RKT

UNIVERSITY OF TWENTE.

INCREASING PROCESS EFFICIENCY AT RKT BY IMPROVING STRUCTURE AND COMMUNICATION

Bachelor Thesis Industrial Engineering and Management

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Preface

Dear reader,

You are about to read my bachelor thesis for the study Industrial Engineering and Management at the University of Twente. The research for this thesis was conducted at Rombouts Kunststof Techniek located in Tholen, Zeeland. The company specializes in the manufacturing and installation of various types of plastics.

During this research, the goal was to improve the efficiency in the process of carrying out customer projects. To achieve this goal, interviews were held with employees at every level of the company to gain an understanding of the processes. The next step was to analyze this data to identify where there was room for improvement. Based on this, several solutions were formulated to help the RKT improve the internal communication and structure of projects.

I would like to thank everyone at RKT who helped me during this research. The employees at the company were always happy to answer any questions or to make time for an interview. Despite the problems uncovered during this research RKT is still managing to be successful, which shows the hard work and dedication of everyone at the company.

I would also like to thank Berry Gerrits who guided me during this thesis. He was always willing to think along whenever the research ran into difficulties. The feedback he provided was of great help to shape the final version of my thesis. Finally, I would like to thank Peter Schuur as well for being my second supervisor.

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Management Summary

Introduction

This research aims to address the challenges encountered by RKT management, a company specializing in various customer-specific plastic projects. The core focus of this investigation lies in enhancing process structure and internal communication. This is done by first identifying the problems in the current situation.

Research problem

RKT has been grappling with sub-optimal efficiency levels in its project setup and execution. These inefficiencies, characterized by delays and errors, have led to diminished profits and low employee morale. This research seeks to analyze the causes of these issues and propose viable solutions, which leads to the research question: "How can RKT improve its efficiency by implementing improvements in internal communication and process structure, from customer order intake to project completion?"

Methodology

The research was structured around the Managerial Problem Solving Method (MPSM). The first part of the research consists of a literature review to answer several research questions. The goal of these research questions was to investigate existing and currently used practices in companies that are comparable to RKT. This was done with the following research questions:

The practical part of the approach consisted of investigative questions about the current structure and processes at RKT. This was done by conducting observations at the company and by holding interviews with many of the company's employees. This provided the answers to the following questions:

Following the investigation of the current situation at the company, several problems were identified. These problems are linked to one of the research questions used to investigate the current situation. Each problem is then followed by one or more solutions based on the findings of the literature review.

Conclusions and solutions

Two main challenges have been identified within RKT:

1. Deficient internal communication: The literature emphasizes the importance of internal communication for a company's successful operation. RKT exhibits a significant lack of digitalization, resulting in reliance on inefficient communication methods. Additionally, the lack of regular meetings between office staff and mechanics exacerbates poor project preparation and evaluation, causing repeated mistakes.
2. Absence of structured process management: The company operates in an unstructured work environment, leading to a lack of control over projects. The absence of clear responsibility for issue resolution and the premature assignment of projects compounds this problem.

In light of these issues, the following recommendations are proposed:

1. Digitalization: RKT should consider using a digital application designed to address the identified problems.
2. Implementation of RKT Framework: To ensure structured project management, RKT should adopt a company specific framework. This would facilitate the breakdown of projects into

manageable steps, ensure thorough preparation before project assignment, and introduce the role of a project owner.
3. Regular Meetings: RKT should hold preparatory and evaluation meetings around each project to foster effective two-way communication and collaborative learning from past experiences. This structured approach would encourage shared responsibility, fostering a sense of unity among employees.

Based on the two main problems identified during the research, solutions were formulated that the company may implement to improve the situation.

The communication issue consists of two main aspects: too few meetings and a lack of digitalization to facilitate effective internal communication. The solution formulated to resolve the first aspect is to introduce preparatory meetings at the start of every project and evaluation meetings at the end of every project. The research among the employees at the company showed that many mistakes and delays are caused by poor preparation of a project and poor communication at the start of a project. Therefore, the preparatory meetings include a number of points that should be discussed between the project leader and the relevant mechanics. In addition, these meetings increase the quality and frequency of the internal communication. The evaluation meetings are intended to enable the employees to learn from the experiences during a project, and to effectively use these learnings in future projects. Currently the company has a system for evaluating projects, the solution improves this system in several ways. Firstly, the mechanics are included in every meeting, something that is infrequent in the current system. Secondly, the meetings are held regardless of the success of a project, the company currently only looks at projects that went over budget. Lastly, the structure of the new evaluation meetings enables employees to learn from past experiences more effectively and to put these learnings to use in future projects.

The second approach to improving the situation regarding internal communication is the introduction of a company specific application. The level of digitalization in the company in the current situation is low. Therefore, it is proposed that the company develops an application with several different functionalities. By reducing the reliance of physical document and by giving the employees an easy-to-use channel of communication, errors during projects can be reduced.

The second major issues that was identified is the lack of structure during the life cycle of a project. The effect of this is that the employees at the company are often confused, lines of communication are entangled and roles are ambiguous. In order to straighten out the process, a solution in the form of a framework is presented. The intention behind this framework is to give the employees in charge of managing the projects a solid structure that they can follow. This framework is based on five sequential steps, where each step must be completed before the project can move to the next step. This ensures that a project is adequately prepared. In addition, the framework calls for a project owner to be appointed during each project. The project owner carries responsibility for the execution and is the main point of contact for mechanics. These improvement to the current situation can help the company to get a better grip of the projects.

To assist the company in implementing the proposed solutions, a roadmap is created. Spanning a year, this roadmap segments the timeline into four distinct quarters, each with specific milestones and objectives. Each quarter identifies the key stakeholders involved, ensuring clarity in roles and

responsibilities. This approach not only simplifies the implementation process but also ensures systematic progress.

The roadmap's architecture is sequential. In the initial phase, the emphasis is on laying a robust foundation. This preparatory stage is pivotal as it sets the tone and direction for the subsequent quarters. By investing time and resources in this foundational phase, it ensures that the ensuing changes are well-informed, strategic, and align with the company's broader objectives.

As delineated in the roadmap, while the initial phase is introspective and preparatory, the succeeding quarters are more action-oriented. This progression, from planning to execution, ensures that the changes are not just incremental but sustainable. With each quarter building on the achievements of the previous one, the roadmap ensures a cumulative growth trajectory for the company.

In essence, ensures that the company's journey of transformation is not just systematic, but also holistic, comprehensive, and future-focused.

Quarter	People Involved	Tasks
1	Management	- Clearly defining each distinct role - Cleary specifying the responsibilities for each role - Determining the end goal for quarter four, defining what constitutes success and failure - Setting up KPIs to gather data and measure success
2	Management and office staff	- Setting agreements on structure - Implementing the role of project owner - Communicating responsibilities and expectations per position - Defining criteria for the preparation of a project - Set up the system of meetings with the mechanics
3	Management, office staff and mechanics	- Implementing the framework - Implementing preparation and feedback meetings with mechanics - Gathering data on KPIs
4	Management	- Evaluating the progress from the previous quarters using the KPIs - Determining the next steps

Roadmap for implementing the selected solutions.

Contents

List of abbreviations

RKT	Rombouts Kunststof Techniek
MPSM	Managerial Problem Solving Method
SME	Small to Medium-sized Enterprises
ERP	Enterprise Resource Planning
CAD	Computer Assisted Drawing
BPR	Business Process Reengineering
TD	Technical Department

PID	Project Initialization Document
KPI	Key Performance Indicator

Reader's guide

Chapter 1 – Introduction

This initial chapter provides an overview of the research topic. Section 1.1 introduces the company under investigation, while section 1.2 presents the problem case. Subsequent sections, 1.3 and 1.4, briefly touch on the problem owner and the stakeholders respectively.

Chapter 2 – Research Approach

This chapter presents the research strategy employed in this study. Section 2.1 lists the research questions that guided the literature review.

Chapter 3 - Literature Review

In this chapter, the research questions formulated in Chapter 2 are explored and addressed. Section 3.1 delves into the topic of internal communication, section 3.2 examines the role of digitalization in internal communication, section 3.3 discusses various process management methodologies, and section 3.4 focuses on the mechanisms of implementing change within an organization.

Chapter 4 - Organizational Analysis: Identifying Issues and Proposing Solutions

This chapter is divided into three segments, each scrutinizing the current situation at the company. Identified problems follow each part, with every problem accompanied by one or more proposed solutions. The three segments are: 4.1 flow of information, 4.2 roles and responsibilities, and 4.3 communication methods.

Chapter 5 - Choosing Solutions

This chapter briefly evaluates the solutions identified in Chapter 4 using several weighted criteria. The top three solutions are then determined, as these are considered the most crucial to implement.

Chapter 6 – Implementation of solutions

This chapter presents an implementation plan for the "framework" and "meetings" solutions, as well as a cost approximation for the "application" solution.

Chapter 7 – Evaluation

The evaluation of proposed solutions was conducted in collaboration with the company's director. Given the impracticality of assessing the solutions in practice, the solutions were rated based on their predicted impact.

Chapter 8 – Conclusion

The concluding chapter provides the research conclusions, recommendations to the company, discussion, and suggestions for future research.

1. Introduction

1.1 Introduction to the Company

Rombouts Kunststof Techniek (RKT) is a Dutch company based in Tholen, Zeeland that operates within the plastics industry. Their operations encompass the production and processing of various plastic products.

The company's output includes items such as buoys intended for use in harbors and rivers, underground piping solutions, and protective coatings for steel pipes. These offerings are designed to meet the needs of various sectors, such as infrastructure, construction, and maritime.

RKT's approach to its operations has an emphasis on innovation. This is reflected in the development of specialized equipment for field operations, including a mobile welding station, known as the "Butterfly". This equipment has had the effect of reducing processing times in pipeline welding operations.

The implementation of this equipment is carried out by a team of specialized plastic mechanics who operate not only domestically in the Netherlands, but also across the European Union.

An important aspect of RKT's corporate mission is the pursuit of high-quality product output while maintaining a focus on sustainability. This demonstrates the company's commitment to environmental responsibility, alongside its objective of product innovation and quality.

Figure 1 The Butterfly

1.2 Introduction to the Case at RKT

In the early stages of the research and project planning, the central problem at RKT company was believed to be the issues and inefficiencies associated with the usage of worksheets. These worksheets function as the medium for transferring crucial information from office workers to mechanics, encompassing details such as technical drawings, required equipment, client information, and schedules. This perspective about the worksheets was primarily shared by the office employees, who linked a multitude of errors and complications to their design and use. It was presumed that these errors induced needless expenses and inefficiencies.

However, the conducted research, which involved detailed interviews with the mechanics who interact with these worksheets on a daily basis, painted a different picture. Initially, the intent was to identify worksheet-related confusions and flaws, under the assumption that they were the root cause of the

company's issues. Contrary to expectations, the mechanics showed an overall positive attitude towards the worksheets, suggesting only minor areas for improvement or mentioning occasional errors, rather than systemic issues.

Despite these findings, it became clear that the company indeed had a substantial problem requiring attention: communication. The interviews with the mechanics uncovered an underlying issue within RKT, that of poor internal communication.

The data collected from different employees consistently pointed to a central problem - inadequate communication between various parties. Although the initial research objective was to improve the worksheet process, it is now clear that the focus needs to be on improving communication between the mechanics and the office employees supervising the projects. Since communication is a very general and broad topic this research will be limited to the initial groups, namely those directly associated with the projects. Other internal communication lines, such as between different office departments, will not be within the scope of this research.

The second main issue that was discovered lies in the company's structure during the preparation and execution of a project. The absence of a clear communication structure results in confusion and protracted communication chains among employees. Further compounding the problem is the unclear demarcation of roles and responsibilities. Though every employee theoretically has distinct duties, the lack of structure blurs these lines.

To address these issues, it's essential to focus on improving the structural and communication problems at RKT. This new focus will necessitate a shift in the project plan, moving from the initial objective of refining worksheets to restructuring communication lines and clarifying roles.

1.3 Problem Owner

In this context, the problem owner refers to the individual or group that bears the primary responsibility for identifying solutions and implementing changes to rectify the issue. They possess the requisite authority, resources, and capacity to effect meaningful changes in the process to mitigate or eliminate the problem.

In RKT's scenario, the company's management is recognized as the main problem owner. Being at the helm of the organization, the management wields control over strategic decisions, company resources, and policy changes. They have the ability to drive significant changes through the allocation of necessary resources, implementation of new regulations, or the adoption of digital transformations.

However, the office staff can also be considered partial problem owners. Given their active involvement in the daily operations and management of the projects, they have the potential to drive changes in their working methods, possibly in collaboration with the mechanics. Nonetheless, the ultimate responsibility for effecting change lies with the management, affirming their status as the principal problem owners.

1.4 Stakeholders

The process of understanding the nuances of internal communication project management within a company necessitates the identification of stakeholders. Drawing from the definition by Freeman & McVea (2005), stakeholders encompass individuals or groups that can be affected by or have the influence to affect the company's performance. In the context of this analysis, our focus narrows to stakeholders tied to internal communication - individuals and groups that are influenced by, and have the potential to impact, the existing communication issue. (Welch & Jackson, 2007)

The internal stakeholders within the organization can be categorized into three main groups:

1. Top Management
2. Middle Management, encompassing supervisors and project leaders
3. Teams and individual mechanics, functioning both in-field and within the workplace

These groups form the hierarchical spectrum through which communication is required to flow effectively. The extent of impact a stakeholder can exert on the issue can greatly vary depending on their position within this hierarchy. Similarly, the impact of the problem on different stakeholders is also diverse.

Top and middle management, for instance, have the potential to enact the most significant changes to address the communication problem. However, the adverse consequences of the problem permeate all levels of the organization, albeit in distinct ways.

Inadequate communication between project leaders and mechanics can lead to frustrations and necessitate overtime, the implications of which are directly faced by these employees. Conversely, while top management might not confront the same immediate frustrations, they shoulder the responsibility of managing the repercussions these issues have on the company's financial well-being due to the additional costs incurred.

By considering these factors, it is possible to gain a deeper understanding of the internal communication dynamics within the company and craft strategies that account for the unique viewpoints and challenges encountered by different stakeholder groups.

2. Formulating the Approach

In this section, the research approach to address the identified management issue at the company, specifically inefficient internal communication and lack of structure, is outlined. Using a systematic methodology, the research aims to uncover actionable solutions that will enhance efficiency through improved internal communication and more structured processes.

The central research question guiding this investigation is:
"How can RKT improve its efficiency by implementing improvements in internal communication and process structure, from customer order intake to project completion?"

The Managerial Problem Solving Method (MPSM) as developed by (Heerkens & van Winden (2017) will be used to conduct the research. This seven-step methodology encompasses the following stages:

1. Problem Definition – Chapter 1
2. Approach Formulation – Chapter 2
3. Problem Analysis – Chapter 4
4. Formulation of Alternative Solutions - Chapter 4
5. Solution Selection – Chapter 5
6. Solution Implementation – Chapter 6
7. Solution Evaluation – Chapter 7

The MPSM method is deployed as the guiding framework for this research. Subsequent chapters delve into the various stages of the MPSM, as delineated below:

Chapter 1 commences with the initial stage of the MPSM - the problem definition. The management problem is delineated, with a parallel examination of its associated underlying problems, facilitated via a problem cluster.

The subsequent segment of Chapter 4 is dedicated to the analysis of the problem and the consequent formulation of pertinent solutions. The process initiates with an exploration of the company's extant processes and operations. This analysis subsequently engenders the identification of various problems, each of which is complemented by one or multiple viable solutions.

Considering the time constraints inherent in this research, it is not feasible to address each identified issue. Thus, Chapter 5 focuses on the prioritization of solutions by weighing their potential benefits against associated investments.

Chapter 6 pertains to the development of a strategic proposal aimed at the efficacious implementation of the recommended solutions. The proposition is designed to provide the organization with the requisite information and strategic direction necessary for a successful implementation.

The evaluation of the proposed solutions in this research will not hinge on their practical implementation. Instead, the input will be solicited from the company's management, focusing on their perceptions regarding the potential impacts and feasibility of the suggested solutions. This method aligns the research outcomes with the company's operational realities and strategic outlook, thereby ensuring the management's active involvement and investment in the problem-solving process. This evaluative process is described in Chapter 7.

2.1 Research Questions

In seeking to address the issues faced by the company, this research aims to provide an answer to the primary research question, along with actionable recommendations for potential solutions.

Given the complexity of the primary research question, it necessitates subdivision into several sub-questions to ensure a comprehensive understanding and solution proposition. Chapter 4 proposes and answers three topics that investigate the current processes at the company.

Beyond understanding the internal processes of the company, it is also crucial to review relevant literature. To unearth solutions for the problems RKT is encountering, the following research questions are proposed:

1. **How do organizations manage internal communication between different departments?**
2. **How do companies currently make use of digitalization in process management and communication?**
3. **What kinds of frameworks are employed to improve process structure and management?**
4. **How to implement changes to a process structure to ensure a successful outcome?**

3. Literature Review

In this section, a literature review is conducted to answer the research questions formulated in Chapter 2. This chapter investigates systems and practices used by companies similar to RKT. To define this similarity, the literature will be used is applicable or originates from Small and Medium-sized Enterprises (SMEs) in the manufacturing or construction sector. The four main topics in the order they are discussed are: Internal communication, Digitalization and digital systems, Frameworks, and Means of implementing change. The literature on these topics was found by using keywords. Based on the results of the keyword searches, the snowball method was used to find additional papers on the relevant subjects.

3.1 How do Organizations Manage Internal Communication Between Different Departments?

3.1.1 Introduction

Successful communication is pivotal in driving an organization's success, specifically in the domains of large-scale manufacturing and construction projects. Delays or errors within these projects can incur substantial costs, with a substantial number of critical missteps often originating from communication mishaps.(Safapour et al., 2020). It is particularly crucial during project execution, serving as a conduit for discussing problems, implementing changes, and updating supervisors on progress. To ensure effective communication, companies must establish clear structures and channels.

This section delves into the theory of communication, aiming to better understand its significance and how various organizations manage it.

3.1.2 Communication Structures

Communication between employees and managers can be characterized into two types: two-way and one-way communication. One-way occurs when one party, often management, addresses employees as a group without expecting a response from them. This differs from two-way communication which allows discussion or feedback between the parties. (Welch & Jackson, 2007)

Ideally, two-way communication is preferred due to its interactive nature. Two-way communication requires managers to involve employees in the opportunities and challenges faced by the company in the current environment. However, this may not always be feasible, particularly in large organizations with a vast employee base. The logistics of facilitating two-way communication between managers and employees would be time-consuming and impractical.

As a consequence, one-way communication is often the viable alternative. Despite its unidirectional flow, one-way communication can still be highly effective when the transmitted message is clear and consistent. For instance, when specific tasks need to be assigned to a team of mechanics for a project, a project leader can effectively communicate these tasks to the entire group simultaneously, thereby ensuring a smooth, efficient transmission of information.

Companies need to find a balance between these two structures. Two-way communication is preferable as it involves employees more in the company which is beneficial for employee morale. However, due to

the time-consuming nature of this structure it is not possible to completely abandon one-way communication. (Welch & Jackson, 2007)

3.1.3 Goals and Benefits of Effective Internal Communication

Inadequate internal communication can significantly hinder a company's success. Hence, prioritizing the enhancement and maintenance of effective communication within the organization is crucial. Effective internal communication can bolster productivity within a company. Productivity, defined as the relationship between a process's input and output to create a product or service (Opitz & Hinner, 2003) can be profoundly influenced by the quality of internal communication. The input of a process can often be the work provided by an employee, and the efficiency of this work is largely affected by the level of internal communication in the company.
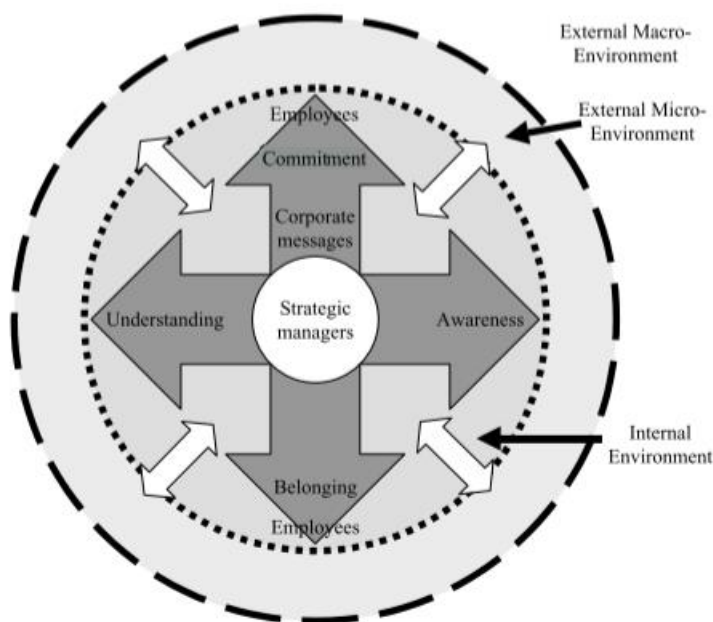
Figure 2 Goals of internal communication (Welch & Jackson, 2007)

Figure 2 showcases the four objectives of internal communication as defined by Welch & Jackson (2007). In terms of employee commitment, Allen & Meyer (1990) categorize it into three distinct types:

1. Affective Commitment: Employees under this category feel a strong emotional bond with the organization and genuinely want to be a part of it. They resonate positively with the organizational culture and values, leading to their happiness and satisfaction at the workplace.
2. Continuance Commitment: This form of commitment exists when employees choose to stay with an organization due to the perceived high cost of leaving, rather than emotional attachment. These costs could include loss of income, seniority, or the social consequences of leaving their current position.
3. Normative Commitment: This pertains to employees who continue with the organization out of a sense of obligation. They may feel that the organization has invested heavily in their development, or their departure could have a significant adverse effect.

Employee commitment is intricately tied to the quality of internal communication, which impacts daily tasks, team collaboration, and project execution. It essentially reflects the level of employee loyalty towards the company.

Enhancing internal communication can positively influence employee commitment, particularly when it addresses the remaining three goals: understanding, awareness, and belonging.

"Understanding" refers to an employee's grasp of the company's position in the competitive landscape. Internal It's about ensuring that employees are not only aware of the company's vision and objectives, but also understand how their roles contribute to achieving these goals. Effective internal communication serves as a crucial tool in aligning employees with this overarching vision.
"Awareness" denotes the extent to which the organization communicates changes in the business environment to its employees. With clear communication, companies foster awareness which can keep employees informed and allows them to react more effectively to changes.
"Belonging" reflects the feeling among employees that they are an integral part of the team. People inherently desire a sense of belonging, making this a crucial objective of internal communication. Effective internal communication can pivot this from a potential "us versus them" scenario to a unifying "we" paradigm, creating a sense of unity and mutual respect among employees.

Poor communication can adversely affect employee morale, leading to diminished performance or elevated staff turnover. On the other hand, good communication and a focus on the four goals mentioned can improve process control by enabling employees to swiftly address and resolve project problems and changes. This not only reduces errors and delays but also enhances final product quality and customer satisfaction, further underscoring the critical role communication plays in an organization's productivity and success. (Opitz & Hinner, 2003)

3.1.4 Types of internal Communication
Downward Communication
Downward communication refers to the transmission of information from higher echelons of an organization to those at lower levels. This approach is typically exemplified by directives from management instructing subordinates on tasks to perform. It serves five main purposes (Lunenburg, 2010):

- **Implementation of Goals, Strategies, and Objectives**: Management is tasked with developing and conveying the organization's long-term vision and the strategies necessary to achieve it.
- **Job Instructions and Rationale:** Not only must management instruct employees on their roles, but they must also provide the reasoning behind these instructions. While there might be some flexibility in task execution, the parameters of such flexibility need to be defined and communicated by the management.
- **Procedures and Practices:** In alignment with job instructions, management must establish standardized procedures and best practices. This uniformity can be facilitated through procedure manuals or formal training.
- **Performance Feedback:** Constructive feedback and recognition for good work are crucial for continuous employee improvement and morale.
- **Socialization:** Encouraging socialization can boost employee motivation. This can be facilitated through social events, team-building exercises, or company newsletters.

Upward Communication

Upward communication flows in the opposite direction, from lower levels to higher ones. It serves several purposes(Lunenburg, 2010):

- **Problem and Exception Reporting:** Routine updates about challenges or alterations encountered during a project fall under this category.
- **Suggestions for Improvement:** Frontline employees who engage in daily operations often have valuable insights into optimizing processes or solving issues. Sharing these ideas with management can lead to structural or procedural enhancements.
- **Performance Reports:** These are utilized to inform management about a department's operational efficiency or productivity.
- **Grievance and Dispute Resolution:** When conflicts or disagreements arise among employees, and resolution isn't achieved independently, management should be informed for appropriate action.
- **Financial and Accounting Information:** Updates about the financial performance or status of the company are often communicated upwards to allow for informed decision-making.

Horizontal Communication

Lastly, horizontal communication occurs among peers at the same hierarchical level within an organization. This method is largely used for coordination and collaboration, either within the same department or across different departments. (Lunenburg, 2010)

3.1.5 Indicators of Quality Communication

The quality of communication hinges on two pivotal components: the nature of communication and its perception (Reza Hosseini et al., 2017). 'Nature' refers to the method and frequency of communication within a process, characterized by its frequency and bidirectionality. 'Perception', on the other hand, refers to how the involved parties interpret the communication. For it to be effective, the communication must be perceived as beneficial, comprehensive, and precise.

Indicators and their Definitions

Indicator	Definition	References
Accuracy*	The data are correctly transferred without bias, any distortion or withholding of information.	(Aubert *et al.*, 2013; Kahn, Strong, & Wang, 2002; Miller, 2005; Thomas *et al.*, 1998; Xie *et al.*, 2010)
Completeness*	All the essential data are available and no required information is missing.	(Aubert *et al.*, 2013; Kahn *et al.*, 2002; Thomas *et al.*, 1998; Xu, Nord, Nord, & Lin, 2003)
Reliability	The receiver regards information as reliable.	(Aubert *et al.*, 2013; Kahn *et al.*, 2002; Miller, 2005)
Understandability*	The audience easily comprehend the provided data and information.	(Aubert *et al.*, 2013; Kahn *et al.*, 2002; Miller, 2005; Thomas *et al.*, 1998; Xie *et al.*, 2010)
Bidirectionality	Feedback, clarifications and verifications are easily obtainable from the involved parties.	(Aubert *et al.*, 2013; Mohr & Sohi, 1996)
Timeliness*	The information is provided on time (not earlier and with no delay).	(Aubert *et al.*, 2013; Kahn *et al.*, 2002; Miller, 2005; Thomas *et al.*, 1998; Xie et al., 2010)
Frequency	This notes how often involved parties contact each other.	(Ellwart, Happ, Gurtner, & Rack, 2015; Mohr & Sohi, 1996)

*Note: These indicators have been mentioned in the construction literature.

Figure 4 Indicators of quality communication (Reza Hosseini et al., 2017)

In addition to the indicators in Figure 4, five additional indicators were found during research done by Reza Hosseini et al. (2017)

Sense of Presence

The sense of presence refers to the capacity of individuals involved in a conversation to comprehend each other. When employees are communicating, physical documents often play a vital role in providing a comprehensive understanding of the discussion's key points.

Documentability

Documentability has dual aspects. On one hand, it can refer to the documentation of knowledge to establish a foundation. This documented knowledge base enables parties to swiftly access necessary information, thereby expediting processes.

On the other hand, documentability can relate to the capacity to document communications. In instances where trust is lacking, recording conversations and agreements can provide assurance, as it offers a form of negotiation leverage. These recorded dialogues can subsequently lead to fewer errors, as those involved will be more cautious in adhering to the agreements.

Persuasiveness

Persuasiveness refers to individuals' ability to influence one another during communication. It's particularly vital in the design and execution phases of manufacturing and construction processes. Persuasiveness enables involved parties to comprehend why a task needs to be performed in a specific way or why a deadline is stringent.

Accessibility

Quality communication is vital in manufacturing and construction processes and requires excellent accessibility to the involved parties. For instance, when a problem arises, a mechanic should be able to quickly contact a supervisor to solve the issue. If this doesn't happen, delays and lowered morale among participants may occur.

Relevancy

The information conveyed during communication should be relevant, meaning that it should strictly provide appropriate responses to questions, for instance. Irrelevant information could lead to confusion and inefficiency.

3.1.6 Conclusion

To conclude this research question, internal communication plays a major role in the success of a company. It's crucial to understand that effective internal communication depends on multiple factors. Acknowledging the stakeholders involved in the given scenario is particularly important, as the approach to communication varies based on the individual's role within the organization.

From a management perspective, communication serves to inspire and inform team members. While strategic directions and decisions are determined at this level, the successful realization of these visions depends on the active engagement and understanding of all employees. Therefore, the management of an organization needs to understand the value of internal communication in achieving employee commitment.

On the other hand, non-management employees primarily engage in horizontal communication, coordinating their efforts with colleagues to accomplish daily tasks and projects. However, maintaining an open line of communication with management is equally important, particularly for discussing challenges, changes, or providing innovative suggestions. While it is important that this open line is facilitated by management, active participation of all employees is needed.

Overall, it's clear that a well-rounded communication approach, accommodating all levels within the organization, is key to fostering a productive work environment.

3.2 How do Companies Currently Make Use of Digitalization in Process management and communication?

3.2.1 Introduction

This section delves into the multifaceted opportunities digitalization presents for streamlining a company's processes. The onset commences with an exploration of smartphones, given their ubiquity in today's society. The latter half of this chapter sheds light on four prevalent uses of digitalization. Existing literature is used to discern the potential advantages of embracing digitalization.

Presently, a multitude of contemporary enterprises are either already harnessing digital avenues or are on the cusp of transitioning. This burgeoning trend provides a rich reservoir of data, enabling robust conclusions about the digital shift. According to a study by (Arora & Rathi, 2019), businesses that have embarked on this digital journey have observed marked upticks in sales, operational efficiency, and competitive edge. However, the process of introducing digitalization can come with challenges. The study underscores several barriers, with the steep financial outlay associated with devising and rolling out digital solutions emerging as a principal concern, especially for smaller companies.

The process of digitalization will also impact the employees at a company. For this reason, it is highly advised that companies include employees from all levels in the process during the creation and implementation of digital systems. This allows companies to make use of the knowledge employees have about the current process and way of working, and how digitalization could best help them. Next to this it can help employees overcome possible fears or doubts, leading to better acceptance of the final product. (Kilimis et al., 2019)

3.2.2 Smartphones

The use of personal devices for internal communication is a means for companies to promote communication between employees. Research has shown that this brings both positive and negative consequences for a company's productivity. (Pitichat, 2013)

Due to the social aspect of smartphones, the possibility arises that employees will be distracted from their work by them. Notifications from smartphones can undoubtedly be disruptive, drawing employees away from their work tasks. Additionally, the intrusion of personal life into the professional space via smartphones may escalate stress levels for some individuals.

The use of smartphones is thoroughly intertwined in people's life that forbidding their use or presence in the workplace is often not an option. Luckily smartphones also offer benefits to the internal communication of a company.

Smartphones in the workplace can improve relationships between employees. Due to the social applications of smartphones, they are an effective tool to use in the workplace to connect employees. An internal application from a company allows employees to interact with each other in ways they would normally not be able to. This increase in communication and contact does not only improve working relations between employees of the same level, but it also allows management to form better relationships with the employees in different levels at the company.

Another benefit of smartphones is the ability to share knowledge among colleagues. This can include a variety of different aspects, from sharing data files to sharing project blueprints. Using a mobile application allows for quicker transferring of knowledge while at the same time removing the need for physical documents.

Finally, smartphones can increase the sense of autonomy among employees. This is caused by the sense that employees are free to choose their own preferred devices, as opposed to a company imposing a ban. A sense of autonomy has proven to increase employee morale and productivity. (Pitichat, 2013)
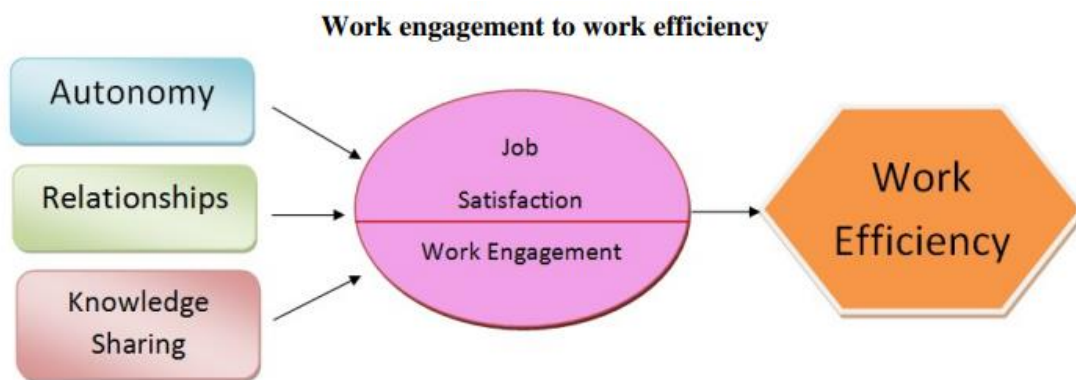
Figure1: Toward work efficiency by utilizing Smartphones at work

Figure 3 Relations between the potential benefits of smartphone use and work efficiency (Pitichat, 2013)

The three potential benefits of smartphones as mentioned above can play an important role in the workplace, and how employees experience their work. While the use of smartphones is not something that is applicable in the same manner to every company, or even every industry, the potential needs to be considered by companies.

3.2.3 Digital Systems

ERP

An Enterprise Resource Planning (ERP) system allows companies to digitally organize the entire process. The system allows for interdepartmental transferring of information, from customer order intake to the final execution of a project or service. Next to facilitating the transfer of information in a company, an ERP system also serves as a database. The strength of an ERP system lies in the ability to connect every aspect of a company into one system. When a company uses multiple different system besides the ERP,

there is often the possibility to use an Application Programming Interface (API) to enable communication between the ERP and other systems. (Gupta, 2000)

Intranet

Intranet is a private version of the internet that is only used by a company network. It is only accessible by employees of a company, often only at the location of the company. This allows a company to fully control what happens and who has access.

The intranet is used to share information within a company and to facilitate communication between departments and employees. The complexity of a company's intranet varies greatly, some companies might only use it as a database for sharing documents while other companies make use of many different features. These features can for example include a messaging or chat system, a knowledge base and integrations to other systems. (Bottazzo, 2005)

Internet of things

The internet of things (IoT) is a combination of digital systems that are interconnected. An example of this is sensors and computer that communicate information to one another via a network. The applications of the IoT are vast, in industry it is often used to boost efficiency or to improve predictions. Companies in the production or manufacturing sector can for example use IoT to monitor equipment. This can enable preventative maintenance to increase operationality and safety. (Parusheva & Aleksandrova, 2021)

CAD

Another widely used system is Computer Aided Drawing. This type of software allows a company to create digital 2D or 3D drawings. This removes the need for physical drawings on paper and allows for the drawings to be quickly shared throughout the company, via an ERP system for example. (BasuMallick, 2022)

3.3.4 Conclusion

Digitalization offers a myriad of avenues for companies to explore. The literature underscores that early adopters in this realm often find themselves at a distinct competitive edge. This advantage stems from the multitude of benefits intrinsic to digital systems, including the enhancement of planning and logistics capabilities and fostering elevated levels of teamwork and communication.

3.3 What Types of Management Techniques are Employed to Improve Process Structure and Management?

3.3.1 Introduction

A variety of methodologies are employed by companies to structure their processes, each characterized by unique advantages and disadvantages. The choice of methodology is often dictated by the specific requirements of the company. This section delves into some of the most popular methodologies, elucidating their individual strengths and weaknesses.

3.3.2 Agile

The Agile methodology prioritizes flexibility, employing an iterative process with continuous feedback and improvement where team members can revisit previous steps to implement changes or rectify

mistakes. The Agile methodology makes use of sprints that last for a set duration and focus on one or several smaller parts of the project. Agile is particularly useful in situations where the client's desired outcome is not explicitly defined or the project takes place in a dynamic environment, allowing for a higher degree of adaptability. (Volovyk & Harmash, 2022)
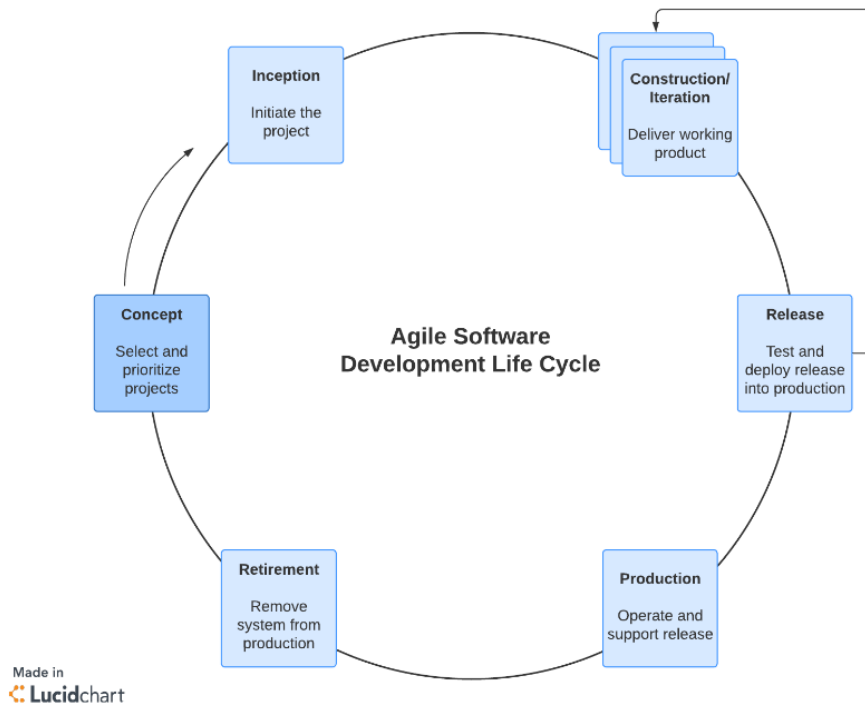
Figure 4 Visual representation of Agile

3.3.3 Kanban

Kanban is a variant of Agile, utilizing a similar iterative process. However, Kanban aims to effect incremental improvements based on insights gathered during the project. It employs a visual approach to identify bottlenecks in the process, which can then be addressed through small-scale enhancements rather than substantial process overhauls. The main aim of Kanban is to limit the amount of work in progress to prevent an overload of tasks. This is done by agreeing on a set number of tasks that can be in progress at one point. (Volovyk & Harmash, 2022)

3.3.4 Waterfall

The Waterfall methodology represents a more linear alternative to Agile. As the name suggests, the process cascades through a predetermined sequence of steps, each of which must be completed before progressing. This method lacks the flexibility of Agile, being less equipped to accommodate changes to completed steps. Therefore, it is essential for the project scope to be clearly defined from the onset, making Waterfall less suitable for instances where the client lacks a precise vision of the desired outcome. The success of the Waterfall methodology depends on the stability of the project's requirements and environment. (Volovyk & Harmash, 2022)

3.3.5 PRINCE2

The PRINCE2 (PRojects IN Controlled Environments) methodology is a sequential method that emphasizes project control. It starts by setting clear boundaries, defining roles, and establishing expectations, ensuring that the predetermined project scope is only exceeded when absolutely necessary. The larger process is broken up into smaller, more manageable stages. (Chen, 2010)

3.3.6 Critical Path Method

The Critical Path Method involves charting a predefined path before the project's commencement. Each necessary task is identified and its relationship with other tasks is mapped. This involves determining task dependencies and expected durations. Consequently, a path of tasks is established, offering clear insights into the sequence of task completion and the overall project timeline. Due to the task's decency on one another, a drawback is that a delay on a single task can delay the whole project. (Volovyk & Harmash, 2022)

3.3.7 Lean

The Lean methodology focuses on waste reduction in a process. Unlike the other methods, Lean aims to identify and evaluate value-adding and wasteful activities within a process. Value-adding activities contribute directly to customer value, while wasteful activities may not directly add customer value but might be necessary from the company's perspective. By pinpointing wasteful activities, a company can minimize them, thereby focusing more on value-adding activities. (Volovyk & Harmash, 2022)

3.3.8 Conclusion

The frameworks discussed in this section all bring unique benefits when introduced to a process. However, not every framework can easily be applied to every situation. It is therefore important to closely examine the desired situation and the aspects of the process in question.

3.4 How to Implement Changes to a Process Structure to Ensure a Successful Outcome?
3.4.1 Introduction

This section investigates how to implement changes to an organization or process. The previous research questions have all looked into the practices used by companies, however it is equally important to know how to apply these findings when changing a process. This section will therefore look into challenges and requirements when implementing changes.

3.4.2 BPR

Business Process Reengineering (BPR) is a management strategy that focuses on changing the process within a company to achieve higher productivity or efficiency. It is a comprehensive method to implement significant changes within a company. Unlike approaches that use a more iterative approach to improve a process over time, BPR aims to make more radical changes in a shorter time span.

3.4.3 Pitfalls of BPR

Implementing Business Process Reengineering (BPR) could involve considerable risks for any company due to the drastic nature of the changes involved. As such, it requires thorough planning and deliberation to ensure a successful transformation. Goksoy et al. (2012) have pointed out a number of pitfalls that businesses should be mindful of when conducting BPR.

Firstly, any proposed process change should not diverge from the organization's primary objectives. The alterations need to be driven by the pursuit to enhance the company's central mission. Therefore, it is crucial for the company to explicitly define the purpose of the existing process, and the ways the amendments will reform it, whilst still aligning with the organizational goals. (Goksoy et al., 2012)

Secondly, process alterations may introduce significant disruptions to everyday operations. This aspect warrants cautious attention. During BPR planning, there is a risk that the design phase might eclipse the implementation stage, leading to a possibility of envisioned alterations either failing or getting delayed during actual execution. (Goksoy et al., 2012)

Thirdly, despite BPR's reputation for inducing radical changes, it is essential to remember to implement these changes one step at a time. An overzealous attempt to promptly put into action extensive changes often leads to failure, as employees may feel overwhelmed or might not have sufficient time to adapt to the new circumstances. Moreover, companies should be patient and understand that changes, especially those involving cultural shifts, could take considerable time before any tangible effects become evident. (Goksoy et al., 2012)

Finally, the significance of management commitment in the context of BPR cannot be stressed enough. Practically speaking, any significant transformation within an organization must originate from the top echelons and cascade down. This necessitates robust involvement and dedication from the management.
Strong leadership is a prerequisite to secure employee buy-in for the changes. Leaders must clearly communicate the necessity and benefits of the proposed changes to inspire and motivate employees. They must also actively demonstrate their commitment to the changes by being involved in every step of the process, showing that they too are part of the transformation.
In essence, the role of the management team goes beyond merely initiating and implementing BPR; they must also foster an environment that encourages acceptance of the changes. They need to lead by example, fostering a culture of resilience and adaptability. Thus, for BPR to truly take hold and succeed, management must embody the change they wish to see in the organization. (Goksoy et al., 2012)

In summary, successful implementation of BPR hinges on thoughtful contemplation of the objectives and how these align with the existing organization. Many of the pitfalls outlined can be circumvented by crafting a well-rounded approach that addresses both the design and the execution phase of the BPR within the company. Management plays a key role in this process; their commitment can make or break the implementation. This approach will ensure the benefits of BPR are fully realized and the potential pitfalls avoided.

3.4.4 Business Change Methodology
Goksoy et al. (2012) propose a fifteen-step methodology for the successful implementation of business changes:

1. Identify the necessity for change: Examine the organization's existing processes and pinpoint areas that could benefit from improvements. This is the crucial first step toward an effective BPR.
2. Ensure management commitment: As previously highlighted in the discussion on pitfalls, commitment from management is an absolute prerequisite for successful implementation of BPR.

3. Communicate the necessity for change with employees: While the involvement of management is critical, obtaining commitment from employees is equally important. Thus, it's essential to keep employees informed about the coming changes and the associated objectives.
4. Develop process objectives: Upon identifying areas needing improvement, the subsequent task is to delineate what the ideal situation should look like post-implementation of changes.
5. Form a reengineering team: The proposed modifications should be meticulously designed, and a comprehensive implementation strategy should be crafted. This responsibility falls on a select group of employees who possess an extensive understanding of the organization and its processes.
6. Determine the scope and scale of the project: After the objectives have been outlined, the team must establish the extent of the changes and the estimated timeframe required for implementation.
7. Designate the process to be reengineered: Following the determination of the scope, the next course of action is to specify exactly which process will undergo reengineering.
8. Analysis and understanding of the current process: To prevent any pre-existing issues from persisting in the new process, an analysis of the current process is essential to gain further insights.
9. Design the new process: Once the desired goals and scope of the changes have been established, the team can proceed to devise the solutions.
10. Take advantage of IT: Information Technology can play a significant role in facilitating BPR. Hence, it is important to consider the potential benefits of IT in the new process and its implementation.
11. Include collaborators in the reengineering process: Collaborators such as suppliers or clients should also be involved in the process to ensure a smooth transition across all aspects of the operation.
12. Pilot the new process: Prior to actual implementation, a pilot run of the new process can prove beneficial in identifying any unforeseen flaws or oversights.
13. Train employees who have relevance with the redesigned process: Relevant employees should be updated about the changes and given training to familiarize them with the new process.
14. Implement the new process: In this phase, the company should formulate a transition strategy, which can range from a gradual implementation to a swift, overnight shift.
15. Monitor and improve the new process: Once the process has been reengineered, the company should diligently monitor its effects. BPR isn't a one-off project; it's an ongoing endeavor to continually enhance and adjust the process for long-term efficiency and effectiveness.

This methodology provides a structured approach to implementing process changes in an organization. It takes into account the preparation needed before commencing with the desired changes. Secondly, it notes the importance of continuous monitoring. A company can monitor the success of the implemented changes by using Key Performance Indicators (KPIs) based on the nature of the process.

3.4.5 Conclusion
In conclusion, Business Process Reengineering (BPR) is a strategy that is aimed at improving organizational efficiency or productivity by implementing radical changes. Due to the radical nature, careful planning and monitoring is required. Management needs to be on top of guiding the changes and ensuring commitment both from itself and the employees.

The fifteen-step methodology formulated by (Goksoy et al., 2012) provides a structured approach. It outlines the need for identifying areas of improvement, the process of formulating and implementing solutions and the monitoring of the final result.

3.5 Conclusion of the Literature Review

This chapter aimed to dissect the literature concerning communication and structure, essential elements that shape organizational dynamics.

In Section 3.1, the intricacies of internal communication were examined. It was discerned that communication within an organization is more than just relaying messages; it's about fostering an environment where high-quality, two-way communication thrives. Ensuring that employees are active participants in the communication process, rather than passive recipients, is paramount to achieving an inclusive and informed workforce.

Section 3.2 delved deeper, spotlighting the transformative role of digitalization in the corporate sphere. The ubiquitous presence of smartphones was scrutinized, leading to an enlightening conclusion: rather than viewing these devices as distractions, forward-thinking managers can leverage them as invaluable tools for enhanced connectivity and real-time communication.

The discussion in Section 3.3 highlighted various methodologies employed by organizations to optimize their structural dynamics. A well-defined structure not only streamlines processes but also acts as a catalyst for organizational efficiency, promoting better resource allocation and decision-making.

In Section 3.4, our focus shifted to the intricate art of process enhancement. The cornerstone of successful change is clarity – understanding the underlying issues that necessitate change. Once identified, the blueprint for change, or a roadmap, must be methodically crafted, ensuring that every phase of the transformation is meticulously planned and executed. This planning is not just about foreseeing potential challenges but also about facilitating smooth transitions that can be seamlessly integrated into the organization's existing framework.

To synthesize, this literature review illuminated the multifaceted nature of communication and structure in organizations. As we gear up to address the challenges at RKT, the insights garnered from this review will serve as foundational pillars, aiding in the formulation of pragmatic, research-backed solutions.

4. Organizational Analysis: Identifying Issues and Formulating Solutions

This chapter investigates the current processes and situation at the company. Therefore, the central question is: "What is the current operational state of the company, and how are processes currently managed?"

The intent behind this initial question is to generate insights into the daily operational procedures at the company. Due to the broad nature of this question, it's further divided into three smaller investigative areas:

1. "**What is the information flow structure within the company when a customer places an order?**"
2. "**What are the distinct roles within the company, and what responsibilities do they each carry?**"
3. "**What are the methods of communication between employees across various departments at the company?** "

This chapter consists of three parts with each part first answering one of the questions mentioned above. This is then followed by multiple problems that were identified in the current situation. Each of the problems is followed by one or more proposed solutions, after which the next problem and its accompanying solution are described.

4.1 What is the Information Flow Structure within the Company when a Customer Places an Order?

RKT comprises three key divisions: the office, the workshop, and fieldwork. Within these main divisions, there are numerous subdivisions. For instance, the office houses various departments, such as management, project planning, and human resources, among others. Outside the office, mechanics operate either within the workshop or in the field. While these mechanics possess a wide range of skillsets, they often specialize in specific tasks such as milling or welding.

Information transfer regarding orders is facilitated through worksheets created by the work planners. For the workshop-based mechanics, these worksheets predominantly feature drawings and action steps necessary for the final product's creation. In contrast, for field-based mechanics, the worksheets carry additional information, including the project location, customer details, and safety precautions, along with the equipment required, which can vary significantly per project.

The process for handling client requests follows a series of steps. Initially, there is the order intake, which could either be based on a quotation or be quote-free. Quotation-based requests are entered into the ERP (Enterprise Resource Planning) system and subsequently transformed into orders. In these cases, order costs are typically determined by the required materials and processes involved. However, for larger or more complex projects, like sizable onsite installations, providing an accurate quotation might be challenging due to uncertainties around the required activities and materials. Such orders, known as 'direct orders,' necessitate one or more calculations based on customer information.

Office-based draftsmen use CAD software to design the customer's request. The complexity of the designs generated is not constant but varies greatly, largely contingent upon the specifics of the project at hand. Simpler projects, such as workshop assemblies, may just require basic drawings depicting

where to connect various components and at what angle. However, for larger, typically field-based, projects, the draftsmen are often required to create complex, multi-faceted drawings. These comprehensive drawings serve as an overview of the entire project, aiding mechanics in grasping the broad scope and minute details of the task. Upon completion, these designs are printed out and physically handed to the mechanics appointed to fulfill the order, serving as their blueprint for the execution of the project.

Following order intake, preparations commence. Necessary materials are procured from respective suppliers, and a project schedule is created, factoring in supplier delivery times and customer preferences. Upon securing the materials and confirming the schedule with the customer, labor hours and equipment are reserved based on the type and duration of the activities. The designated mechanics are assigned to the project, their equipment is reserved at the technical department, and a company vehicle is booked for the project date.

The process above outlines the steps taken when a customer places an order with the company. This process is executed by the office employees. Once the order intake is complete, the mechanics - divided into fieldworkers and workshop staff - undertake the actual work. The customer orders are converted into worksheets, providing the necessary information for the mechanics to carry out the manufacturing or construction as per the customer's request.

4.1.1 **Problem:** Preparation

Addressing the initial phase of setup and preparation is crucial. As the company primarily engages in repetitive and straightforward tasks, such as the welding of hundreds of meters of pipelines, the efficiency of the project depends on a smooth start. If complications arise, they most commonly occur at the project's inception due to several reasons connected to the company's lack of structural and communicative solidity.

Consider project initiation via customer requests. Typically, a project leader receives the task specifications either via email or phone, with the only available information being what the customer is able to provide. In some cases, photographs provided or requested from the customer can supplement this. However, it's not uncommon for the data at hand to be insufficient for gaining a comprehensive understanding of the task, leading to issues when the work commences. One could think that an easy solution to this problem is to simply ask the clients for more information, for example in the form of detailed pictures or filled-in questionnaires. This solution might help in some cases, however the problem with this approach is the fact that clients will often consider this part of RKT's responsibility.

In the absence of a clear protocol to address these situations, the company often has to resort to site visits for a complete situational overview. While this approach can eliminate problems related to information scarcity, it is not part of the standard process. As a result, it is often neglected or skipped.

The projects can be broadly divided into two categories: those that are impossible to inspect beforehand and those that are possible. Instances where prior inspection is impossible usually involve underground pipelines that need welding. These pipelines can only be inspected once the surrounding area has been excavated, which typically happens shortly before the scheduled work. Thus, in these cases, the information relayed by the customer forms the sole basis for work preparation.

The second category, constituting the majority, includes projects where prior inspection is possible. Currently, there is no structure as to when a project must be inspected in person. The result of this is that it rarely or even never actually happens. This puts the company at a disadvantage right away since employees deny themselves the possibility of properly investigating and preparing a project. The reason why employees are not inclined to perform these inspections is because it is considered to take up too much time or to be the responsibility of someone else.

4.1.2 Solution: Preparation

Preparation Meetings

Addressing the issue of collaboration between mechanics, office staff, and Technical Department (TD) employees requires a two-pronged approach. The first part, preparation, is discussed in this section while the second part, evaluation, is discussed later. The solution involves planning meetings between project leaders and mechanics, a strategy currently absent from standard procedures but one which could significantly benefit the company. While the daily tasks of both mechanics and office staff can be demanding, and mechanics are often out in the field, this research has highlighted numerous frustrations stemming from employees working in isolation rather than in synergy. These frustrations are particularly prominent during the preparation and evaluation phases of projects.

Mechanics frequently express the belief that preparation could be better, whereas office staff counter that perfect pre-project site inspection isn't always feasible. The suggested resolution involves regular preparation meetings between office staff and mechanics, aiming to align understanding on the following points:

1. Project details: The project leader can provide a brief overview, giving mechanics an understanding of the work location, the client, and the ultimate goal of their work.
2. Customer details: Mechanics need to know who they're working for, facilitating direct communication should problems or questions arise, thus removing the project leader as the intermediary and preventing miscommunication.
3. Task types: It's important for mechanics to know the tasks required (welding, cutting, coating, etc.), enabling them to better prepare and offer their own insights based on their experiences. Knowing what is expected of them, it will be avoided that mechanics face surprises once they arrive.
4. Equipment needs: Discussions should include which tools and equipment are necessary. In some cases, mechanics have their own beliefs on the optimal equipment to complete a project, so allowing them to express preferences could improve project outcomes.
5. Scope and flexibility of the project: Clarity about the project's boundaries and the potential areas where changes might occur can help avoid confusion and miscommunications, especially in instances where the client might request alterations. This can help solve the problem of ambiguous agreements, as discussed in Section 4.3.5.
6. Project timeline: Discussing the project's schedule and completion deadlines can alleviate stress around tight deadlines, potentially improving the quality of the final work delivered. Explaining why tight deadlines are sometimes unavoidable can also help mechanics better understand the reasons behind such planning.

Introducing meetings that include the points above will help both parties to understand each other's reasonings and concerns. The introduction of these meetings will also significantly improve the quality

of communication according to the indicators (Reza Hosseini et al., 2017). Completeness is improved since these meetings allow for a complete transfer of information. Questions can be asked and answered during the meeting to fill in any information gaps that an employee might have. Understandability will equally benefit from these meetings as it allows project leaders to explain details. Previously, mechanics would need to use the worksheets alone to understand a project, leading to cases of misunderstanding. Bidirectionality is improved due to the fact that these meetings allow for feedback, clarifications and verifications. Finally, regular meetings improve the frequency of communication since employees meet at the start of every project.

Meetings in person will require the company to give up more hours due to travel time. For this reason, it would be advised to hold the meetings online as an alternative. The company can use additional digitalization in order to facilitate this, digitalization will be discussed in Section 4.3.8.

4.1.3 Problem: Scheduling and Flexibility

A key communication-related issue at the company pertains to scheduling and flexibility. RKT prioritizes responsiveness and adaptability to cater to its customers' needs swiftly, often within a tight timeframe. However, this customer-centric approach comes with a trade-off in the form of unpredictability in the mechanics' schedules. Mechanics often receive their assignments just a day in advance, or even on the same morning. This last-minute planning generates stress for the mechanics, as it provides minimal certainty regarding their weekly schedule. Additionally, receiving assignments on such short notice hardly leaves any time for mechanics to adequately prepare for the project, which could affect the efficiency and quality of their work.

4.1.4 Solution: Scheduling and Flexibility

The use of an application could significantly enhance the clarity of the planning processes, especially given RKT's high regard for client flexibility. Under the current approach, project schedules often cannot be established weeks or even days in advance, resulting in mechanics being informed about project specifics just the day before. While the nature of the work makes it challenging to entirely eliminate this practice, the following proposal aims to minimize its impact on the mechanics.

The solution proposed to the company is the development of a comprehensive feature to the application with a timetable feature that is accessible to all users. This timetable would provide a real-time view of all ongoing projects as well as those scheduled for the upcoming period, enabling mechanics to easily see their forthcoming assignments. This will take away some of the uncertainty faced by the mechanics, which has proven to be a problem.

To handle short-notice projects, the application would be designed to send notifications to assigned mechanics as soon as a project is added to the timetable. This would provide mechanics with the earliest possible warning, thereby maximizing their preparation time. However, the success of this feature hinges on the proactive input of information into the app by project leaders, especially the project's start date and the assigned mechanics.

4.1.5 Problem: Practical Knowledge in the Office

The second issue related to communication is the lack of practical knowledge among the office workers. This is caused by the fact that only some of the employees in the office worked as mechanics before

moving to the position they currently hold. This results in a lack of understanding of what the mechanics require, how projects should be done and what the possibilities are. This regularly negatively impacts the success and efficiency of a project.

There are some employees in the office who have previously worked as mechanics. These employees better understand the needs of the mechanics, as was pointed out by the mechanics during the interviews. Currently there are no attempts made to solve this problem by requesting the assistance of mechanics during the preparation of a project.

To bridge this gap, incorporating insights and ideas from both office employees and mechanics could prove beneficial. Many mechanics boast significant experience and possess knowledge about how to execute projects efficiently, an expertise that may not be fully present among office staff, especially those who have never worked in the field. Mechanics pointed out during the interviews that project leaders with previous experience as mechanics were generally better at preparing and guiding projects.

Addressing these issues would lead to a significant boost in the company's efficiency, thereby reducing waste, increasing profits, and diminishing employee frustration. Consider, for instance, the company's specialization in PUPP Lining, a self-developed field coating system for horizontal directional drillings. As the sole company focusing on this work, demand is already high and predicted to rise further. This trend is especially notable in Germany, where the benefits of RKT's services have been recognized and the demand is expected to skyrocket.

Successfully managing these initial projects will demonstrate the efficiency and quality of work, as well as the capabilities of the equipment and mechanics, thus offering a substantial competitive advantage. However, capitalizing on this emerging market will only be possible if the company's internal communication issues are rectified.

4.1.6 Solution: Practical Knowledge in the Office

Shadowing Day

With the potential to expand into new markets in Germany, it's critical for the office staff to have a comprehensive grasp of the tasks at hand. However, the current lack of field experience among office staff sometimes hinders this understanding. A potential solution to this issue could be the provision of additional training for project leaders. Given that the project leaders do not need to possess an intricate knowledge of the mechanics' specific work, this training could effectively be facilitated by pairing them with a team of mechanics. Through this arrangement, project leaders would have the opportunity to experience projects from the mechanics' perspective, thereby gaining a deeper appreciation for their requirements and challenges. This hands-on learning approach could significantly enhance the project leaders' understanding and ability to support their teams effectively.

Regular Meetings

Another aspect of addressing this issue is already discussed in Section 4.1.2 'Preparation' and Section 4.1.9 'Evaluation'. The introduction of these meetings is intended to foster greater communication between project leaders and mechanics. During these sessions, both groups can deliberate on project plans, and retrospectively analyze completed projects. The essence of these meetings is to create a platform where mechanics can contribute their expertise, voice their needs and concerns. Conversely, project leaders can clarify their rationale for specific decisions, and in doing so, better align themselves

with the mechanics. Detailed explications of the preparation and evaluation meetings are provided in their respective sections.

4.1.7 **Problem:** Lack of Project Evaluation

As mentioned earlier, an anticipated cost is associated with every order, which is then presented to the customer. The calculation of this projected cost is influenced by numerous factors and is designed to be closely aligned with the actual cost of the project. This allows the company to easily determine the success of a project by comparing the difference between the anticipated and actual cost. Currently, this data is utilized by the company to assess the performance of individual projects. When a project exceeds its budget, the reasons are determined and recorded in the company's ERP system.

However, while this approach might seem effective for performance assessment, it has a number of shortcomings. The first issue is the fact that projects are evaluated only when they overrun their cost, not when they fall below the expected cost. As a result, even though potential errors might be pinpointed, successful aspects of a project that could be replicated in the future are often overlooked.

Furthermore, the evaluation of project performance is conducted solely by project leaders and other office-based staff. The mechanics, who are directly involved in the execution of the projects, are not included in these assessments. Feedback from mechanic interviews revealed that it is infrequent for them to be asked for input or explanations during these evaluation sessions.

Lastly, there are concerns about how the company uses the knowledge obtained from these evaluations. Currently, it appears that the company does not utilize this information in a systematic manner to drive improvements. When questioned about this, all the employees interviewed shared a common response: the company barely leverages the insights from evaluations to implement improvements.

4.1.8 **Solution:** Lack of Project Evaluation

Evaluation Meetings

In addition to preparation meetings discussed in [section 4.1.2](#), it's recommended that evaluation meetings occur post-project. The current feedback process often leaves out mechanics, a problem that needs addressing. Including mechanics in regular post-project evaluations offers the company valuable feedback, leading to improved processes. Key discussion points in these meetings should include:

1. Budget outcomes: Reviewing whether the project was completed under, over, or exactly within budget helps mechanics understand the financial aspects and implications of their work, emphasizing the business perspective.
2. Positive outcomes: Highlighting areas where the project exceeded expectations or things went particularly well can foster positivity and provide valuable insights for future projects.
3. Challenges faced: Understanding what went wrong, especially distinguishing between unavoidable issues and preventable problems, is crucial for learning and improving future projects.
4. Unforeseen factors: Discussing unexpected elements that either hindered or helped the project can offer insights for better planning in future projects.

5. Deviations from the plan: Reviewing any instances where the project plan was not followed can shed light on the reasons behind these deviations, allowing for adjustments in future planning.
6. Lessons learned: Implementing feedback from evaluations into process improvements is key. Employee insights can offer valuable suggestions for potential new methods and solutions to existing problems.

While in an ideal world every project would have a preparation and an evaluation meeting, this isn't practical given the number of projects at RKT. It is suggested instead to have these meetings once or twice a week, discussing multiple projects in each. The company can increase or decrease the number of meetings depending on the experience gained from using this system. If a project is accepted shortly before its start date, an extra meeting could be arranged if deemed valuable by the project leader. Evaluation meetings, while slightly more flexible, should ideally occur as soon as possible post-project completion for the most accurate recollections. Including as many mechanics as possible in these meetings is crucial, but even when only one mechanic is available, the meeting should still go ahead. Ideally, the project's foreman, being the main contact between mechanics and the project leader, should be present at these meetings.

Evaluation meetings bring many of the same benefits to communication as preparation meetings when it comes to the quality of communication. It ensures that communication is no longer just one-way but two-way instead. Two-way communication has been noted to as an important factor to successful internal communication (Welch & Jackson, 2007).

4.2 What are the Distinct Roles Within the Company and what Responsibilities Does Each Carry?

The process from the intake of an order to its completion involves various employees, each fulfilling distinct roles. Key roles in this process include project leaders, the work planner, the draftsman, warehouse personnel, and one or more mechanics.
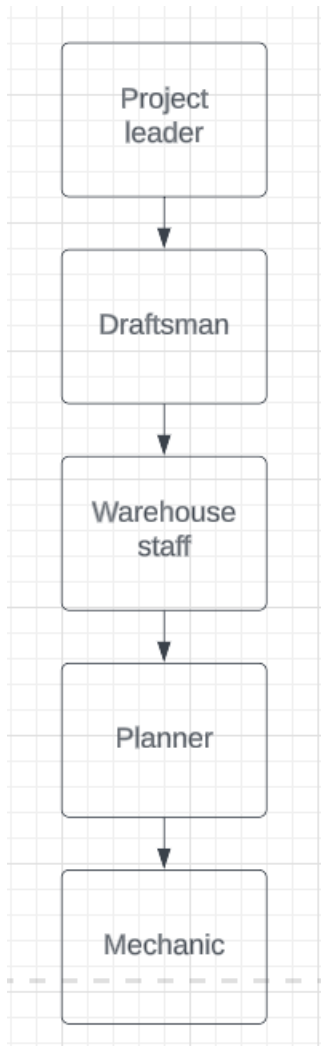
Figure 5 Employees and flow of information

Figure 5 visually represents this structural layout, offering a straightforward overview. In theory, this is the approach the company adopts for handling incoming customer requests, with information passing through several individuals during the course of a project.

The project leader is in theory responsible for handling the project during its preparation and execution. His task is to speak to the customer to understand the requirements of the project. After the needs of the customer are clear, the next step is to commence preparations for the project. Section 4.1 gives a detailed overview of this process, therefor it is briefly summarized here. The project leader needs to gather all necessary information to draft the project, this is then handed over to the draftsman who designs the project. The information given to the draftsman by the project leader determines the quality of the final design. Finally, the project leader reserves equipment and orders materials. When the project is set to start, the information is handed to the mechanics who then execute the project according to the project plan.

The role of the draftsman has already been touched upon. As mentioned, he receives information from the project leaders and uses technical drawings and Computer Aided Design (CAD) to design the project. This can range from designing a single part to drawing an entire system. His responsibility is to design

the project as accurately and clearly as possible, such that the drawings can be used by the mechanics. The warehouse staff, also known as the Technische Dienst (TD) or Technical Department in English, is responsible for maintaining and preparing the equipment. When a project leader issues an order, the TD receives the information and prepares the requested equipment into a pick-up such that the assigned mechanics can easily load his vehicle.

The planner finally assigns the mechanics to the projects. This can only happen when a project is prepared, thus the work of the planner hinges on the project leader's preparation. While the planner is responsible for planning mechanics, he works with the project leaders since certain projects require certain teams of mechanics. The planner is finally responsible for ensuring that the planning is always filled. This means finding replacements in the case when a mechanic falls out.

Lastly, the role of mechanics is discussed. This role is relatively straightforward, the project leaders issue the mechanics with orders for a project and the mechanics follow these and executes the project as planned. The responsibilities of the mechanics are to ensure that the delivered project is of high quality whilst sticking to the set timing for the project. While mechanics mostly follow the order of the project leaders they do have a certain degree of freedom. This can for example be in the way certain tasks are performed and the equipment that is used.

4.2.1 Problem: Mentality

A prevalent issue affecting productivity and efficiency is the "us versus them" mentality that currently exists between the office staff and the mechanics. This separation hinders effective collaboration and progress.

The overarching issue here can be attributed to inadequate communication. Beyond the direct operational hindrances caused by communication lapses, such as mistakes and inefficiencies, there's an intangible cost: the erosion of employee morale. The interviews revealed that the challenge of communication isn't confined to project-specific interactions. Inter-departmental social interactions are noticeably sparse. This is particularly pronounced for field mechanics who, due to their early starts and late finishes at project sites, seldom interact with their colleagues in the office or workshop. Their early departures to project sites and late returns mean they often miss the chance to bond with others. This disjointed schedule can lead to situations where a mechanic might return to the main facility after a time, only to find unfamiliar faces due to being unaware of new hires or recent departures.

While the field mechanics' scenario is somewhat understandable given their external assignments, the limited interactions between workshop mechanics and office staff, who both operate within the company premises, are more perplexing. Lunch breaks, which should ideally be a time for intermingling, often see employees sticking within their departments. This compartmentalization means that project leaders, tasked with overseeing mechanics, can gradually become disconnected from their field-based colleagues.

4.2.2 Solution: Mentality
Social events and acknowledgment
As was discussed in the literature, employee morale is an important factor in productivity. It is most

desirable for a company to have employees that are affectively committed because it increases their job satisfaction, which in turn boosts work efficiency (Pitichat, 2013) (Welch & Jackson, 2007). It is up to management to make sure that employees feel motivated and committed to the company, as socialization is one of the responsibilities of downward communication (Lunenburg, 2010).

The proposed solution, therefore, is for management to take an active role in orchestrating activities or events that foster social interaction and demonstrate appreciation towards the employees' work. During the discussions with mechanics, they expressed a deep value for recognition. Therefore, this seemingly simple solution could significantly enhance employee commitment and job satisfaction. By incorporating regular acknowledgments and creating avenues for team building, management can improve employee commitment and cultivate a more engaged, dedicated, and motivated workforce.

Apart from the social part, there was also the problem of the "us versus them" mindset when it comes to work related aspects. This problem is again mainly caused by a lack of communication. As was discovered during the literature review, one of the goals of communication should be to create belonging in the form of a "we" mentality. Therefore, the solutions that have been proposed to improve communication can also serve to solve this problem. By implementing the preparation and evaluation meetings, employees need to converse with each other. This helps to create a mutual understanding between the parties.

Finally, the solution of creating an application as discussed in [Section 4.3.2](#) has the potential to solve both the social problem and the professional problem. The application allows more effective communication which helps improve relationships between employees. Secondly, the application could be created with a more social aspect as well. A chat function that employees can use to talk about non work-related subjects could be a helpful way for field mechanics to have more interaction with their colleagues. Additionally, the application could be used as a medium to share company news, for example in the form of a weekly or monthly company newsletter.

4.2.3 Problem: Project Ownership and Responsibility
Understanding the necessity of assigning a dedicated project owner, it's clear that the current situation within the company is far from ideal. The absence of clearly defined responsibilities and project ownership contributes to project chaos and inefficiency.

Currently, the role of project ownership is not explicitly assigned. While projects are technically under the supervision of one of the project leaders, there's an evident absence of accountability. This lack of ownership can be attributed to the ambiguity in roles and responsibilities, and the fact that several office members are typically involved in a single project. Such a scenario diffuses the sense of responsibility, leading to a situation where nobody truly feels accountable for the project's outcome.

This issue has serious implications for the company's workflow and efficiency. Projects tend to descend into disarray as critical tasks are postponed until the last moment. Problems arise and delays occur frequently due to this unstructured approach, diverting the team's attention towards immediate crisis management rather than forward planning. Instead of preparing for the next project, the team members find themselves constantly putting out fires.

Consider the role of an office employee responsible for production planning and coordination. When complications occur during a mechanic's task, the usual approach is to consult this role, despite the fact that it is not directly associated with the formulation of the order or the blueprint. This peculiar situation arises from the ease of access to this position in the office, who often answers the office phone.

Consequently, this role ends up functioning as a liaison, managing issues between the mechanics and office personnel. This situation leads to an excessive amount of time being spent oscillating between the office and the workshop or field projects.

The evident lack of defined project ownership and a single point of responsibility results in inefficient time management and a reactive rather than proactive approach. It is essential for the company to rectify this by clearly defining roles, responsibilities, and ownership for each project to ensure smooth execution and efficient management of resources.

4.2.4 Solution: Project Ownership and Responsibility
Project Ownership
Another significant issue identified is the lack of a designated project owner during the project execution. This deficiency is a major drawback for the company as it drastically undermines work efficiency due to the increased likelihood of mistakes and delays during a project. In addition, the lack of accountability obstructs the effective improvement of the processes since there is no vested responsibility. Therefore, the following recommendation is made to the company.

The role of the project owner must be introduced and comprehensively delineated. This implies that every project must have an assigned project owner. When an individual is designated as the project owner, they must be informed of their responsibilities and expected duties. The responsibilities encompass:

Project preparation, which includes the following subsidiary steps:

- Collecting all necessary information from the customer to thoroughly understand their requirements.
- For field projects, the project owner is required to visit the site in person to gather crucial information, anticipate potential impediments, and identify potential hazards.
- Ensuring the completion and verification of technical drawings needed for the project to eliminate uncertainties, inconsistencies, or errors.
- Ensuring the ordered equipment and materials are ready on the required day for the project.
- Providing mechanics with all essential information regarding the project and the customer.

The project owner is accountable for:

- Appointing a foreman. While the project owner oversees the entire project, the foreman is entrusted with the task of on-site managing the project during its execution.
- Facilitating effective communication among themselves, the mechanics, and the customer.
- Resolving any problems encountered by the foreman.
- Setting the project timeline and cost.

- Motivating the mechanics and resolving any conflicts.

The project leader is advised to undertake the role of the project owner, as their existing position encompasses most of the responsibilities required by a project owner. In urgent circumstances, other office employees can assume this role, though this is not recommended to maintain clarity and structure. The project owner collaborates with the foreman to ensure the project's success. Therefore, the foreman has their own set of responsibilities, which include:

- Providing daily updates to the project owner, including the project status, progress made, or problems encountered.
- Addressing problems encountered by themselves or the other mechanics. If the problem is minor and easily solvable, it can be resolved instantly. However, in case of any uncertainties, the foreman should contact the project owner.
- Adhering to the project schedule and budget. Any changes to these parameters should be communicated to the project owner.
- Securing approval from the project owner before making changes to the agreed-upon project plan at the customer's request.

Establishing clear responsibilities at the start of a project is the initial step toward improving the process structure. The next step involves implementing a framework that can be consistently followed. The purpose of such a framework is to provide employees with a clear overview of their position in the process and to outline the next steps.

4.2.4 Problem: Management

It appears that the company is facing significant challenges regarding the management of employees, lack of consistent processes, absence of performance evaluation, and limited long-term planning.

At present, the company's management structure is weak, with responsibility for guiding employees divided between two key roles - project leaders and management. Project leaders are tasked with directing the mechanics, while management is supposed to guide the project leaders. This hierarchy is not effectively upheld, leading to an array of issues.

Firstly, the company's office employees operate without much supervision or structure. While their autonomy could be viewed as beneficial due to the flexible nature of the projects, it has led to a wider problem of overall organizational disarray. There's an evident lack of standardized procedures applicable to all employees, causing inconsistencies in project preparation and customer engagements. A clear example is the inadequate overview of equipment management. The lack of an effective system leads to equipment being unavailable or misplaced when required, which further hinders project execution and efficiency.

In addition, the company struggles with a lack of long-term vision and planning. Despite management's awareness of some existing issues, there's no concrete action plan to address them. The focus remains

on battling surface symptoms rather than identifying and resolving the root causes, leading to stagnation rather than progress.

4.2.5 Solution: Management

Framework

At RKT, the prevalent management style, which is more reactive rather than proactive, necessitates a more systematic approach. Given the current circumstances, the suggestion is to introduce a structured framework, specifically designed to meet the company's unique needs. This framework, as outlined in Figure 6, utilizes the sequential process of the waterfall method. In other words, each phase of a project needs to be finalized before the subsequent phase can commence. This approach aligns with insights gleaned from company research that underscored the significance of robust preparation in determining project success. Hence, the framework devotes considerable emphasis to the preparatory stages.
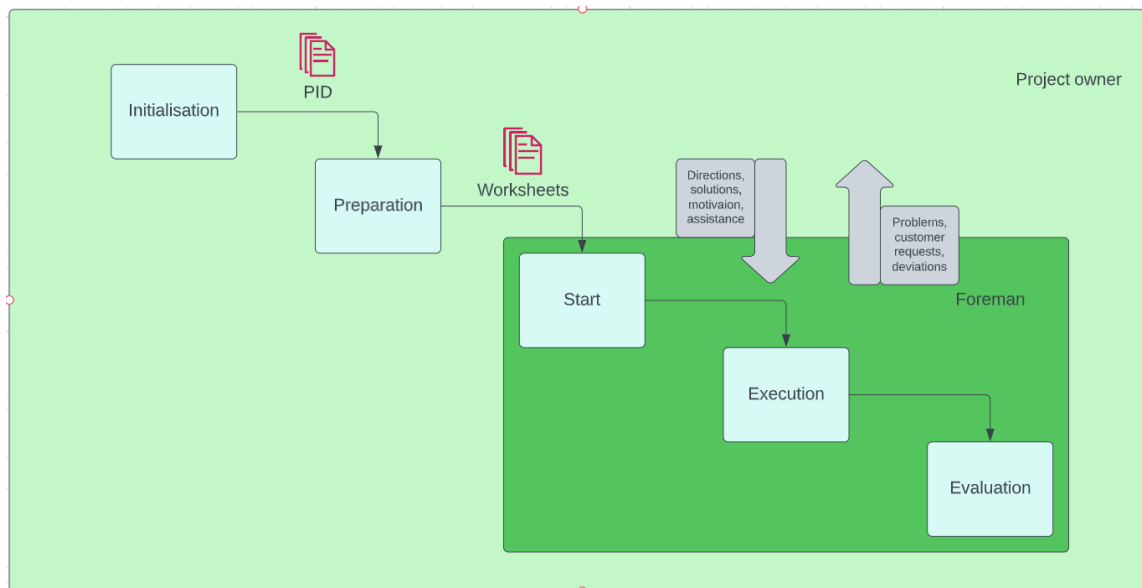
Figure 6 Visualization of the RKT Framework

Within this process, the project owner bears the ultimate responsibility for every stage. Their role includes ensuring that the project is appropriately prepared at the onset, and they provide clear leadership throughout the execution phase. Moreover, during the project's final three stages, the foreman assumes a share of the responsibility, liaising between the mechanics and the project owner when complications arise.

The framework encompasses five stages:

Initialization: The appointment of a project owner kicks off the process. This individual will manage the project throughout its lifecycle. The project owner initiates the project by thoroughly understanding the customer's needs, and setting clear project scope boundaries. They gather all necessary details, including measurements, location, required equipment, permits, safety precautions, preparation of the worksite, and timelines. These details are clearly documented in a Project Initialization Document (PID).

Preparation: Upon the completion of the initialization phase, the project segues into the preparation stage. In this phase, drawings and instructions are developed based on the PID. Additionally, necessary equipment and materials are procured or reserved, and assignments are handed out to the mechanics. The PID and the drawings collectively inform the creation of worksheets for the mechanics.

Start: With the preparation stage concluded, the project advances to the 'Start' phase. Here, mechanics are briefed about the project, fostering better communication between office staff and the execution team. A more detailed explanation of the preparation meetings can be found in Section 4.1.2. After this briefing, the mechanics procure the pre-reserved equipment and materials for the project.

Execution: Despite exhaustive preparation, challenges can still arise during project execution, such as equipment malfunctions or inclement weather conditions. When such unforeseen events occur, the mechanics have a clear line of communication with the project owner to seek a resolution.

Evaluation: Once the project is completed, an evaluation is conducted. This stage aims to identify both the successful elements and areas requiring improvement. Every project, irrespective of whether it exceeded its budget or missed its deadline, undergoes this evaluation. Section 4.1.8 provides more details about the evaluation meetings.
To ensure that the findings made during the evaluation are actually used to improve the process, a lessons learned document should be created. The act of assessing and then actively applying the results of the evaluation encourages employees to engage in the generation of new ideas, fostering a sense of shared responsibility within the company.

Although the framework stipulates a clear sequential process, it should also allow for a degree of flexibility, acknowledging that a customer may request changes during the project. In such instances, the customer can submit a change request to the project owner, who will review it considering its impact on the project's cost and timeline. If the changes are approved, they are incorporated into the PID, and all pertinent parties are duly informed.

Digitalization
The efficiency of the framework can be further boosted through digitalization. Section 4.3.8 discusses the overarching advantages of embracing more digital solutions. However, in this section, we briefly highlight the direct benefits of digitalization within the framework. Primarily, digital solutions significantly enhance communication among various stakeholders during the project process. For instance, the meetings associated with the third and fourth stages could be conducted virtually, facilitating quicker and higher-quality communication between the foreman and the project owner.

Secondly, essential documents like the PID and worksheets can be promptly shared among the relevant employees, eliminating the necessity for physical documentation.

Thirdly, the procurement of materials or equipment from the Technical Department (TD) can be digitally managed. The project owner can enter the required equipment into the application, alerting the TD staff to prepare the order. Concurrently, a digital checklist of equipment and materials can be sent to the mechanics to verify they have all the necessary items before loading their vehicle.

Finally, the application could integrate an evaluation tool to document important points for the evaluation meeting. This enables the effortless discussion of any feedback entered during the project, rather than relying on employees' recall of events. Additionally, a standardized evaluation form could be

implemented to capture metrics on the general aspects of each project. A recommendation for the evaluation forms is outlined in the final section of this solution.

Evaluation forms

In order to gather more comprehensive data on project efficiency, it is recommended that the company introduces standard evaluation forms. There are two different forms suggested for this purpose: one for the mechanics and one for the project leaders.

During the company research, it was clear that the mechanics are interested in contributing to the company's improvement. However, they expressed disinterest in completing lengthy questionnaires. Accordingly, the mechanics' evaluation form is designed to be concise, focusing on the following key performance indicators (KPIs):

1. Quality of communication
2. Readiness of equipment
3. Adherence to the time schedule
4. Safety
5. Overall satisfaction

Each KPI can be scored on a range from worst to excellent. The form is divided into six options, this removes the possibility of selecting an inconclusive middle option. This method will provide insight into the progression of projects, and whether the circumstances are improving, deteriorating, or remaining stable.

	Worst	Poor	Bad	Poor	Good	Excellent
Communication						
Readiness of equipment						
Adherence to time schedule						
Safety						
Overall satisfaction						

Comments	

Figure 7 Visualization of the evaluation form for mechanics

On the other hand, the evaluation form for project leaders includes six KPIs, providing more detailed information about the course of a project:

1. Actual cost/Predicted cost: This ratio quickly visualizes whether a project has adhered to its budget.
2. Idle hours/Total hours: This ratio can provide information about the project's efficiency. If the ratio is significantly greater than one, it should be investigated to determine if it's due to poor planning and coordination or repeated equipment failures.
3. Actual working hours/Planned working hours.
4. Change requests: The number of times a customer requests changes. A high number could indicate that the project preparation should have been more thorough.
5. On-time delivery: The number of days a project was late or early can indicate a need to investigate the cause.
6. Problems encountered: This can include equipment failure, forgotten equipment, mistakes in technical drawings, or miscommunications. If this number is high, the cause of the problems should be investigated.

Actual cost		Predicted cost	
Idle hours		Total hours	
Actual working hours		Planned working hours	
Change requests			
On-time delivery			
Problems encountered			

Figure 8 Visualization of the evaluation form for project leaders

The collected data from these evaluation forms can provide crucial insights into project efficiency and performance, helping the company understand how it can improve its operational processes and project outcomes. However, it's crucial to interpret these KPIs judiciously as they may not provide a complete picture on their own. For instance, a high cost-to-predicted-cost ratio could reflect customer satisfaction, while a low ratio could indicate rushed work. Hence, any significant deviation in KPIs should prompt a detailed investigation. If leveraged correctly, these KPIs can offer valuable insights into the efficiency of the company's projects and help track progress over time.

4.3 What are the Methods of Communication Between Employees in the Same Department and Across Various Departments at the Company?

The predominant modes of communication within the company are largely dependent on the department in question. Throughout the duration of this research, the communicative approaches within the office and the workplace were carefully observed.

To begin with, communication between office employees was observed. Here, the problems with communication were minimal. The office layout places employees within close proximity to one another, which facilitates easy communication. Employees could simply walk over to another's desk or engage in a conversation without needing to leave their seats.

RKT uses an Enterprise Resource Planning (ERP) system named 'Ridder' to handle the creation and to keep track of current and completed projects. It serves as a database that is accessible by all employees in the office, facilitating cooperation in the office.

Communication among the mechanics in the workshop was observed next and was found to be similar to the communication within the office. The noise level in the workshop presents a slight challenge to communication but such a thing is to be expected here.

Next, communication between the workshop mechanics and office employees was observed, which typically happens in two ways. Either a mechanic leaves his workspace to head to the office to speak with the necessary person, or an office employee visits the workplace to address issues after receiving a call. It must be noted that there is a physical distance between the workshop and the office in the form of a road that needs to be crossed.

Lastly, the communication between field-based mechanics and office employees was examined. The most common method of contact between these two groups is via telephone calls or texts through WhatsApp. Occasionally, a project leader may visit a project site to communicate with the mechanics directly. This generally happens in the event of a significant problem where the project leader's on-site assessment and instructions are required. There is no standardized digitalization in this part of the communication. The current way of working requires employees to use their personal devices, which is not always optimal.

The final form of communication to be considered is through the use of worksheets. These are created by project leaders and contain all the necessary information to complete a project. The worksheets are then distributed to the mechanics who utilize this information during both the preparation and execution phases of a project. The company heavily relies on communication through the worksheets. The worksheets are handed over to the mechanics without any sort of briefing. This has caused problems in many occasions due to misunderstandings or mistakes in the worksheets.

4.3.1 Problem: Meetings
In Sections 4.1.1 'Preparation' and 4.1.7 'Evaluation', the lack of meetings has already come forward. This section provides a brief overview of the overarching problem, namely the lack of meetings in general during the lifecycle of a project.
This cycle can be broken down into three stages: pre-project, mid-project, and post-project.

1. **Pre-Project Stage**: Currently, mechanics receive their assignment and drawings and begin their work. In rare occasions, a work preparation meeting is held before the project commences, but this is inconsistent and depends on the project leader's discretion. While every project might not require extensive briefings, especially straightforward and short-duration ones, it becomes problematic for more complex and lengthy projects. A lack of comprehensive understanding can cause mechanics to rely excessively on project leaders for assistance, hindering productivity during project start-up.
2. **Mid-Project Stage**: In addition to the pre-project phase, there's also a lack of in-progress check-in meetings. Although this may not be necessary for shorter projects, it becomes crucial for longer ones to prevent any issues or sources of frustration that could lead to delays. Without ongoing communication with the mechanics, project leaders may remain unaware of these problems.

3. **Post-Project Stage**: Evaluations are another area where communication falls short. While post-project evaluations are conducted when a project exceeds its budget, these sessions primarily involve office employees to identify the reasons for the extra costs. Mechanics are not invited to these meetings to provide their insights on the project's execution, potential issues, areas of improvement, or successes. This lack of evaluation and feedback sharing results in negligible changes to the work process, leading to persistent problems that can cause increased costs, delays, and frustrations.

4.3.2 Solution: Meetings
Regular Meetings
The solution to this problem is largely addressed in Section 4.1.2 'Preparation' and Section 4.1.8 'Evaluation'.

The issue regarding mid-project meetings cannot be addressed in the same way. Given that the company currently doesn't hold any meetings, introducing preparation and evaluation sessions would already constitute a significant change. Adding additional meetings in the mid-project stage would be excessive. As discussed in the literature, the basis for change is the cooperation of the employees. Imposing compulsory meetings at each phase could potentially be perceived as an inefficient use of time and resources. When both preparation and evaluation meetings are properly implemented, the need for mid-project meetings will be decreased. It is therefore advised to further solve this problem by means of improved digitalization. This will allow the mechanics to keep in contact with the project leaders, and vice versa. The details of this solution are presented in Section 4.3.8. These solutions aim to improve various aspects of communication quality, as outlined by the indicators of quality communication. (Reza Hosseini et al., 2017)."

4.3.3 Problem: Role of Equipment and Tools in Communication and Efficiency
Although it may initially seem tangential to this research, there's an undeniable link between issues regarding damaged or absent tools and suboptimal internal communication. From discussions with the mechanics, it was revealed that significant frustration occurs when they arrive at a project site only to find they can't initiate or progress their work. A key factor here is the reliability and availability of the right equipment. This issue can thus be divided into two interconnected parts.

Starting with the issue of malfunctioning or unreliable tools, this is a problem cited by various mechanics. A majority of tasks carried out by a mechanic during a project necessitate specialized equipment, tools, or machines. These can be as simple as a drill or as intricate as a mirror welding machine. When any of these tools malfunction, work cannot proceed. The implications of such a breakdown can differ - sometimes mechanics can divert to other tasks while awaiting a solution, but often, if a critical piece of equipment fails, work must be entirely suspended. Such incidents can become financially burdensome for the company, with potentially five or six mechanics left idle. Beyond the clear impact on the project's budget, employee morale also takes a hit. Delays might necessitate overtime, which can be particularly demoralizing in challenging weather conditions. Moreover, clients generally aren't appreciative about these delays.

To address these situations, it's necessary first to determine the root cause. This is where the company's lackluster communication and structure return to the forefront. Presently, the company lacks any plan or strategy for repairing broken equipment, tending to use it until failure before considering repair options. Given that equipment is unlikely to fail while sitting in the warehouse, these breakdowns nearly

always occur during operations. The company does perform electrical flow tests on the equipment, which can identify some issues, but it isn't a foolproof method. If mechanics notice potential failure signs in a machine, there's currently limited communication between the mechanic and the Technical Department (TD). There is no straightforward method for mechanics to alert the TD about these concerns, further exacerbating the problem of employees working in silos. The irregular working hours and communication gaps between mechanics and other employees often result in broken equipment being left in the warehouse unnoticed, highlighting the absence of a clear, structured process.

The second equipment-related issue pertains to instances when necessary tools are inadvertently left behind at the company. This issue echoes the problems encountered when equipment breaks down, as work cannot continue, and mechanics are left idle until the tools are delivered. While broken equipment can sometimes be fixed on-site, forgotten tools necessitate a return trip to the warehouse, further contributing to inefficiency. This issue, too, can be traced back to the company's deficient communication and organizational structure. The TD is accountable for collecting the equipment from the warehouse for the mechanics to load into their vehicles. However, the current process lacks checks during the collection and loading of equipment, increasing the chances of materials or equipment being overlooked.

4.3.4 Solution: Role of Equipment and Tools in Communication and Efficiency
Equipment Related Problems

To mitigate the issue of equipment breakdowns, the RKT app should include a feature to generate a ticket addressing malfunctioning equipment for the Technical Department (TD). There are two potential configurations for this system, with the choice hinging on the company's preference.

The first, simpler approach involves creating a dedicated page within the app that either lists all equipment or includes a search bar to find specific machinery. Once the relevant machine is located, users can create a ticket specifying that the machine is malfunctioning and requires repair or replacement.

A more sophisticated approach would leverage a barcode and scanner system. In this setup, each piece of machinery at RKT would be assigned a unique barcode, easily applied via sticker. In the event of a breakdown, mechanics would scan the barcode through the app and hit a button to notify the TD of the malfunction.

This feature can be further refined to suit the company's specific needs by adding or removing functionalities. When creating a ticket for faulty machinery, it could be beneficial to allow mechanics to specify the cause of the malfunction beyond simply stating that the machine is not working. A drop-down menu detailing common issues per machine could be implemented, with an added text input option for problems not listed.

In addition to generating a ticket for complete equipment failure, the system could incorporate a feature to report equipment exhibiting signs of potential malfunction or suboptimal performance. If mechanics notice a decline in machine efficiency or early indications of a problem, they can notify the TD to preemptively conduct checks or repairs.

Another beneficial feature could provide instructions for addressing minor issues that don't require specialized equipment or spare parts. This would empower mechanics to perform maintenance and repairs on-site, sparing them a return trip to the TD. To ensure the success of this feature, a standard complement of common spare parts should be included with the machine or in every vehicle.

Beyond notifying the TD, the app could also serve to monitor the state of the equipment. Tracking data such as the frequency and causes of breakdowns or wear and tear can provide insights into equipment condition. This could help the company develop a comprehensive repair and maintenance plan - something currently lacking.

Interviews with the mechanics revealed that the absence of necessary equipment was as significant an issue as equipment breakdowns. This equally significant source of delays and frustration could be addressed by integrating a checklist feature into the app for TD employees, potentially with a second checkpoint for mechanics. This feature would list the necessary tools and equipment, allowing the TD employee to check off items as they are loaded. If an item is overlooked, the app could trigger a reminder notification to load it. This ensures a more structured overview of the equipment required per project and when it is needed.

4.3.5 Problem: Changes to Project Plans

Another issue that arises from the combination of inadequate communication and poor preparation pertains to discrepancies in the project site conditions compared to what was initially agreed upon. A case in point involves a recent project, where the designated pipe's actual height differed significantly from what had been decided between RKT and the client.

Mechanics, who are often well aware of the impending issues resulting from these discrepancies, face a dilemma. On one hand, they could proceed with the task despite knowing it might lead to complications down the line. However, this approach usually results in further delays and additional costs due to the inevitable need for modifications and repairs.

On the other hand, refusing to start the work until the discrepancies are addressed may cause immediate delays but could save substantial time and resources in the long run by preventing rework. Consequently, effective communication and thorough preparation are essential to prevent such situations and ensure efficient project execution.

In the current process there are no clear agreements about this matter. The effect of this is that mechanics have no clear view of what is possible when it comes to changes in the projects. It could occur that a customer requests the mechanics to deviate from the agreement or to perform extra work. Without clear agreements, a mechanic might accept such a request since he deems the extra work not significant. This has the chance of causing more problems down the line, as different customers might now expect this same flexibility from the mechanic.

4.3.6 Solution: Changes to Project Plans
Meetings and Digitalization
To tackle this problem, a more structured approach is needed for every project. The main problem is the

lack of preparation and communication. As outlined in [Section 4.1.2](#), the preparation meetings are intended to align mechanics and project leaders on these details. When a project is accepted, the project leader needs to clearly communicate with the mechanics what the possibilities are for deviating from the plan.

Secondly, the suggested application can be used to solve this problem as well. The improved communication and the ability to quickly share information can help the project leader to understand a client's request. If changes to a drawing are needed to carry out the request, the draftsman can simply alter the drawing and send the document back to the mechanics in the field.

4.3.7 Problem: Digitalization

There is a distinct problem related to the absence of digitalization in the workflow process. As mentioned before, the only standardized digital system the company uses is the ERP system named 'Ridder'. At present, work orders and tickets are exclusively paper-based, which, despite having a few advantages, primarily presents significant drawbacks.

Beginning with the advantages, it's noteworthy that mechanics appreciate the ease of comprehending a drawing when it is printed on a larger format such as A3 or A4. The physical print provides an opportunity to grasp the complete picture immediately, something that may be cumbersome on smaller screens, like mobile phones, where constant panning and zooming may be required.

However, the disadvantages of paper-based worksheets far outweigh the benefits, particularly for field mechanics. Firstly, field mechanics lack the convenience of instant access to a printer to replace any lost, dirty, or forgotten worksheets. This inability to quickly reproduce a necessary document is a significant hindrance to their productivity.

Secondly, field mechanics must carry all their paper-based work orders at once, often resulting in a substantial and unwieldy stack. Since a drawing on paper can only show one angle, multiple paper drawings might be needed. This pile can easily become disorganized, complicating the process of locating specific information.

Thirdly, if a worksheet contains an error, addressing the issue swiftly becomes challenging. Rectifications require a telephone conversation between the project leader and the mechanic to verbally explain changes or corrections or resort to sending photographs. This process is time-consuming and increases the risk of a misunderstanding, which then in turn can lead to mistakes during the project.

4.3.8 Solution: Digitalization

RKT Application

The literature review revealed that companies effectively utilizing digital systems can secure a competitive edge (Arora & Rathi, 2019). RKT has not fully exploited the potential of digitalization, leading to the proposed solution: the development of an application for RKT employees. The application forms the foundation for numerous integrated solutions targeting issues such as planning and equipment management. The core aim of the application is to enhance employee communication. Features enabling information sharing will permit employees to swiftly share and access documents

such as worksheets, instructions, and protocols. This not only quickens communication but also increases its frequency, both of which are key indicators of communication quality (Reza Hosseini et al., 2017). Additionally, this feature negates the necessity for vast amounts of physical documentation.

For field use by mechanics, the application must be accessible via mobile devices. This can be facilitated by enabling employees to use their personal smartphones. Given that most individuals carry their smartphones constantly, this approach offers convenience. By designating a separate RKT application for work-related communication, the need for employees to use WhatsApp for such interactions is eliminated, aiding in maintaining a boundary between work and personal life. One limitation of using smartphones, however, is their relatively small screen size, which might be an issue when viewing detailed worksheets. Therefore, the company should consider investing in additional tablets with larger screens. Although this does entail extra costs, not every mechanic needs a personal tablet. As mechanics typically work in teams on projects, a viable solution is to equip each vehicle with a tablet. This approach reduces the total number of tablets required while still ensuring access for all mechanics.

Digitalization has been cited as a solution to several problems discussed in this chapter. Therefore, this section provides a concise overview of the features that the proposed digital application should include:

1. Support for preparation and evaluation meetings: Digitalization can address the challenge of in-person employee availability. Through the application's messaging feature, employees can participate in meetings remotely.
2. Equipment reporting: To tackle the issue of equipment failures and their impact on cost and employee morale, the application should include a feature for reporting malfunctioning or broken equipment.
3. Digital checklists: The problem of forgotten equipment can be mitigated by incorporating digital checklists into the application. This feature provides employees with a clear overview, eliminating reliance on memory or experience.
4. Scheduling feature: To provide mechanics with certainty and enhance their preparation for projects, the application should include a feature that clearly displays when and where mechanics are needed.

5. Choosing a Solution

Chapter 4 has presented several solutions that the company may use to improve the current situation. While every solution is beneficial, it is not possible to implement them all at the same time. Since this research is also bounded by time, not every solution can be fully worked out with an implementation plan.

To solve this, five criteria are used to judge each separate solution. The score each solution attains on a criterion depends on the results of this research. A scale from 1 to 5 will be used, where 1 represents the worst score and 5 represents the best score.

The criteria used are the following:

Cost: 1 = significant investment needed; 5 = moderate investment; 10 = little to no investment needed.

Time Requirement: 1 = solution requires significant work hours invested; 5 = moderate work hours; 10 = solution takes up little extra work hours.

Expected Benefit: This is defined by specific indicators like expected return on investment (ROI), projected increase in revenue, improvement in customer satisfaction. 1 = the solution will benefit the company slightly; 5 = moderate benefit; 10 = the solution will benefit the company greatly.

Ease of Implementation: 1 = the solution is difficult to implement; 5 = moderately easy to implement; 10 = the solution is very easy to implement in the current structure or processes.

Employee Acceptance: 1 = the solution could encounter significant resistance from employees; 5 = moderate resistance; 10 = employees will easily accept and understand the solution.

Since these criteria are not equally important, weights are added to each of the criteria. The weights have been determined based on the current situation of the company. For example, in this current situation, cost is seen as the most important factor in the decision to implement a specific solution. The criteria are ranked as follows:

Cost: 10
Time Requirement: 8
Expected Benefit: 9
Ease of Implementation: 7
Employee Acceptance: 6

Adding these values gives a total of 40, which means that after normalization the weights of the criteria are:

Cost: 10/40=0.25
Time Requirement: 8/40=0.2
Expected Benefit: 9/40=0.225
Ease of Implementation: 7/40=0.175
Employee Acceptance: 6/40=0.15

The table below shows the score of each solution, followed by the weighted total score.

	Cost	Time Requirement	Expected benefit	Ease of implementation	Employee acceptance	Weighted score

RKT application	3	5	9	7	7	6,05
RKT framework	8	6	8	7	6	7,13
Preparation and evaluation meetings	7	6	8	7	7	6,88
Social events	5	5	6	5	7	5,53
Shadowing days	5	5	6	8	5	5,75

Table 1 Scores of the different solutions

Conclusion

1. **Implementation of the RKT Framework**
2. **Introduction of Preparation and Evaluation Meetings**
3. **Development of the RKT Application**

These are the top three solutions according to the weighted scoring method, showing a balance between various factors such as cost, time requirement, expected benefit, ease of implementation, and employee acceptance.

The remaining solutions, namely "Social Events" and "Shadow Days," while they may offer some benefits, focus on narrower aspects of the issue. This specificity has resulted in lower overall scores in comparison to the more comprehensive solutions.

The top three solutions stand out as they are expected to have a more substantial impact on the existing challenges. They represent a broader and more strategic approach to resolving the issues at hand. For instance, implementing the "Project Owner" solution not only introduces a clear accountability structure to the process, but also couples this with the deployment of the RKT Framework. These solutions work together to enhance structure and oversight, leading to better project outcomes.

6. Implementing the Solutions

To ensure the successful execution of the selected solutions, it's crucial to carefully consider their implementation strategies. Due to time constraints, comprehensive planning for all potential solutions is not feasible. Therefore, we will focus our efforts on the top solutions identified in Chapter 5.

As determined by the criteria set forth in Chapter 5, the top three solutions are:

5. **Implementation of the RKT Framework**
6. **Introduction of Preparation and Evaluation Meetings**
7. **Development of the RKT Application**

Solutions 1 and 2 are combined into a single implementation plan as they are perceived to have the most significant impact on the issues at hand.

While the RKT Application development also presents a highly beneficial solution, only a cost approximation is presented. Due to time constraints and limited expertise in app development, a comprehensive implementation plan for this solution will not be presented in this discussion.

6.1 Implementation of the Framework

The suggested solution will take time to implement effectively. For this reason, an implementation schedule has been constructed for the company. The schedule will run for one year, this year being divided into four periods lasting three months each. The schedule has been based on the fifteen-step methodology from Goksoy et al (2012). Many of the earlier steps have been discussed already in this research. The schedule below focuses on the practical implementation of the changes.

Quarter	People Involved	Tasks
1	Management	- Clearly defining each distinct role - Cleary specifying the responsibilities for each role - Determining the end goal for quarter four, defining what constitutes success and failure - Setting up KPIs to gather data and measure success
2	Management and office staff	- Setting agreements on structure - Implementing the role of project owner - Communicating responsibilities and expectations per position - Defining criteria for the preparation of a project - Set up the system of meetings with the mechanics
3	Management, office staff and mechanics	- Implementing the framework - Implementing preparation and feedback meetings with mechanics - Gathering data on KPIs
4	Management	- Evaluating the progress from the previous quarters using the KPIs - Determining the next steps

Table 2 Roadmap for implementing the selected solutions

The primary objective of the first quarter is to prepare for the implementation process, a responsibility assigned to the company's management. Tasks during this period include defining various roles within the company, and clearly articulating responsibilities and expectations associated with each role. Management should also set comprehensive goals for upcoming improvements. This means that management will need to clearly define what they see as a positive impact resulting from the implemented changes. To objectify this, management should establish Key Performance Indicators (KPIs) to monitor the results. Goals can then be set based on these KPIs, such as reducing the number of projects that exceed the budget by 25 percent. Specific KPIs are suggested in the description of the third quarter.

The second quarter focuses on bringing office employees up to speed with the new structure. A smooth transition relies on clearly outlined responsibilities and expectations from management in the first quarter. Also, this quarter sees the implementation of the waterfall framework, which requires a thorough understanding of exact project requirements. This includes drafting a checklist of prerequisites before a project can begin - such as measurements, drawings, materials ordering, and confirmed customer agreements. Agreements on how this is done, like visiting a project site in person, need to be included. Lastly, management and project leaders need to decide on the structure of meetings with mechanics, including the timing, duration, and agenda of these meetings. Clear communication with the employees is important in this period. The process changes should be clearly motivated such that employees see the benefits.

The third quarter serves as the implementation phase. Mechanics need to be informed about the new agreements discussed in the previous quarter, such as the project owner role and customer agreements. The new meeting system with mechanics also has to be implemented according to the plan formulated in the second quarter. This quarter demands data collection on the effectiveness of the new solutions, tracking changes in efficiency, operational methods, and employee response to the new structure. Suggested KPIs to track these improvements include:

1. **Task Completion Rate:** This metric tracks the percentage of tasks or projects completed within the set timeframe or predetermined cost. This is a straightforward measure of efficiency and can provide valuable insights into how well the new system is working.
2. **Client Satisfaction Score:** This could be measured through customer surveys after the completion of each project. High client satisfaction often is an indicator that a project was executed smoothly with major mistakes or delays.
3. **Employee Satisfaction Score:** The success of the implemented changes depends for a large part on the employees themselves. To ensure employee satisfaction, surveys can be used to gauge this. It can also allow for
4. **Process Adherence:** This measures how often team members stick to the newly implemented processes. High adherence indicates the new processes are clear, understandable, and seen as valuable by the team. This could be measured by using a checklist that tracks all required steps and whether they were fully completed.
5. **Change Requests:** The number of change requests or modifications needed after project completion could also be a useful KPI. A high number might indicate issues with project planning or execution.
6. **Return on Investment (ROI):** Beyond simply tracking projects that go over budget, looking at the ROI of each project can provide a more nuanced view of its financial success.

7. **Time to Resolution:** This KPI measures the average time it takes to solve any issues or problems that come up during a project. A decreasing time to resolution could indicate improvements in internal communication and problem-solving skills.
8. **Project Scope Creep:** How much the project deviates from its original plan. It could be an indicator of how accurately projects are being planned and scoped. This can be measured by looking to see if there were any differences between the delivered product and the planned product. Alternatively, this KPI can be measured by the number of hours spent on a project compared to the amount that was planned.

Finally, the fourth quarter is reserved for analyzing improvements and determining the subsequent course of action. If no significant improvements are evident, management may opt for another iteration of the implementation schedule. If so, a thorough evaluation of the first iteration is essential to make necessary adjustments for the second iteration. If, on the other hand, the third quarter proves insufficient to draw reliable conclusions, an additional quarter could be introduced for extended data collection.

Should the implemented changes effectively enhance the process to the desired degree, maintaining the schedule may no longer be necessary. However, continued vigilance is essential to prevent regression to the original situation. The responsibility falls upon the management to ensure that employees adhere consistently to the agreed-upon procedures.

6.2 Cost Approximation of the Application

Should the company choose to enhance the digitalization of the process through the recommended application, an approach similar to the one used for the framework implementation can be adopted. The initial step would be to clearly delineate the intended functionalities of the application. Establishing the application's scope is crucial to estimate the costs and production timeline accurately.
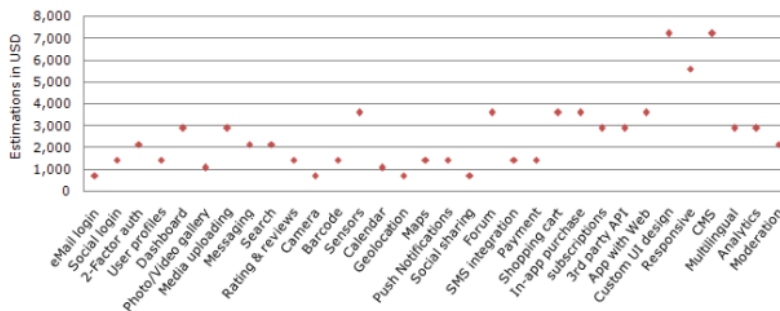

Fig. 6. Evaluation: Combination of the WBS and App features using online App cost estimators.

Figure 9 Rough estimates of the price of different app functionalities (Shams et al., 2019)

Figure 7 provides an estimated cost breakdown for various app components. It's important to note that these estimates are based on the pricing models of app development companies, not on scientific research. Based on these figures, the cost to build the app is expected to be around 20,000 euros. However, this estimate only considers individual components, and a more realistic budget for a fully functional application would be between 30,000 and 50,000 euros. This estimate aligns with the average

cost of building a medium complexity app found on various internet sources. The production timeline for an app of average complexity is typically estimated to be around 6-8 months. Both the cost and production time will significantly vary depending on the specific requirements of the application. Once the application is developed, the company should anticipate ongoing maintenance costs. A standard approximation for this is 15-20 percent of the initial production costs per year. (Shams et al., 2019)

Before the application can be used in practice employees will need to receive training on how to use the application. This training should cover all the features in the application, their purpose and when and how to use them. This will ensure that employees can use the full potential of the application.

7. Evaluating the Solutions

The management has evaluated three primary solutions to bolster company efficiency and improve internal communication: digitalization, implementation of preparation and evaluation meetings, and the establishment of a structured framework with the appointment of a project owner.

Firstly, digitalization emerged as a crucial consideration. The management recognized its importance as a strategic step for the company RKT to stay competitive. This solution, while reducing paperwork substantially, allows for an increase in communication channels. Thereby, the possibilities for various applications of digital systems were significantly acknowledged. However, the success of this solution would depend on ensuring effective and seamless integration of the digital systems into the company's existing workflow.

Secondly, the proposed solution of instituting regular preparation and evaluation meetings garnered support. These meetings could potentially enhance operational efficiency and minimize errors. However, a potential drawback was highlighted: the significant time investment required from employees, thereby detracting from the company's profit-generating hours. A balanced approach was suggested to tackle this issue, which would involve conducting these meetings for only critical projects or transitioning some of them to an online format to save time.

Lastly, the suggestion to bring in additional structure via a comprehensive framework, including the appointment of a project owner, was positively received. Ideally, the company would prefer to recruit a dedicated employee to oversee and manage all projects, thereby ensuring accountability. However, considering the current financial constraints, the company found it a significant investment. The solution proposed by this thesis — the introduction of a structured framework — appeared to be a more economical yet efficient way of enhancing project management.

8. Conclusion, recommendations, Discussion and Future Research

Chapter 8 of this thesis consists of four sections. First, the conclusions of the research are discussed in section 8.1. Section 8.2 will present the recommendations to RKT. 8.3 is dedicated to the discussion based on assumptions made and the limitations of the research. Lastly, section 8.4 discusses potential future research.

8.1 Conclusion

This study's primary goal was to conduct an in-depth investigation at RKT, targeting the crucial research question: "How can RKT augment its efficiency by implementing improvements in internal communication and structural processes, spanning from customer request intake to completion?"

The study unveiled that the central challenges RKT grapples with—namely, issues surrounding internal communication—serve as the root causes of various other difficulties. These systemic problems substantially inhibit the company's operational efficiency. Consequently, the aim was to delineate and propose viable solutions to address these challenges.

The research methodology leveraged in-company observations and interviews to extract valuable data and insights regarding the existing processes. It emerged that inefficient communication and structural inadequacies were the primary culprits behind project delays, cost overruns, and employee dissatisfaction, all significantly contributing to RKT's diminished efficiency.

The company's ineffective communication results from multiple factors, primarily the absence of structured meetings at crucial project stages, leading to minimal interaction between various departments. Currently, employee communication is an ad-hoc process, primarily driven by individual initiatives, rather than facilitated by a structured, company-wide approach.

In addition to the communication issues, a glaring lack of structured processes is another significant impediment. The blurred delineation of responsibilities across various roles triggers a chaotic work environment, propagating a vicious cycle. Poor project preparation and unclear project ownership result in frequent errors and delays, which, in turn, necessitate additional resources and time, inevitably affecting the subsequent project's efficiency.

However, the challenges currently plaguing RKT are not insurmountable. The literature review suggests several viable solutions to alleviate these issues. The communication problem can be addressed by instituting regular meetings, both preparatory and evaluative, fostering a robust communication culture. Improved inter-employee communication is vital for a company's success, as the literature review confirms.

Digitalization is another solution worth pursuing. Implementing a company-wide application could positively impact multiple aspects of the operational process, including communication, information sharing, planning and scheduling, equipment failure management, and feedback collection.

To mitigate the issues arising from a lack of structural clarity, we propose the RKT framework. Designed to offer clear, sequential steps for project execution, the framework emphasizes thorough project preparation—a component currently under-performed—and precisely defines roles at each project stage. This approach should help eliminate the prevalent confusion and accountability deficit, ultimately enhancing the company's operational efficiency.

8.2 Recommendations

To resolve the issue of lacking structure it is recommended to use the RKT framework. The framework will allow employees to work in a more structured manner with the intention that a project can only advance if the previous steps are fully completed. This will ensure proper preparation which in turn will lead to greater efficiency during projects. The appointment of a project owner is recommended since it will improve responsibility during the execution of a project. By clearly stating who is in charge of a single project there can be no doubt as to who to contact.

To further improve the internal communication within the company it is highly recommended to introduce preparation and evaluation meetings for every project. These meetings will facilitate two-way communication between mechanics and project leaders, allowing for discussion, clarification and questions. The poor preparation of projects can be solved in this manner, while the evaluation meetings will enable to company to actively work in improving the processes.

The company is recommended to increase the level of digitalization drastically. To achieve this, it is recommended to introduce a company specific application that incorporates the following features:

- Communication channels between employees
- The ability to quickly share information between employees
- The inclusion of protocols and manuals
- A timetable that shows employees when and where they need to work
- Checklists to ensure equipment is not left behind
- The ability to create tickets for broken or poorly working equipment

This application can be used by the company to improve internal communication.

8.3 Discussion

The research relied on interviews conducted among employees within the company. While it is believed that the employees interviewed gave honest answers, it is still possible that personal bias influenced the answers. This became apparent during the very first stages of the research when the problems were assumed to be largely caused by issues in the worksheets. This was caused by the fact that initially the research plan was based on input from office employees. Later interviews with employees in different departments refuted this idea. To paint the most complete and accurate picture of the situation, employees in every department and role were interviewed.

8.4 Future Research

During this research, it was concluded that the most significant problem faced by the company is the lack of structure and communication. Several solutions have been formulated as a result. Due to the time restraints of the research, it was not possible to observe the solutions in practice and to evaluate their effectiveness. This could be an interesting next step in the process of improving the efficiency of the company. By researching the impact on the longer-term, additional research can be done to further improve the proposed solutions. Analyzing the performance of the framework would be a useful next step to finetune the RKT framework further. Since the current framework uses a somewhat inflexible sequential structure it could be interesting to experiment with a more iterative process for example.

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Appendix

Results of the interviews with employees at RKT

	1	2	3	4	5	6	7	8	9
Structure		X		X		X	X	X	X
Practical knowledge			X	X	X	X	X		
Lack of preparation		X	X	X	X	X	X		X
Lack of digitalization						X	X		
Cohesion		X				X	X		
Training			X	X	X		x		
Communication	X	X	X	X	X	X	X	X	X
Lack of evaluation		X		X		X	X		X
Workload								X	X
Old/broken machines	X					X			
Lack of checks warehouse	X						X		
Lack of checks worksheets					X		X		
Lack of overview			X	X	X				

Table 3 Results of the interviews, 1 to 6 are mechanics while 7 to 9 are office employees