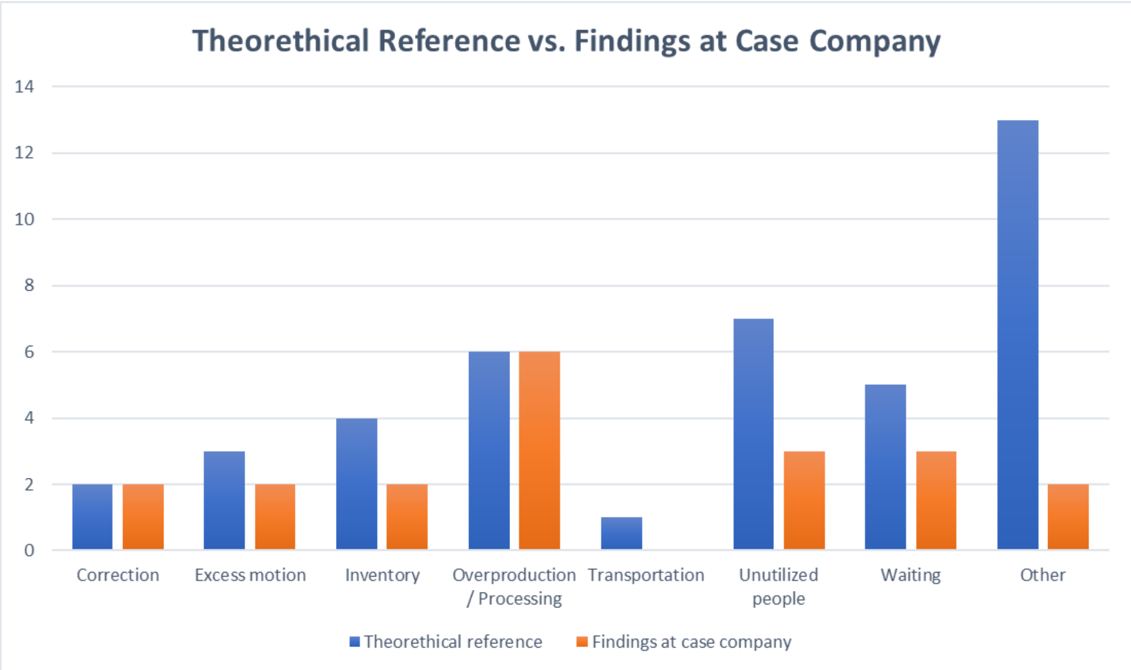


Figure 8. Amount of waste per category, a process from theoretical references vs. the project handover process.

It needs to be highlighted that the other study was performed on an entire product development process while the study performed in this thesis only mentions the non-value-adding activities that exist or impact the project handover, which is performed during two stages of an eight-stage product development process.

5.3 Improving the Handovers

This chapter suggests improvements to the project handover process that is based on the interview findings and Lean principles. As some of the issues with the handover come from earlier stages of the product development process or the overall ways of working within the organization, not all issues can be solved easily without further analysis or due to their complexity. But the following improvements can solve the majority of the issues with the project handover process.

5.3.1 Standardize the Process and a Documentation Checklist

Most of the issues with the process can be traced back to the lack of standardization. A proposal for a standardized process is described in section 5.4.

That documentation is uncompleted and faulty when it is time to hand over the product to the PLC Team is clearly one of the factors that cause problematic handovers most often. To improve this the responsibilities within the product development project and what is expected documentation-wise from each member must be made clearer, and this can be aided with a standardized handover checklist. Based on the interviews and material provided by the interviewees a suggestion of a standardized handover checklist has been made and can be found in this thesis (Appendix 3). Projects vary, and the checklist may need slight modification for each project, but it shall work as a standardized base on what the PLC resource will need from the project group when it is time for handover.

With the standardized list, combined with clarification on what is expected by the project members, and with the Project Manager underlining the importance of well-made documentation early in the product development project, a lot of things can improve. If possible, a Compliance Team member should also always participate in the handover meetings for expert input that may be individual for that particular product.

5.3.2 Coordinate the Information Intake

Another factor guilty of ineffective handovers, and the one that combined with the documentation issues impacts the quality of the handovers the most, is the massive information intake for the PLC resource at the handover. The briefing does not work well enough today.

To solve this the PLC resource should join the projects earlier, preferably already in the Concept Finalization Stage of the product development process. The key thing here is that the PLC resource shall not become a member of the project group and join e.g., the pulse meetings already at this point, but instead become a passive entity participating in all the less frequent Design Reviews of the new product, starting from the Cross-Functional Design Reviews already made in unison with Production and the After Sales Team today. On top of this, from the point the PLC resource joins, short monthly meetings should be scheduled for a quick briefing between the Development Engineer(s) and the chosen PLC resource. Preferably in a lab environment so the Development Engineers(s) can both show and tell what has been done since last time, what progress has been made and what challenges have arisen, and so on.

These small changes make the PLC resource more familiar with the product from an early stage which means that the information intake at handover is much more balanced. By doing this it may also improve the product since during these meetings the PLC resource can give inputs based on experiences from later stages of the product life cycle that the Development Engineer(s) eventually does not consider.

5.3.3 Establish Rules for Residues

The uncertainty on who shall handle the residues of a project impacts both the handover process and the entirety of the product development process when a clear decision is not made. Since all projects are individual it is hard to have a specific point applicable for all projects when the handover shall happen, no clear solution was found during the interviews. But a valid comment re-occurred regarding this; to always, if possible, hand over the project to the PLC Team. Because they have a better system for implementing changes to products already being manufactured. The Engineering Change – system in MissWin makes it a lot easier for all Teams and functions to keep track of changes to the product after the 0-series production run. Handing over an incomplete product should not be done, and the project should be pro-longed if lengthy critical problems show up after 0-series production. But when the project is allowed to live on there are higher risks that information about changes made is missed out by those that need that information, but are not directly involved in the physical change of the product, such as After Sales, Compliance, and Production, and any changes to the product may change the service procedure for the tool, its verifications, or the assembly instructions. So, if possible, a handover to the PLC Team is always preferred. If the residues after 0-series production are too resource-heavy for the PLC Team to handle, they should still be made with the Engineering Change system, to be able to synchronize the needed changes more easily and to make sure that all changes can be followed up systematically.

5.3.4 Inform About the Handover

In some cases, the rest of the Power Tools Unit including Production, Strategic Sourcing, have been informed when the handover is officially done. Other times they have not which has caused unnecessary confusion, so a simple improvement is to make it a rule to send out an email to related parties at the end of the last official handover meeting.

5.4 Proposed Project Handover Process

This is the proposal for a new standardized project handover process. It is also visualized with a Swimlane Flowchart (Appendix 4). This proposed process does not require much effort but can eliminate the majority of the issues and non-value-adding activities of the current process.

1. **A resource from the PLC Team is chosen**
    - The first Cross-Functional Design Review is upcoming. The Project Manager discusses with the Product Life Cycle and Quality Manager who could be a suitable candidate for this handover. The resource is chosen based on their experience with similar products, their familiarity with the main suppliers for the product, and the PLC resources' current workloads.

2. **Introduction Meeting**
    - When the PLC resource is chosen, the Project Manager invites the PLC resource and the Development Engineer(s) for an introduction meeting. During this meeting, the PLC resource is introduced to the concept of the product and the project, the Development Engineer(s) is briefed with the standardized handover checklist on what will be needed at handover, and a monthly re-occurring 30-minute briefing meeting between the PLC resource and Development Engineer(s) is scheduled. From this point forward the PLC resource participates in the Cross-Functional Design Reviews of the product, but not the pulse meetings.

3. **0-Series Briefing Meeting**
    - As the project reaches 0-series production the Project Manager schedules another briefing meeting with representatives from all Teams within the project group. Here the PLC resource can ask questions regarding the product that remain unclear.

- From this point, the PLC resource starts participating in the pulse meetings and handles all new and non-critical unplanned changes to the product through the Engineering Change System in MissWin.

4. **Handover Preparation / Closure of the project**
   - The project group finishes its final tasks and prepares for handover.

5. **Handover Meeting(s)**
   - When the final project tasks are done and the project is deemed ready for handover, the Development Engineer(s) calls for a meeting with the PLC resource and the project group's Compliance resource. During this meeting they go through the handover checklist with the Development Engineer(s) showing that every document exists, is in the right location and is the right version. The PLC resource acts as a critical reviewer and asks questions if necessary. The Compliance resource gives their input and answers questions if necessary.

   - If everything is in order the handover proceeds, otherwise the handover preparation continues, and a new handover meeting is scheduled.

6. **Official Handover**
   - With the agreement that everything is in order, the responsibility for the product design is handed over from the Development Team to the PLC Team. Eventual residues from the checklist will be fully handled by the PLC Team and upcoming changes such as quality improvements, new features, or other changes to the product are made by the PLC Team until the product reaches the end of its life cycle.

   - The PLC resource announces to the Power Tools Unit and stakeholders in other functions that the product design is officially handed over.

This proposal addresses the issues regarding poor documentation, immoderate information intake, the management of residues to some degree, not announcing the handovers, and the lack of standardization of the project handover process. With this proposal, it is the hypothesis that at least the following non-value adding activities will either be eliminated or improved:

- Project group having to fix incomplete/missing documentation.
- Correcting errors made due to faulty documentation.
- Adapting a new handover approach each time.
- Unnecessary handover meetings when project work is not complete.
- Immoderate amount of information changing hands too fast.
- PLC resource finishing project tasks (PLC used as junkyard).
- Unnecessary work is being made due to missing/lost information/knowledge.
- PLC resource and project group working on the same project residues
- Review of already handed over documentation because of expectation of errors
- Stakeholders find out work responsibilities on the go.
- Project Manager not coordinating handover enough / having the tools to successfully do so.
- Not utilizing existing resources.
- PLC resource waiting on incomplete/missing documentation.
- Stakeholders having to investigate who currently has responsibility for the product.

This proposed process and the handover checklist should, if chosen to be implemented, be used with a continuous improvement mindset to improve it even more over the course it is utilized, as projects change and evolve at the Power Tools Unit. As some of the factors that affect the process are on a organizational level their improvement is complex and might not be resolved with this improved process alone, but they have been acknowledged in this thesis and hopefully, as a result of this, they can be improved in the future.

6 Conclusions

This study aimed to answer the research question *What are the inefficiencies in the current project handover process from the Developer Team to Product Life Cycle Team at the Power Tools Unit at Mirka Ltd.?* And to complete the objectives 1*. To find the factors negating efficiency and quality in the current process* and 2. *To suggest an improved handover process that may be standardized, based on data gathered from the case company, and literature.* The study was deemed successful since the research question was answered and the objectives were fulfilled with the combination of the literature and the semi-constructed interviews of the 13 stakeholders. The major issues with the process were found to come from the earlier stages in the product development process and to be the results of the lack of standardization. This caused inefficiencies such as burdensome handover of documentation, immoderate information intake for the PLC Team, and unclarities such as who handles project residues. Other factors also affected the handover process, such as the individuality of the projects and the organizational culture to some degree, like the step to ask for help sometimes being too big. The issues along with suggestions for improvement based on Lean methodology and the interview findings were discussed in detail, and an improved handover process and a handover checklist were proposed for standardization. With the findings in this thesis giving a clear image of the current process, other adaptions of the process can also be made, and the proposed process can be evaluated and modified with a continuous improvement approach to optimize it even further over time, this can also be done by first simulating the process. For modifications of the proposed handover process, only performing minor changes at a time is recommended, which are easily reversible to the next project handover if unfeasible. By doing this the project handover process can be the best version of itself also as projects continue to evolve at the Power Tools Unit.

6.1 Discussion

The improvement of the process was made with a Lean approach, but other methodologies listed in the literature review chapter or methodologies not discussed at all in this thesis could also have provided good results.

The study was made with an entirely qualitative approach. While this way was deemed suitable and successful, it could have benefitted from a quantitative input also. As an example, simulation software could have shown the benefit of various adaptions of the process. For the thesis, only one improved variant of the process was proposed. This was due to the time limit, but in a best of worlds scenario with more time, several improved versions would have been proposed for the Power Tool Unit, as this is but one of many ways that the process can be improved.

6.1.1 Challenges of the Study

The major challenge with this thesis and study was the time limit. With 13 interviewees arranging the interviews, the transcription, and the analysis were very time-consuming. I underestimated this from the beginning and this caused unnecessary stress, in the end, to compile all findings. As this is my first real qualitative study, I consider this a lesson learned. It is also important to choose the interviewees and interview questions wisely from the start to get a full and clear picture of the unit of analysis without a lot of other irrelevant information. Luckily, I got help with this from my supervisors both at the case company and the university.

6.1.2 Significance of the Study

The study highlights the issues and possibilities for improvement with the current project handover process as well as some issues with the entirety of the product development process and the overall ways of working within the organization. With this information, the Power Tools Unit can improve and become even better in its operations which may benefit the unit and Mirka in the long term.

As it was found during the literature review there are relatively few studies particularly focused on the handover process of a product development project. This study gives an insight into what type of inefficiencies and issues may exist in this type of sub-process of an R&D process in a successful organization in 2021 and how they can be solved with Lean methodology. This paper can be used for future benchmarking in other organizations, and it may also be used as a reference for analyzing the entirety of product development processes, to some degree.

6.1.3 Managerial Implications

Based on the findings of this study a handover process suffers if it is not standardized to some degree. One must recognize that projects are individual, but there needs to be a guiding roadmap to follow and/or a checklist for successful handovers. In this thesis, a proposal for a process that can solve most of the issues found in this study and a handover checklist is included as appendices. The proposed process is described furtherly in section 5.4. This proposed process can be implemented, evaluated, and standardized in future projects at the Power Tools Unit. To achieve even better project handovers the process should be reviewed frequently over time as the Power Tools Unit and the projects evolve, and based on the interviews the entirety of the product development process could also benefit from further analysis.

References

AbdEllatif, M.;Farhan, M. S.;& Shehata, N. S. (2018). Overcoming business process reengineering obstacles using ontology-based knowledge map methodology. *Future Computing and Informatics Journal*. doi:https://doi.org/10.1016/j.fcij.2017.10.006.

Aguanno, K.;& Schibi, O. (2018). *Agile Business Analysis : Enabling Continuous Improvement of Requirements, Project Scope, and Agile Project Results.* J. Ross Publishing.

Antony, J. (2006). Six sigma for service processes. *Business Process Management Journal, 12*(2).

Barsalou, M. (2016). *The quality improvement field guide : achieving and maintaining value in your organization.* CRC Press.

Belvedere, V.;Cuttaia, F.;Rossi, M.;& Stringhetti, L. (2019). Mapping wastes in complex projects for Lean Product Development. *International Journal of Project Management*.

Bergman, B.;& Klefsjö, B. (2002). *Kvalitet i alla led.* Studentlitteratur.

Bessant, J. (2017). *Riding the Innovation Wave : Learning to Create Value from Ideas.* Emerald Publishing Limited.

Bradley, J. R. (2012). *Improving business performance with lean.* Business Expert Press.

Cao, Y.;Zhao, K.;Yang, J.;& Xiong, W. (2015). Constructing the integrated strategic performance indicator system for manufacturing. *International journal of production research, 53*(13), 4102-4116.

Carrilo, M. (2019). MEASURING AND RANKING R&D PERFORMANCE AT THE COUNTRY LEVEL. *Economics & Sociology, 12*(1). doi:DOI:10.14254/2071-789X.2019/12-1/5

Chaudhuri, A. B. (2020). *Flowchart and Algorithm Basics : The Art of Programming.* Mercury Learning & Information.

Galletta, A. (2013). *Mastering the semi-structured interview and beyond : From research design to analysis and publication.* New York University Press.

Helms Mills, J.;Mills, A. J.;& Dye, K. (2009). *Understanding organizational change.* New York: Routledge.

Hoseini, S. A.;Fallahpour, A.;Wong, K. Y.;& Antucheviciene, J. (2021). DEVELOPING AN INTEGRATED MODEL FOR EVALUATING R&D ORGANIZATIONS' PERFORMANCE: COMBINATION OF DEA-ANP. *Technological & Economic Development of Economy, 27*(4). doi:10.3846/tede.2021.15144

Hunt, V. D. (1996). *Process mapping : how to reengineer your business processes.* Wiley.

Kaushik, P.;& Khanduja, D. (2009). Application of Six Sigma DMAIC methodology in thermal power plants: A case study. *Total Quality Management & Business Excellence*. doi:https://doi.org/10.1080/14783360802622995

Keeeun, L.;Yujin, J.;& Byungun, Y. (2017). Developing an research and development (R&D) process improvement system to simulate the performance of R&D activities. *Computers in Industry, 92–93*. doi:https://doi.org/10.1016/j.compind.2017.08.001

Keyte, B., & Locher, D. (2008). *LEAN HANDBOKEN: Värdeflödeskartläggning inom administration, service och tjänster* (1 ed.). (P. Sjögren, Trans.) Liber.

Khan, A. A.;Keung, J.;Niazi, M.;Hussain, S.;& Ahmad, A. (2017). Systematic literature review and empirical investigation of barriers to process improvement in global software development: Client–vendor perspective. *Information and software technology*. doi:https://doi.org/10.1016/j.infsof.2017.03.006

Kumar, P.;Singh, D.;& Bhamu, J. (2021). Development and validation of DMAIC based framework for process improvement: a case study of Indian manufacturing organization. *International Journal of Quality & Reliability Management, 38*(9). doi:10.1108/IJQRM-10-2020-0332

Malik, M.;Khan, M.;& Mahmood, S. (2021). Increasing the efficiency of business process through authentic leaders and follower's attitude. *Business Process Management Journal, 27*(2), 529-545. doi:10.1108/BPMJ-04-2020-0162

Malik, Y. F.;& Ernawati, D. P. (2021). Literature Analysis and Future Research Framework in Improvement and Substitutes Strategies. *EKSIS, 16*(1). doi:https://ejournal.stiedewantara.ac.id/index.php/001/issue/view/64

Mirka Ltd. (2021a). *Mirka Ltd.: About Us*. Retrieved from Mirka Ltd. Web Site: https://www.mirka.com/top/about/

Mirka Ltd. (2021c). Internal material provided for the study.

Nash, M. A.;& Poling, S. R. (2008). *Mapping the total value stream : a comprehensive guide for production and transactional processes.* CRC Press.

Nash, M. A.;& Poling, S. R. (2008). *Mapping the total value stream: A comprehensive guide for production and transactional processes.* CRC Press.

Nasim, K.;Sikander, A.;& Tian, X. (2020). Twenty years of research on total quality management in Higher Education: A systematic literature review. *Higher Educ Q.* doi:https://doi.org/10.1111/hequ.12227

Oakland, J. S. (2014). *Total Quality Management and Operational Excellence* (4 p.). Routledge.

Patel, S.;Mistry, D.;& Shah, M. (2021). A process improvement methodology for effective implementation of value stream mapping integrated with foreman delay survey. *Innovative Infrastructure Solutions*.

Rashid, O. A.;& Ahmad, M. N. (2013). Business process improvement methodologies: an overview. *Journal of Information System Research Innovation*.

Rossi, M.;Kerga, E.;Taisch, M.;& Terzi, S. (2011). Proposal of a method to systematically identify wastes in New Product Development Process. *17th International Conference on Concurrent Enterprising, ICE 2011 - Conference Proceedings.*

Slack, N., & Brandon-Jones, A. (2018). *Operations and process management : principles and practices for strategic impact.* (5, Ed.) Pearson Education Limited.

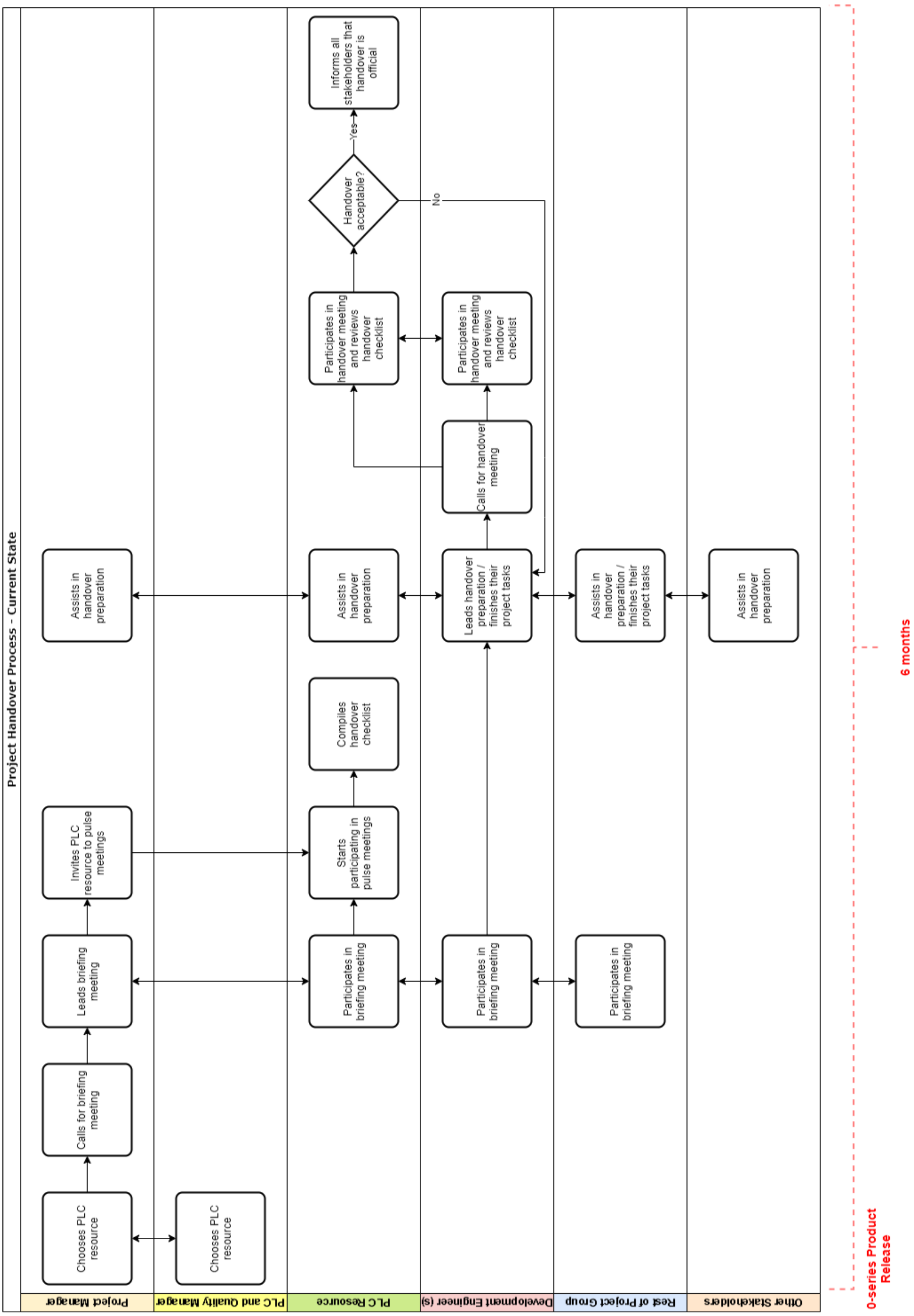
Yu, G. J.;Park, M.;& Hong, K. H. (2020). A strategy perspective on total quality management. *Total Quality Management & Business Excellence*. doi:10.1080/14783363.2017.1412256

Appendices

Appendix 1. Interview Guide

1. Describe the current project handover process from R&D to PLC, based on your perception of it.
2. What is your role in the project handover process?
    1. Follow-up question: When do you enter the project handover process and when is your work done in the project handover process?
3. What are the main aims within the project handover process for you personally?
4. What methodologies or tools are you currently using to communicate during the project handover process?
5. What activities happen in your part of the current project handover process; what gets done?
    1. Follow-up question: What methodologies or tools are you using when performing these activities?
6. How much time does your part of the current project handover process consume? Please estimate the following:
    1. Total time spent per project handover, in active working hours.
    2. Involvement per project handover, in calendar time.
7. Is the current project handover process effective?
    1. Follow-up question: Is the current project handover fulfilling its purpose?
8. Do you have improvement suggestions for the current project handover process?
    1. Follow-up question: What are your suggested improvements?
    2. Follow-up question: Why do you think your suggested improvements are necessary?
9. The project handovers have been very different from project to project in terms of working hours, calendar time, and quality. What do you think is the reason for this?

Appendix 2. Project Handover Process Current State - Swimlane Flowchart



Appendix 3. Proposed Project Handover Checklist

Proposed PT Project Handover Checklist											
Technical Construction File (OK/NOOK)											
OK											
List of Models											
Model Number	**Model Name**	**Comments**									
123456EU	Mirka Example Machine EU Model										
123456US	Mirka Example Machine US Model	Not yet launched									
List of Parts											
Mirka Code	**Part Name**	**Drawing Number**	**Specification Status (OK/NOOK)**	**Drawing Status (2D_OK/3D_OK)**	**Uploaded to MissWin (OK/NOOK)**	**Uploaded to SharePoint (OK/NOOK)**	**Uploaded to EPDM (OK/NOOK)**	**Revision**	**Supplier Name**	**Revision at Supplier**	**Comments**
Common Parts / Parts Used in Existing Products											
Mirka Code 9876543210	Button for Machine A, B and C	11223344	OK	2D_OK, 3D_OK	OK	OK	OK	D	The Supplier Company Ltd.	D	Ongoing discussions on supplier change
New Parts											
Spare Parts											
Other											
Miscellaneous											
Name or ID	**Link / Can be found at ___**	**Comments**									
Reports											
Test Report - External EMC Test	https://sharepoint...	Ask ___ for info									
Standards											
Directives											
Certifications											
Supplier Deals											
Quality Documents											
Lessons Learned											
In the concept phase we tried ___________ and it was not feasible. This because ______________.											

Appendix 4. Proposed Project Handover Process - Swimlane Flowchart