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Project management schedule planning for a short-distance factory relocation

A case study

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ABSTRACT :
The market demand for power management solutions has experienced considerable growth, leading to an increase in the production of uninterruptible power supplies (UPS). The aim of this master's thesis is to explore the characteristics of a factory relocation and provide implementation procedures for an uninterruptible power supply manufacturing company that intends to relocate its operations to a new factory due to limited expansion opportunities and facility constraints.

The research focuses on a project planning phase, with emphasis on designing a factory relocation schedule plan for a three-month bridge period to ensure a smooth transition and minimize production downtime. The study aims to answer two main research questions. (RQ1): What key factors contribute to the success of a factory relocation plan? and (RQ2): How can the case company prepare for an efficient relocation in advance?

The research methodology employed is a mixed-methods approach, involving data collection through semi-structured interviews, workshops, and document analysis. A descriptive case study analysis provided a comprehensive research approach to examine the relocation planning process and identify the primary success factors. The study also employed a narrative analysis to investigate semi-structured interview data to comprehend best practices and lessons learned from previous relocation projects.

Findings revealed several factors that contribute to the success of a factory relocation plan, such as the enforcement of a relocation project management methodology to provide a structured process throughout the project lifecycle, the selection of an experienced and appropriate transportation service provider, the implementation of best practices and lessons learned from previous projects. In addition, the results showed that the information of a hierarchical schedule for a detailed relocation project imposes careful planning and preparation with regular monitoring and adjustments to the plan.

The research contributes to enhancing the comprehension of key factors influencing factory relocations and offers valuable insights into the implementation procedures necessary for achieving factory relocations. This approach provided perceptions for the company’s relocation preparations and can provide practical recommendations for companies undertaking similar projects.

KEYWORDS: project management, factory relocation, schedule planning, transportation service provider, risk assessment, hierarchical schedule

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TIIVISTELMÄ :
Virranhallintaratkaisujen markkinakysyntä on kasvanut merkittävästi, mikä on johtanut häiriöttömien virtalähteiden tuotannon lisääntymiseen. Tämän diplomityön tavoitteena oli tutkia tehtaan siirtämiseen tarvittavia ominaispiirteitä ja tarjota toteutusmenetelmiä häiriöttömiä virtalähteitä valmistavalle yritykselle, joka on tilarajoitusten ja laajentumismahdollisuuksien vuoksi muuttamassa uuteen tehtaaseen.

Tutkimuksessa keskityttiin muuttoprojektin suunnitteluvaiheeseen painottamalla kolmen kuukauden siirtymäkauden ajanjaksoa varmistaen tuotantokatkoksien minimoinnin. Tutkimuksessa vastattiin kahteen keskeiseen tutkimuskysymykseen. (RQ1): Mitkä tekijät vaikuttavat tehdasalueen muuttosuunnitelman onnistumiseen? ja (RQ2): Kuinka tutkimuskohteena oleva yritys voi valmistautua tehokkaaseen siirtymiseen etukäteen?

Tutkimuksessa käytettiin monimenetelmäistä lähestymistapaa, johon kuului tietojen keräämistä teemahaastattelujen, työpajojen ja dokumenttianalyysin muodossa. Kuvaileva analyysimenetelmä tarjosi kattavan lähestymistavan muuttosuunnitteluprosessin tarkasteluun ja menestystekijöiden tunnistamiseen. Tutkimuksessa hyödynnettiin myös narratiivista analyysia teemahaastatteludatan tutkimiseen, jotta voitiin omaksua aiemmissa muuttoprojekteissa havaittuja menettelyjä.

Tutkimuksen tuloksista tunnistettiin useita tekijöitä, jotka vaikuttavat tehdasalueen muuttosuunnitelman onnistumiseen. Näitä olivat muuttoprojektin hallintamenetelmän noudattaminen koko projektin elinkaaren rakenteelliselle prosessille, sopivan kuljetuspalveluntarjoajan valinta ja aiemmista muuttoprojekteista opittujen onnistuneiden käytäntöjen hyödyntäminen. Lisäksi tulokset osoittivat hierarkkisen aikataulun muodostamisen muuttoprojektille edellyttävän huolellista suunnittelua ja valmistautumista sekä säännöllistä seurantaa ja suunnitelman jatkuvaa kehitystä.

Tutkimus edistää ymmärrystä tehdasmuuttoihin vaikuttavista keskeisistä tekijöistä ja tarjoaa näkemystä tehdasmuuttojen toteuttamisessa tarvittavista menettelytavoista. Tutkittu lähestymistapa loi käsityksen yrityksen muuton valmisteluista ja voi tarjota käytännön suosituksia yrityksille, jotka toteuttavat samankaltaisia projekteja.

AVAINSANAT: projektinhallinta, tehdasmuutto, aikataulusuunnittelu, kuljetuspalvelun tarjoaja, riskinarviointi, hierarkkinen aikataulu

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Abbreviations

PM — Project Management

PMM — Project Management Methodology

PMBOK — Project Management Body of Knowledge

WBS — Work Breakdown Structure

CPM — Critical Path Method

KPI — Key Performance Indicator

TSP — Transportation Service Provider

WSM — Weighted Sum Model

RFP — Request for Proposal

WMS — Warehouse Management System

IT — Information Technology

HR — Human Resources

1 Introduction

Scheduling is a crucial aspect of factory relocation. Thus, this thesis focuses on proper schedule planning, which determines the success of the relocation and implies that all activities are completed in an appropriate and efficient manner. Realistic durations and resources are tough to manage without a clear timetable for the transition. The nature and distance of relocation determine actions, measures, and approaches, although since a short-distance relocation requires less preparation and planning than a long-distance offshoring, the drivers of a relocation may be due to several reasons, which can be described as push and pull factors. A more thorough definition of these factors is found in the case company study.

A relocation is typically initiated to improve the overall performance of a business, whether that means increasing production capacity, reducing costs, or accessing new markets. For instance, when the operation of the organization consists of product manufacturing, running out of space triggers push-factor measures. Therefore, proper project management is central to a successful large-scale factory relocation, particularly in terms of carrying out the project scope and deliverables and comparing them to the accomplishments to be achieved. Implementing a contingency plan, on the other hand, may successfully manage unforeseen risks and difficulties that can arise throughout the migration process.

A project's complexity can be determined by several factors, including its scale, nature, scope, and intricacy (Wysocki, 2019). Executing a relocation project with the help of project management methodology guidelines is a prominent way of operating a relocation process. Since different methodologies exist, the one that has the most characteristics of a suitable project process influences the most success in project completion. Methodologies support processes and procedures throughout the project life cycle and imply guidance with a variety of project planning tools and techniques. However, creating a project team for the move to represent all organization functions decreases confusion within the organization and creates stability in organizing a relocation. Applying a one-

size-fits-all project management methodology for all projects is an ineffective approach, and since every move is different, it can be reasoned that there is no one-size-fits-all relocation strategy (Rothe & Heywood, 2015; Wysocki, 2019). This reinforces the knowledge that each relocation process must be managed differently by creating a specific procedure that meets the needs of the transferring entity.

There has been an insignificant amount of research examining short-distance factory relocations or relocation projects in general, with practical methods, obstacles encountered, and the advantages or disadvantages of such relocations. However, research on project management methodologies, lifecycles, and risks, as well as project planning, may provide insights into the advantages and disadvantages of schedule planning since the planning processes used in relocation projects are like those in project management (Kerzner, 2013), suggesting that there is a lack of research regarding project structure in relocation projects, particularly within the manufacturing industry.

1.1 Background

The case company intends to relocate its present operations to a different location within the same region. Therefore, a large-scale relocation project is initiated by following organizational guidelines for relocation project management structure throughout the project lifecycle, which include the decision to relocate, addressing pre-relocation actions, and post-relocation assessment. Although the relocation project will take a few years, the study focuses on a six-month planning phase. During this phase, the primary focus is on designing a factory relocation plan for a three-month period known as the bridge period, which will be regarded as one of the vulnerable periods within the lifecycle. It is also known as the project execution or transition phase from the existing location to the new manufacturing site.

This thesis seeks to uncover the schedule planning development process by developing a high-level project timeline and defining planning content, introducing project management, and evaluating a transportation service provider to improve preparation for a

smooth transition while keeping production partially operational at both sites, in accordance with the case company's specifications. Prior to this case study, the decision to relocate from the current location to a new site and the design of the new facility was made earlier in the project's life cycle.

The case company is one of the leading manufacturers of power management solutions and provides reliable power protection and backup for commercial, residential, and industrial clients in various environments, with markets ranging from offices to large data centers. Due to the current technological advancement, the current factory layouts have started to limit the growth of businesses, factory operations, product development, and the launch of new products. The case company started to compare the viability of an expansion with the alternative decision to relocate. The grounds for the extension were not as feasible as moving to new factory premises.

When a new factory construction project is implemented simultaneously, the relocation project becomes more difficult. Therefore, relocation can only be implemented when the new factory is completed. The new factory is designed to be a modern, multifaceted building that matches current and future needs, enables smoothly optimized work between departments, efficient production flows, and logistics operations, with an increase in testing capacity. Consequently, well-planned management processes are critical to ensuring the smooth transfer of equipment, resources, and employees to the new industrial complex with minimal downtime for manufacturing. The move will help the case company maximize productivity, match growing demand, and increase competitiveness.

1.2 Research objective

This thesis aims to help the case company acquire a deep understanding of the challenges and intricacies involved in relocating operations within a specified period. The study looks to predict potential issues that may arise during the move, with the objective of constructing a high-level project schedule. The definitive goal is to provide a case

study with insights into the complexities of relocating an entire manufacturing operation as well as highlight any potential issues that may arise before the move is implemented. This is supported by conducting research on previous project best practices and lessons learned, tendering an appropriate transportation service provider, and constructing a hierarchical schedule for the move to decrease potential risks and facilitate observing the project's progress. These are demonstrated by the following research questions:

RQ1: What key factors contribute to the success of a factory relocation plan?
RQ2: How can the case company prepare for an efficient relocation in advance?

This study is conducted to prepare for the upcoming relocation execution phase by investigating procedures required to ensure an effective move for the case company. Since the research takes place before the implementation of the plan, it focuses on developing preparatory actions for a smooth transition. Furthermore, the thesis aims to offer a systematic case study approach to relocation project planning with a focus on manufacturing facilities.

The thesis questions presented were acquired through the process of preparing the relocation, a detailed move plan where transportation service provider suppliers are examined as part of the relocation planning for their vital input of knowledge and proficiency in scheduling and resource allocations. The schedule is designed to minimize operational disruptions while being cost-effective. The study will use a case study approach and literature review to find best practices and key success factors for managing the process and developing a relocation plan. The relocation plan will cover the transition in five functional areas, including production, warehouse and logistics, electrical lab, office design, information technology (IT) and security. To set up subprojects for complete timeline transparency, a diverse team of managers is designated to ensure efficient cross-communication during the relocation period. Overall, this thesis aims to provide practical guidance for firms looking to undertake similar initiatives.

The research is mixed with qualitative and quantitative approaches and contemplates a case study method with the factory relocation project as the unit of analysis. Various methods were used to collect information for the study, including semi-structured interviews, examination of case company documents, and a set of workshops.

The factory relocation schedule is planned to use a collection of interviews as lessons learned, materials provided by the case company, and insights drawn from relevant literature. While conscripting a timeline for factory relocation, a transition service provider is selected, interviews are conducted, and various workshops with essential stakeholders and service providers are held. The schedule planning process evolves, changes, and is refined regularly during project workshop meeting sessions.

1.3 Research delimitations

The focus of the study is limited to a single client organization within a particular industry sector. The study concentrates from a project management (PM) perspective and will provide an overview by comparing project methodologies to inspect their intended use in case company relocation project management. The thesis will be limited to exploring certain themes relevant to the move at the current stage of the project's progress. These limitations concern fragments related to the project plan that incorporate costs, budgets, and allowances, as well as the new location facilities and factors related to the site selection decision-making. In addition, the thesis focuses solely on the objectives of the relocation schedule planning process, such as entities that must be relocated or need to be established prior to relocation. The selection of transition service providers is restricted to the largest operators in the area.

This study will not examine the new factory, as it is a distinct project requiring a separate examination. To limit the use of confidential information or company identities, the study does not employ confidential information. Consequently, the factory relocation process is only examined as far as it is related to relocation planning. Since the study is restricted by time constraints and the period takes place before the move, this thesis will

only present the project planning without putting it into practice. Thus, the focus of this research does not cover the process of the case company's initiation, execution, or closure of the factory relocation.

1.4 Structure of the thesis

The aim of this study is to offer practical knowledge about schedule planning and an overview of the importance of project management suitability for relocations. Examining the case study from the project team’s perspective, the study aims to provide new insights into the existing research. The remainder of this thesis is structured as follows: Chapter two clarifies the study by assessing a literature review with a focus on the main topics of project management, project planning, and relocation projects. The third chapter focuses on the methodologies, gathering data, data analysis, and aspects that may be asserted to influence the case study's quality. In the fourth chapter, the case study's results and findings are presented. The last chapter concludes the thesis while providing recommendations for further research.

2 Literature review

This chapter explores a framework for theories, concepts, and previous studies related to project management, project planning, and relocation projects. The literature review sets up a baseline for the case study research on relocation schedule planning. The topics in this chapter are introduced to support the case study research concerning important aspects and fundamentals that influence the preparation of a relocation plan, such as investigating the driving elements of factory relocation to mitigate risks. The literature aims to provide guidance on developing an effective relocation plan by examining the management process and drawing upon existing literature with examples of previous cases. It serves as the theoretical framework and explains the concepts and principles of relocation project management. The philosophy of project management is based on distinct lifecycles and methodologies. Since the literature focuses on relocation project management, planning, and subject areas, key topics related to the project's case study are exploited. For a more in-depth review of project management and planning details and processes, see the Project Management Body of Knowledge (PMBOK) guide (PMI, 2017).

2.1 Project management

According to the Project Management Institute (PMI) book of the Project Management Body of Knowledge (PMBOK) guide, project management refers to the implementation of “knowledge, skills, tools and techniques” and the integration of project management procedures into operations for achieving the project requirements (PMI, 2017, p. 542). Kerzner (2009, p. 4) provides an overall definition of project management as,

> *“The planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Furthermore, project management utilizes the systems approach to management by having functional personnel (the vertical hierarchy) assigned to a specific project (the horizontal hierarchy).”*

Marion (2018) states, the purpose of project management is to facilitate the completion of certain types of work through structured discipline. Project management is utilized to assist organizations in completing projects in an efficient way (Kerzner, 2013), but simply understanding the basics of project management and having trained professionals do not guarantee that project management will be effectively implemented in an organization. Consequently, to find success, it is vital to know which methods have failed in the past and take steps to improve them over time (Angarita & Gallardo, 2018). Wysocki (2019) defines a project as a collection of interrelated and different activities with a single goal that must be completed within a particular timeframe, budget, and parameters. Therefore, a project may exhibit inherent complexities and necessitate classification based on its magnitude, nature, purpose, and intricacy. As the project size grows, it becomes increasingly challenging to manage effectively. According to Zavyalova et al. (2020), the gap between the duties allocated to team members and their real skill set, as well as inefficient leadership tactics, impact project management performance.

The efficiency of project management is a crucial component of accomplishing goals when project results determine competency levels and business strategies (PMI, 2017). Experience, practice, and a “how-to” mentality have been crucial to the growth of the project management profession (Shenhar & Wideman, 2000). Organizations that lack the resources to successfully implement project processes and procedures are more likely to set the project up for failure.

2.1.1 Project management methodologies

Organizations can improve the likelihood of projects succeeding by using project management methodologies. Kerzner (2013) defines a methodology as a set of procedures and actions that belong to a project management-specific field or practice and are intended to achieve a certain goal. Charvat (2003) states that project management methodologies can be described as,

> *"A methodology is a set of guidelines or principles that can be tailored and applied to a specific situation. In a project environment, these guidelines might be a list of things to do. A methodology could also be a specific approach, templates, forms, and even checklist used over the project lifecycle."*

Methodologies are structured with guidelines and procedures that need to be followed to improve project management process efficiency. The purpose of methodologies is to provide structure and guidance for project processes and decision-making to assist companies in achieving excellence in project management (Kerzner, 2009). Project management frameworks are broad, conceptual models, while methodologies are more specific and prescriptive, providing a detailed project management roadmap, according to Wysocki (2019). Project management frameworks focus on providing a high-level interpretation of how rules can be implemented, while project methodologies continue to offer detailed steps and guidelines for carrying out a project (Kerzner, 2013). Choosing the appropriate project management approach can be challenging due to the many available options. Each methodology has its own unique way of organizing project objectives and process groups, making it essential to select the most suitable approach for the project.

According to Charvat (2003), project management methodologies can be broadly classified into two groups: heavy and light methodologies. Heavy methodologies are predictive in nature and involve predicting every milestone and technical detail, which results in a demand for various plans, reports, and schedules. Although heavy methodologies work well for planning projects in excessive detail over a prolonged period, they fail when changes occur during the project. Technological challenges, project delays, and evolving client requirements have led to the emergence of light methodologies. Though these methodologies involve stakeholders at every stage, they rely on project workshops and the flow of information to plan and build projects and use a more informal communication style. Light methodologies have fewer rules, procedures, and documents and are less documentation oriented. Initially, heavy methodologists were opposed to the implementation of light methodologies, as stated by Fowler (2001). The most significant

difference between the two approaches is that light methodologies are more fast-paced, adaptable, and place a lower emphasis on documentation for the project.

Using the right project management methodology (PMM) is essential for project success (Ahimbisibwe et al., 2017). Applying a one-size-fits-all project management methodology to all projects is an ineffective approach (Wysocki, 2019). It is more advantageous to categorize projects based on their characteristics and employ a project management methodology customized to the specific project type. MacMaster (2002) suggests that instead of comparing the information provided by different project management methodologies, it is more useful to compare their scope and size, as some methodologies may be more extensive and cover a broader range of project management features. To achieve success in a project, it is important to align the PMM with the specific requirements of that project (Williams, 2008; Špundak, 2014; Wysocki, 2019). Ineffective methodologies are considered one of the biggest risk factors for project failure (Ahimbisibwe et al., 2017). Although methodology is only an instrument that must be replaceable when required (MacMaster, 2002), an effective and appropriate project management methodology can help mitigate this type of failure.

2.1.2 Traditional, Agile and Hybrid management approach

Traditional and agile methodologies are regarded as the most established and widely utilized in project management environments (Sennett, 2022). Between the two, traditional and agile are often compared since the two represent the most common and established methods used in the industry. Both embody a distinct approach to project management, with traditional methodologies being more linearly structured and plan-driven, while agile methodologies emphasize more adaptability and flexibility with iterative sequences (Sennett, 2022). However, when considering incorporating both traditional and agile methodologies, it may be effective for a project to implement a third option as a hybrid methodology if characteristics of both approaches occur to ensure that the project objectives are met within the established constraints (Tolbert & Parente,

2020; Sennett, 2022). A detailed comparison of the primary characteristics of traditional and agile project management methodologies can be found in Table 1.

Table 1. The primary characteristics between traditional and agile project management (Zavyalova et al., 2020)

Matrix	Traditional approach	Agile approach
Fundamental assumptions	Systems are fully specifiable, predictable and can be built through meticulous and extensive planning	High-quality, adaptive software can be developed by small teams using the principles of continuous design improvement and testing based on rapid feedback and change
Control	Process centric	People centric
Management style	Command and control	Leadership and collaboration
Knowledge management	Explicit	Tacit
Communication	Formal	Informal
Customer's role	Important	Critical
Project cycle	Guided by tasks and activities	Guided by product features
Development model	Life cycle model (waterfall, spiral or some variation)	The evolutionary-delivery model
Desired organizational form/structure	Mechanistic (bureaucratic with high formalization)	Organic (flexible and participative encouraging cooperative social action)
Technology	No restriction	Favors object-oriented technology

To clarify the differences, when choosing a project management methodology, a range of factors such as company strategy, project team size, scope, priority, and flexibility of the methodology should be considered (Kerzner, 2013). Traditional methodologies, known as the waterfall, are preferred by larger project organizations for following a plan or a set of plans with an established structure. Smaller organizations or projects with unclear needs may prefer a more flexible and adaptable approach, such as an agile approach, that encourages changes and modifications throughout the project. The basic concept is that traditional methodologies are best suited for projects with specific objectives and little scope change, such as construction, infrastructure, or manufacturing (Sennett, 2022); with fluid project requirements, such as in software development or marketing campaigns, agile approaches are preferable. Although agile has been used in a variety of diverse types of modern businesses, a hybrid approach combines the best of both methodologies (Tolbert & Parente, 2020). The foundations of what must be done remain the same regardless of how the project is executed (Naybour, 2021). In theory, finding the ideal hybrid project management approach is more manageable when

components of different areas of methodologies that work best for different process groups over the life cycle of a project are acknowledged. The integration of traditional and agile project management techniques can pose a significant challenge, but it may also offer a solution by combining structured and flexible methods to manage projects.

2.1.3 Project lifecycle

A project progresses through the lifecycle of a series of process groups. The development of any program, project, or product goes through various stages, referred to as lifecycle phases (Kerzner, 2013). Managers and executives comprehend phases to effectively manage resources and accomplish goals. To remain vigilant throughout the project lifecycle, it is necessary to first ensure an optimal level of development that allows for the achievement of the intended goals (Angarita & Gallardo, 2018). According to Williams (2008), this implies that projects should be managed through a system of project life cycles, in which planning takes place before any actual work begins. This concept is consistent with the Deming quality control management cycle (Plan, Do, Check, Act), known as the PDCA-cycle. Following this cycle at each stage of the project lifecycle with an effectively implemented plan increases the likelihood of success and achieving the desired outcome. The preparation input and management output are two critical and interdependent project components that must be carefully managed throughout all phases. The success of a project is dependent on a series of interconnected components that require varying levels of attention to secure a positive outcome.

To ensure project requirements in all phases, the project manager must address stakeholder requests, maintain transparent communication, and allocate sufficient resources to complete the project. (Kerzner, 2013). Scope, timetable, budget, quality, resources, and risks are a few of the project limitations that must be balanced between each process group. However, implementation of project management processes and prioritization of limitations can vary depending on specific project conditions (PMI, 2017). Over the course of a project, the manager must gradually transform high-level data into a

comprehensive plan (Marion, 2018). Without a proper plan, nothing can be expected to go as anticipated.

In accordance with the project management body of knowledge (PMBOK guide), the value delivery system provides business deliverables that result in outcomes (PMI, 2017). A project value delivery system runs most effectively when all group components constantly provide information and input, keeping the project aligned with the plan and adaptable to organizational strategies (Kerzner, 2013). In conclusion, a project management lifecycle includes best practices, procedures, and principles to guide the project manager in the system of value delivery.

Both Agile and traditional project management methodologies can be implemented in the project lifecycle by using iterative sequencing with an incremental method for Agile and a linear process group approach for traditional “waterfall” methodologies (Sennett, 2022). The main distinction between the two lifecycles is found in the process structure. The iterative process in agile entails providing constant feedback and refining a functioning prototype until the result is produced. Also, in agile, the incremental build implies completing each iterative part of the project before moving on to the next, suggesting that completed work is supplied throughout the project.

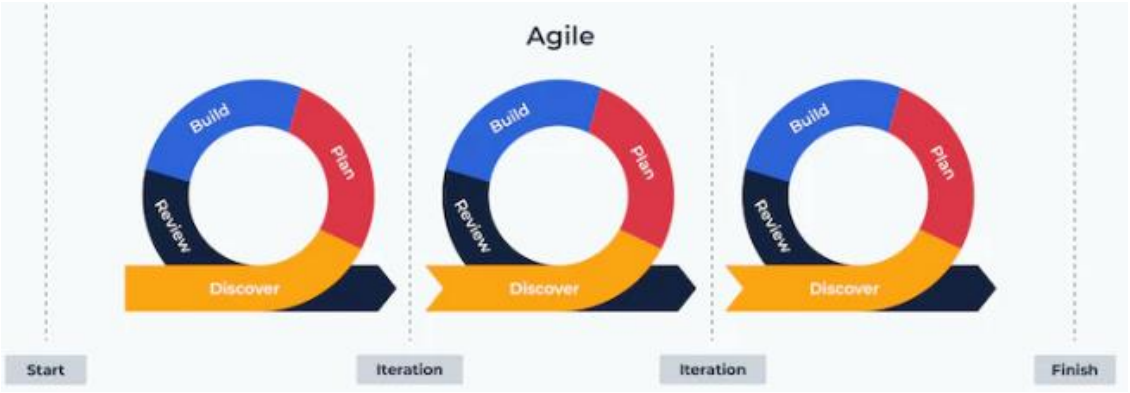


Figure 1. Agile project management approach (Adamfard, 2023)

A traditional project typically goes through a series of stages (Figure 2). Each of which is critical for the project's success and assists in ensuring that the project is finished on time, within budget, and to the satisfaction of all stakeholders (PMI, 2017; Trentim, 2020). A study by Trentim (2020) proposes a simple structure for project management. This context consists of a table that details the process groups of a project, with one level detailing each group's objectives and another one presenting the primary outputs. Each stage of a project aids project management in visualizing critical requirements.

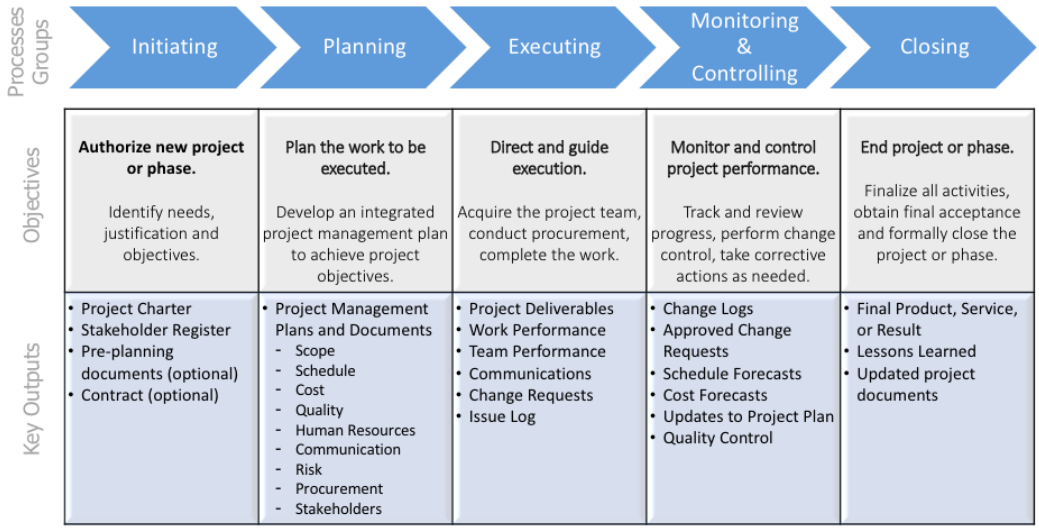


Figure 2. Traditional "waterfall" project management approach (Trentim, M., 2020)

However, regarding project management, Marion (2018, p. 8) states that "project process groups and project lifecycles are not the same thing". He highlights that they are distinct from a project life cycle because the process groups can be used for a variety of work types in such distinct stages. Process groups are a way to handle complex tasks that go beyond just managing projects, and they work as a collection of connected processes for carrying out specified actions as the project proceeds. If project management activity is considered in the context of layers, one set of project management process groups can be viewed as a section below the project life cycle. For example, in the "plan" phase in Figure 3, Marion (2018) demonstrates that each stage should be initiated, planned, executed, monitored, and controlled, and closed separately in distinct phases.

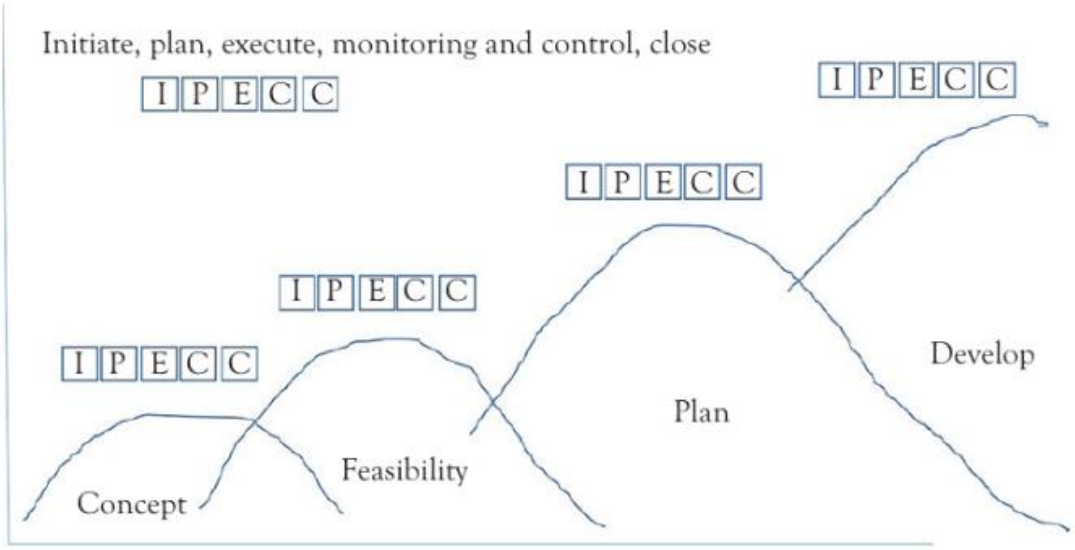


Figure 3. Controlling the project life cycle within distinct stages (Marion, 2018, p.8)

A process is composed of stages and gates, where each gate serves as a structured decision point after each step, overseen by cross-functional teams (Kerzner, 2013). An efficient project management process typically includes six or fewer gates. If there are an excessive number of gates, it may distract the team and cause them to spend too much time preparing for gate inspections instead of working on the project itself. The stage-gate process is just one of many processes that provide structure to the overall methodology for managing projects, while project management is used to manage the phases between gates. Therefore, the stage-gate approach is a decision-making tool used within each lifecycle phase of a project, and it can be customized to enhance decision-making and risk management. According to PMI (2017), the approach to project management is impacted by the methodology used and how the life cycle is created. To move on to the next process group, a phase-gate review is conducted in project management to verify that the gate acceptance criteria for a process group are fulfilled.

2.1.4 Risk management

Proper risk management increases quality and decreases expenditures, which can be described as a subjective loss occurrence. Risk management is a crucial component of project management that involves anticipating potential situations of uncertainty and developing appropriate plans to prevent foreseeable problems from becoming obstacles that could negatively impact a project (Kerzner, 2013). Risk management strategies, from identifying to mitigating risks, consist of assessing potential risks and challenges. In project management, the risk management strategy plays a role when the project and the risks associated with it must be considered throughout the project's lifecycle (PMI, 2017). Therefore, risk management follows a structured process to implement risk responses for identified risks. In contrast, the six steps shown in Figure 4 represent broad steps of the risk management process. Thus, it is significant to consider the overall intended use of the risk management process when the scope and type of the project distinguish the risk management process steps.

Figure 4. Risk Management Process

Khan and Zsidisin (2011) state that the risk management process can be simplified into three main components: risk identification, risk analysis, and risk evaluation. Consequently, the risk management process begins with naming all hazards that may exist, followed by assessing the likelihood and effect of the most significant risks. Finally, a risk

assessment procedure is carried out to set up the best response for the identified hazards. Furthermore, for each risk, it is critical to name individuals responsible for implementing a risk response action.

As a project's size increases, so does the level of risk associated with it. Detecting potential risks and challenges and developing appropriate response strategies is vital (Kerzner, 2013). Organizations may suffer additional indefinable harm, a loss of business opportunities, customer unhappiness, and poor employee satisfaction due to downtime and cost expenditures linked with manufacturing, operational, or IT activities and a reallocated workforce (Willett & Green, 1997). The potential monetary loss from an unsuccessful extensive operation is difficult to assess in advance if the project's complexity is challenging. Therefore, the greater the number of project variables, the higher the project cost. However, the risk effects on the project duration decrease over time (PMI, 2017).

A planning process involves consideration of the project and the risks associated. The degree of risk is decided by the scenario in which it happens. Projects can fail if risk management is not effectively implemented, or the project management methodology does not provide any risk management recommendations (Kerzner, 2013). The research also states that the difference between expectations and the actual performance assumed in the project scope may be due to a lack of technical skill and risk management or a combination of the two, emphasizing the significance of the risk management process in project management. Every incident that could disrupt project success might be classified as a project risk (Marion, 2018). The challenge of managing project risks starts with risk identification. To manage risks effectively, it is important to evaluate the likelihood and impact of each risk and develop response strategies accordingly. As a result, a complete risk assessment utilizing a risk matrix is needed to detect and evaluate the severity of threats at an early stage of project planning. Although the assessment of risks may be

subjective if it is based on an individual's viewpoint, the use of risk matrices exists for appropriate risk assessment.

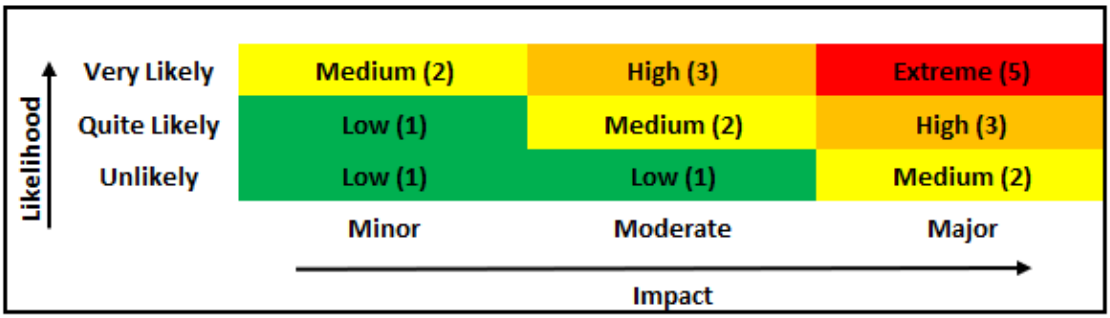


Figure 5. Risk Matrix (3x3)

Distinct categories of risk response actions can be implemented to augment a risk response plan. Therefore, risk responses can be utilized to address risks, including avoidance, transfer, mitigation, and acceptance (Hillson, 2001). Risk avoidance entails eliminating the threat entirely, whereas risk transfer entails transferring the risk to another entity. Although risk mitigation reduces the likelihood or severity of a risk's occurrence, risk acceptance accepts the risk and its repercussions (Fang et al., 2013). Prior to implementing risk responses, the risk matrix guides the likelihood and impact of a risk with a scoring system.

2.2 Project planning

Project planning is organized before implementation. A project plan is a thorough and detailed document that serves as a roadmap for a project and sets the foundation for the project schedule (Serrador, 2014). The plan details steps to define the scope, achieve objectives, and assign tasks and activities to complete the project (Kerzner, 2013; Serrador, 2014; Marion, 2018). Project planning is the project manager’s primary role (Kerzner, 2013). The process of project planning is a crucial component in the overall management of a project (Pellerin & Perrier, 2019). Procedures are founded on a concept model and the implementation of a project management methodology. Projects are important for

generating value for a business, but the allocated budget may not always be adequate (Shen & Walker, 2001). Therefore, developing methods that are suitable for the existing resources is critical.

Effective project planning is critical to project success. According to Williams (2008), proper planning can significantly increase the chances of project success. Planning, synchronizing, and executing plans comprise the most crucial tasks of a project manager (Kerzner, 2013). A project plan outlines project execution, monitoring, and closure. Therefore, planning is the main procedure that enables a project team to design a proactive strategy for achieving the targeted project goals. Even before the project is permitted, high-level planning can begin, but the degree of preparation should be dictated by the level of the project scope and conditions (PMI, 2017). However, spending an excessive amount of time preparing for a project can be inefficient (Kerzner, 2013), when the preparation process aims to provide sufficient information to proceed in the right direction without an excessive amount of detail.

The complexity and applicability of a project are influenced by the content management plan, which can range from simple to complex. According to Coward (1998), for the effective completion of a project, project managers must meet the specified requirements within a certain budget and timeframe. The process can be difficult and involves a balance between the implementation of concepts and the prioritization of clarity, as well as implementing planning and management abilities. Whereas continuous and adaptive planning may be beneficial for project development since they allow modifications and enhancements depending on stakeholder input and upgrades during the project monitoring and controlling process (PMI, 2017). However, implementation of planning strategies varies depending on distinct phases of the project due to the distinctiveness of each project process group. Scope, deliverables, schedule, risk management, and communication are critical components needed in project planning. When all these components function together, it is essential to create a structured approach to project management. To carry out a temporary project within a larger organizational environment,

the project team must receive approval, management, and support while being assigned a clear scope of work (Marion, 2018).

2.2.1 Scope and deliverables

According to Angarita & Gallardo (2018), key elements of a successful project, from the perspective of those involved, include meeting the project scope, time, cost, and quality requirements. Every project should have a well-defined objective that will impact on its success. To achieve this objective, the project must produce specific deliverables within certain milestones. Thus, the project scope defines the deliverables of the project (Marion, 2018). Maintaining control over the project scope is considered a fundamental aspect of project management.

According to PMI (2017), projects require specific planning for their deliverables. Starting a project to create specific deliverables involves establishing a well-defined project scope (Marion, 2018). A project is initiated to produce specific deliverables after the project scope is clearly defined. High-level project deliverables are broken down into smaller levels of detail with predictive planning strategies that use numerous deliverables for effective planning (PMI, 2017). Therefore, a project charter is created to outline objectives, scope, and boundaries, allowing the team to work without excessive supervision (Marion, 2018). Having a strategy and delegating tasks solely to employees is not a guarantee of success. A timetable must be established to manage the project's progress and development (Pellerin & Perrier, 2019). As a result, emphasizing the significance of having a designated individual, a project leader, who takes direct responsibility for the project's success is indispensable to taking responsibility by steering the project (Kerzner, 2013).

2.2.2 Schedule

Project planning entails project scheduling (Pellerin & Perrier, 2019). Effective scheduling requires a thorough understanding of the work being planned; without such knowledge,

scheduling cannot be successful (AlNasseri & Aulin, 2015). Kerzner (2013) emphasizes the importance of schedules in providing a comprehensive plan for project teams to track ongoing operations. The aim of schedule planning is to optimize the flow of work and employment to avoid unnecessary waiting times (Seppänen et al., 2010). To ensure effective scheduling, certain guidelines should be followed, including clearly defining major events and dates and establishing the exact sequence of work by implementing project planning tools. Schedules should identify time constraints and necessary resources for each event. These guidelines should be followed regardless of the complexity of the project.

APM (2016) outlines that while developing a schedule, the projected duration of each action is recorded to facilitate project implementation and risk assessments. It includes various elements such as constraints, risks, assumptions, interfaces, dependencies, and opportunities. The PMBOK guide also refers to comparable structural similarities (PMI, 2017). In scheduling activities, it is crucial to consider the number of events, the level of technical detail, and the schedule objective (Kerzner, 2013). There are no definitive guidelines regarding the complexity of the schedule. Thus, the project team should determine the optimal level of detail by considering these factors. Angarita and Gallardo (2018) emphasize that the scheduling planning procedures related to time estimation, control, management, and activity sequencing are crucial for successful construction projects, although these principles can be applied to interpret the complexity of projects. Consequently, while project objectives differ from each other, the project structure remains the same.

A schedule primarily addresses “what”, “when”, and “how much” but it also serves as a useful starting point for developing the overall project plan (Marion, 2018). Hence, with a schedule in place, the understanding behind the different elements of the complete project plan becomes more logical, when the schedule acts as a framework for the development of a comprehensive plan. In project management, it is important for the team to remember that the main purpose of developing a schedule is to coordinate activities

to achieve the primary project objectives with optimal timing and the least risks and expenses (Kerzner, 2013). Since poorly constructed schedule dependencies raise risks, tasks are prioritized based on their significance and interdependencies.

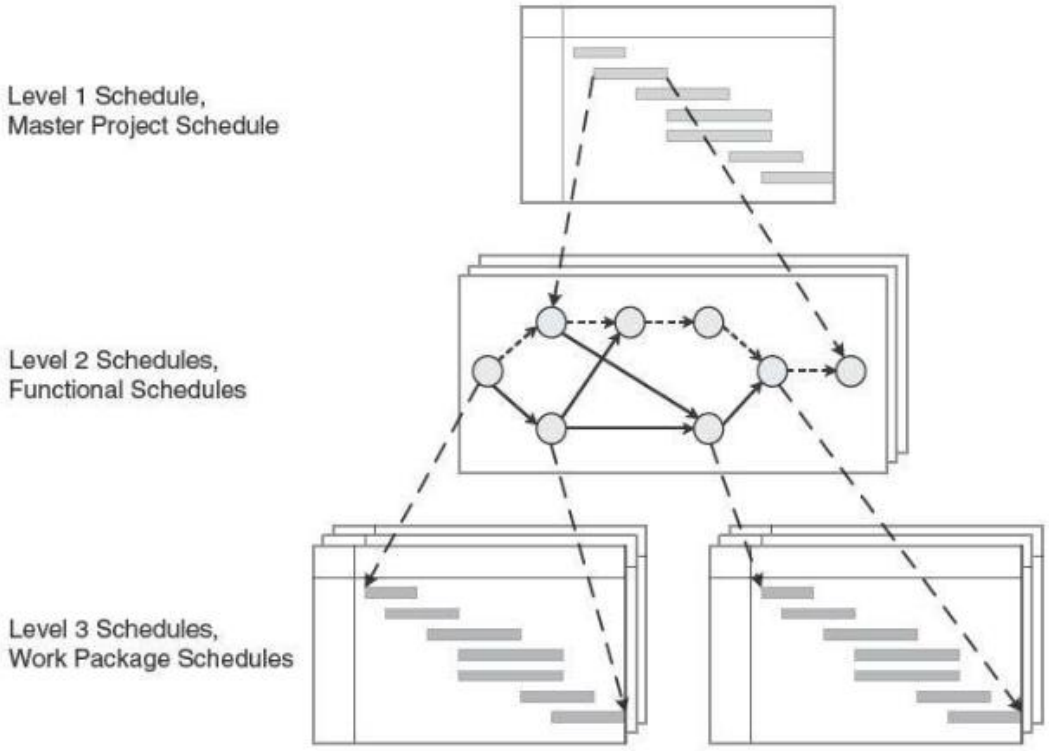


Figure 6. Hierarchical Schedule (Martinelli & Milosevic, 2016)

The project manager typically provides a primary schedule with a high-level overview of the tasks to be performed, while the functional managers, who serve as the primary experts, are responsible for the detailed schedules (Kerzner, 2013). First, a high-level baseline timetable should be utilized as a monitoring instrument to evaluate the visible outcomes of scheduled activities (Glenwright & Mattos, 2008). Then, based on the high-level activities for functional schedules and work package schedules are developed as thorough and in-depth project planning actions.

In the context of project scheduling, a milestone is an occurrence that has a zero-time duration (APM, 2016). Securing realistic milestones to designate a point in a project timeline is essential for effective planning (Kerzner, 2013). Milestones in the project

schedule refer to important start dates, such as access dates, key launch phases and completions, and other significant dates, when segmenting the project timeline into intervals, or short periods, to control and track progress (Kerzner, 2013; APM, 2016).

2.2.3 Planning tools

Project planning tools are utilized to facilitate the planning and organization of a project. Project management tools, such as software packages, have been created throughout the years to aid project managers. As they are widely used in various project planning and task arrangements, particularly in work breakdown structure (Pellerin & Perrier 2019). Dividing a project into work packages or planning packages is a way to gain a comprehensive understanding of project components (APM, 2016). Work Breakdown Structure (WBS) is a technique that decomposes project scope and deliverables into smaller, more manageable components to improve work efficiency. Marion (2018) pointed out that developing project scope begins with the scope statement, which outlines the project's “what”. However, this is just the starting point, and the elaboration of scope involves identifying project deliverables with excessive task specificity. To ensure that no project deliverables are missed, it is crucial to maintain organization and structure throughout the project management process. For this to happen, a WBS must be developed, which is a hierarchical and categorical outline of project deliverables (Marion, 2018). The WBS breaks down the project into multiple levels, with each level representing a more detailed view of the project task deliverables. The WBS provides a top-down, comprehensive view of all elements, including all levels and sub-levels of deliverables (Kerzner, 2013). As a result, the work breakdown structure describes the deliverables rather than the “who”, “how,” and “when” (Marion, 2018), but these details are also included in the project schedule.

In project planning, scheduling activities is essential to ensuring proper utilization of resources and anticipating future resource requirements. It enables the project team to visually track performance and provides a basis for monitoring resource usage (APM, 2016). For a large-scale project, a dedicated employee regularly produces and updates

activity schedules (AlNasseri & Aulin, 2015). The use of activity steps in a schedule can be beneficial when managing a large-scale project by simplifying the quantity of tasks displayed on the schedule. Instead of showing a series of sequential tasks, multiple steps can be combined into a single task with pre-agreed progress weightings to objectively track progress. Subsequently, activity schedules can be used in planning to establish a schedule or in monitoring and control to identify changes within the project (Pellerin & Perrier, 2019). Overall, Gantt charts have been used in projects to illustrate activity scheduling as a visual timeline for a project schedule (Serrador, 2014). Although the visual implication of Gantt charts is evident, Kerzner (2013) highlights the major drawback of charts, which is their inability to show the interdependence of events and actions. However, an overall plan must first be created to further develop a thorough perspective on project interdependencies.

The critical path method (CPM) is a scheduling technique that employs a network diagram to identify a project's critical path (Kerzner, 2009; Kerzner, 2013; PMI, 2017). It defines time periods for each activity and identifies the longest chain of dependent activities to establish the critical path of the project. Project management incorporates the CPM into flowline scheduling in project schedule software, which can automatically generate a high-level Gantt chart view by compiling project actions (Seppänen et al., 2010). Network diagrams are used to visually represent the dependencies between tasks and identify the critical path (Serrador, 2014). According to Shen and Walker (2001), several researchers have criticized the critical path method network diagram since it relies on a strict planning approach that identifies and logically connects defined tasks prior to the commencement of implementation. Particularly targeting planning approaches, which depend on planning and scheduling software package applications to generate programmed plans that may include errors in data entry or weak operational procedures (Kerzner, 2009; Kerzner, 2013; PMI, 2017), studies propose that the critical path method network diagram consists of a certain number of success factors that refer to the necessary elements to achieve the desired outcomes. The strategy can be employed as a risk mitigation tool to avoid accepting a plan without considering potential consequences,

which can impact various planned activities with different components that may cause failures (Altman, 1991; Shen & Walker, 2001). The use of network analysis in project management helps to reveal interdependencies and offers valuable data for plan integration, scheduling, and resource management (Kerzner, 2013). The main objective of network design is to minimize the occurrence of conflicts during project implementation.

2.2.4 Performance control and progress indicators

Serrador (2014) suggests that project managers should focus on defining project activities, creating Gantt charts, determining the critical path, and working with key stakeholders to enhance project performance. Performance control and progress indicators relate to monitoring and controlling the project's progress (Marion, 2018). Creating a project plan involves defining comprehensive job descriptions, outlining the necessary resources, establishing significant schedule milestones, and setting quality and reliability standards for the final product (Kerzner, 2013). Such factors provide the groundwork for evaluating project performance and determining progress indicators. Properly established indicators help functional units comprehend their responsibilities in achieving project objectives, anticipate budget, time, scope, and quality issues and resource requirements, and detect potential obstacles early on.

Progress indicators assess the development of a project and identify areas that require improvement (Kerzner, 2013). The effectiveness of the method used to achieve the desired results is assessed using key performance indicators (KPIs). These metrics are regularly monitored during the project's life cycle and serve as internal measurements to answer questions such as whether the process was correctly followed, management was kept informed, and resources were appropriately allocated and utilized. KPIs are utilized by top-performing project management companies to evaluate performance internally and externally (Kerzner, 2009). Therefore, different performance controls are implied to enable effective preventive measures for planning to address issues that might endanger the successful execution of the project. Project performances are indicated with different systems of measurements, which are conditional on the type of project.

2.3 Relocation projects

The primary aim of moving a facility is to minimize disruption to regular company operations. According to Ponton et al. (2011), relocation is defined as the transfer of organizational capabilities to a new or existing facility, regardless of the changes to the original location. By creating comprehensive project planning, the disturbance faced by the management can be reduced. Willett and Green (1997) emphasized that reducing disruption is an essential aspect of relocation planning. Ponton et al. (2011) offered a list of success factors and common issues affecting success, such as those shown in Table 2, composed from across various case studies.

Table 2. Typical problems and success factors for relocation (Ponton, et al., 2011)

Common issues	Success Factors
Transparent project management	Extensive project preparations and planning
Cultural, or communication issues	Well defined objectives
Incorrect site or strategy	Comprehensive equipment preparation
Staff fluctuation	Experience
Environment or weather concerns	Effective project management

The main objective of a high-level project plan is to outline the project phases from the decision to move up to the relocation's completion. Depending on the organizational sectors, relocation projects vary from small to large-scale and are divided into smaller projects to facilitate management (Ponton et al., 2011), but traditionally, project management-oriented relocation projects offer project process models divided into five phases (Figure 7).

Figure 7. Relocation project phases (Ponton et al., 2011)

2.3.1 Motives for factory relocations and change

Relocation is the process of moving commercial property. It typically includes considerable changes in location, facility structural change, office environment transformation, and new methods of operation (Rothe & Heywood, 2015). A relocation is unique in every way, though it is unusual for a company to undertake such a large project without solid reasons and only as a last resort (PMI, 2017). Relocating a company to a new site is a substantial choice that can have a noteworthy influence on the company's future goals, productivity, and performance. A relocation can result in disastrous measures within an organization's internal function, increasing personnel turnover and decreasing job satisfaction (Weterings & Knoben, 2013). As a result, plant relocation entails major risks that might jeopardize the company's success. Organizations relocate for a variety of reasons, each with its own set of challenges. According to BBM (2021), common reasons for relocation are the lack of available space, the introduction of a new product line, the development or centralization of operations, improved customer visibility and access, a merger or acquisition, or the expiration of the current lease agreement with the property owner.

Since employee and firm-related factors associated with the relocation process are important for the company's operation, choices on relocation site and layout solutions are strategically important decisions, as they can dictate the organization’s future working environment and impact aspects including efficiency, employee engagement, and overall company targets (Rothe & Heywood, 2015). Capasso (2003) states that the relocation of a workplace should be carefully planned and executed in a way that minimizes business disruptions to ensure uninterrupted service delivery. Including efficient cross-functional communication tactics for alerting employees about the relocation stages and giving team members tasks for managing the relocation. As well as emphasizing the importance of considering both the human and business aspects of workplace moves to ensure the success of the coordination and management of the relocation process.

According to Altman (1991), the relocation decision process of a company can be broken down into three phases: the decision to relocate, the problems affected before relocation, and the outcome of the relocation. Companies are looking for more effective and creative methods to control processing expenditure and offer better products faster and at a reduced cost. (De Felice et al., 2015). Van Dijk and Pellenbarg (2000) note that the data collected suggests that the number of company relocations is tied to the economic cycle of growth and fall. Consequently, government policies may promote the relocation of individual firms. Relocation is not always necessary for a company, but it can offer advantages.

The concept of relocation was developed in the 1970s and is still not entirely understood today due to the numerous ways of relocating (offshoring, reshoring, nearshoring, and onshoring), in addition to the various business motives that have influenced the decision (Ponton et al., 2011). Offshoring is referred to as the process of transferring company activities to a different country, whereas nearshoring is the process of outsourcing to a nearby country or relocating within continent borders; both are typically used in factory relocation operations (McHone, 2016), although reshoring is the return move to the original location. Depending on the type of operation, relocation models demonstrate an outsourcing framework. Because every organization is different, determining the best way entails more than just financial considerations.

Global manufacturing companies' offshore production to China to maintain market share and remain cost-effective due to the rise in labor costs (Dedrick & Kraemer, 2006). As technology advances, this trend has been driven primarily by the need to reduce overall financial costs while remaining competitive in the market. In China, low labor costs have made it an attractive location for manufacturers seeking to minimize their expenses. Dedrick and Kraemer (2006) concluded that the trend is likely to continue as manufacturers search for ways to stay competitive while reducing production costs. However, the risk of the relocation rises as the move's distance increases (Brouwer et al., 2004). McHone (2016) notes that historically, firms have benefited from outsourcing

production to nations with cheaper labor. Yet, offshoring may no longer be as lucrative as it once was since the sole benefit for western businesses is cheaper salaries. As a result, nearshoring the manufacturing operations is preferable as a better alternative decision for most factories, which allows for the factory to be upgraded to a more modern concept.

Ponton et al. (2011) suggest that when a notable change is about to occur, it may be challenging to adjust. Relocation, however, should be viewed as a change, emphasizing continuity rather than a complete overhaul. The primary objective of factory relocation is to improve overall operational efficiency, reduce costs, shorten delivery times, achieve greater financial success, and capture a larger market share (Ponton et al., 2011). The need for relocation arises as organizations seek to optimize their operations and processes. However, external factors such as environmental issues, natural disasters, or global economic factors are other major drivers considered in relocation.

2.3.2 Key drivers of short-distance relocations

Short-distance relocation is a major transition for businesses and an important event in the lifespan of a firm that occurs within the same city or metropolitan area. A study by Weterings & Knoben (2013) suggests that short-distance moves in the same regions and labor markets are mostly determined by the resulting demand for growth, which is frequently the outcome of factory expansion, whereas longer-distance relocations are impacted primarily by regional features. Also, companies consider transferring to a larger facility in response to the problem, although they prefer to stay in the same region to avoid expenses and other business-related growth considerations associated with long-distance migrations, such as the potential loss of skilled personnel, a well-known customer, or important local supplier relationships. Therefore, different strategic decisions are important to consider for short- and long-distance moves, as the reasons for each may vary. Although internal or external factors influence short-distance migrations, distances close to home are thought to have a far lower effect than long-distance relocations.

Internal company factors indicate a manufacturing facility limitation that heavily influences the decision to relocate (Van Dijk & Pellenbarg, 2000). According to Brouwer et al. (2004), the organization's internal company variables, the potential of a new location, and the current characteristics of the company's operating environment are three major factors that influence relocations. According to a study conducted by Hassanain and Ibrahim (2021), there are several factors that motivate factory relocation. These include the need to improve space and capacity utilization, reduce expenses associated with lease, operation, and maintenance, enhance the business image for better attraction, and adopt more modern office arrangements such as activity-based or open-plan offices. Other factors include accommodating changes in employee numbers, upholding or enhancing health and safety standards as necessary, overcoming physical limitations affecting facility services, such as a lack of parking spaces, promoting mergers and acquisitions with other organizations, mitigating the insufficiency of safety and technological functionality, decentralizing, or concentrating organizational divisions, and being in proximity to public or collaborative institutions. The proportional importance of these elements varies according to the distance of the relocation and the organization's growth strategy.

Long-distance and short-distance manufacturing relocations are distinct types of migrations with unique characteristics and challenges. These types of relocations differ in terms of distance and in the factors that drive them. According to Van Dijk and Pellenbarg (2000), motives to leave the current location are driven by push factor relocation decisions, in which the less significant the current location becomes, the more likely the company will be relocated. Although the pull factor suggests a different approach, it is intended to encourage a company to relocate to a new location.

Considerations of operational functionality are a significant factor in the choice of a suitable company location. Companies tend to choose a location where they can reduce the cost of production elements and acquire inputs that meet their quality requirements at a reasonable cost. The significance of production variables in location selection depends

on the industry and the company's unique needs and objectives. The process of choosing the ideal location is often a trade-off between the benefits of a location and its associated costs. According to Sunjka and Papadopoulos (2020) research, the primary reasons for relocating are long-term cost reduction, focus on core business, and expansion into new markets. In strategic planning, industries weigh the benefits of trying to remain in their current location against the pull or push factors of moving to a new location. The study also shows that the decision to relocate can be made for a variety of reasons, including a growth or reduction in product demand, changes in production processes, or offers to merge with other facilities. When location influences revenues, it should also entail a continual examination of the current location (Van Dijk and Pellenbarg, 2000).

2.3.3 Change management in relocation projects

Change management is a critical aspect of a successful relocation project. A study by Rothe and Heywood (2015) expresses that only a few organizations have possessed the expertise and skills essential for effective relocation management, which may otherwise result in unstructured and improvised approaches of handling a relocation process. As relocations occur often, they are an uncommon occurrence from a single organization's point of view. Such organizations have limited experience and knowledge of relocation management, which results in improvised management processes. However, depending on the company's size, the distance between locations, and the type of business model, the relocation condition may be dealt with in a variety of ways. Therefore, the support of the employees throughout the project is needed to ensure good vertical and horizontal communication within the organizational structures. Although Beulen et al. (2011) discovered that most individuals are motivated by self-interest since they desire to know how they benefit themselves, the success of relocation planning is heavily dependent on employee support. Effective communication and change management tactics are essential during relocation to retain employee motivation and limit the negative impact on the company (Cullen and Willcocks, 2003). Therefore, the company's culture is essential for identifying the work environment and employee satisfaction. Consequently, its importance cannot be emphasized.

Previous research has shown that workplace re-modeling necessitates change management initiatives from project management since it is a vast adjustment for all employees (Rothe & Heywood, 2015). With management approaches distributed in categories of orchestra, democracy, one-man-show, and expert taskforce (Figure 8), they highlight how, during the life of a project, methodologies may be used to acquire more thorough process work in the most effective way feasible. Each relocation management process requires customization to a model that suits the project. Therefore, these distinct methods determine the change management process in which the project goes through lifecycle group phases, with variable contrast in terms of project team employee participation and employee engagement throughout the process.

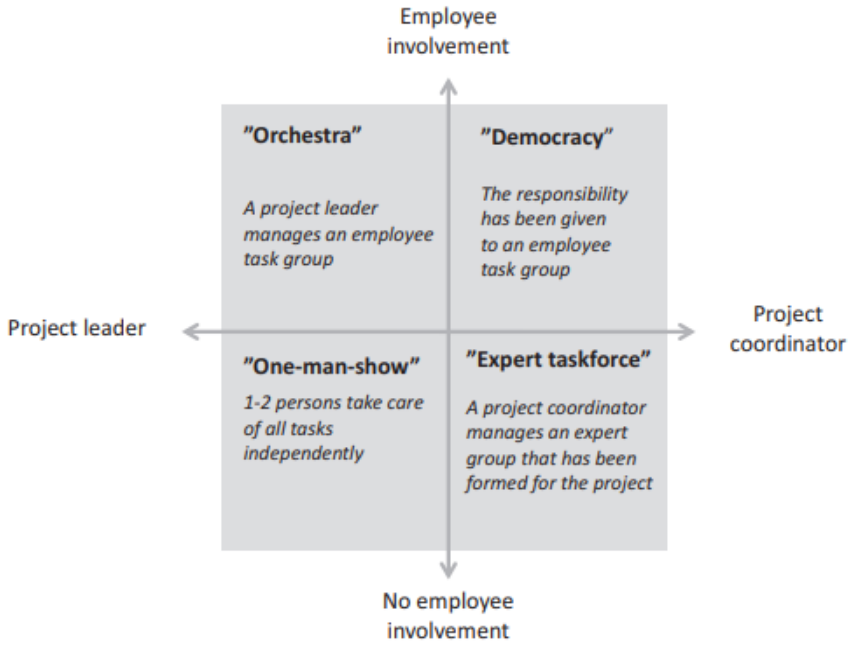


Figure 8. Distinct stakeholder management approaches for allocating resources to carry out the process (Rothe & Heywood, 2015)

Hence, Rothe and Heywood (2015) examined five Finnish companies that moved to various locations, each case with a unique reason to relocate. The cases demonstrate how a relocation objective can range from a business strategy to an operational transfer, depending on the level of change (Figure 9) intended or simply experienced. Even though

all relocations were short-distance moves, the research noted that the amount of change varied across case organizations, which emphasizes the awareness that each relocation process must be managed differently. Since every move is different, it can be argued that there is no one-size-fits-all relocation strategy.

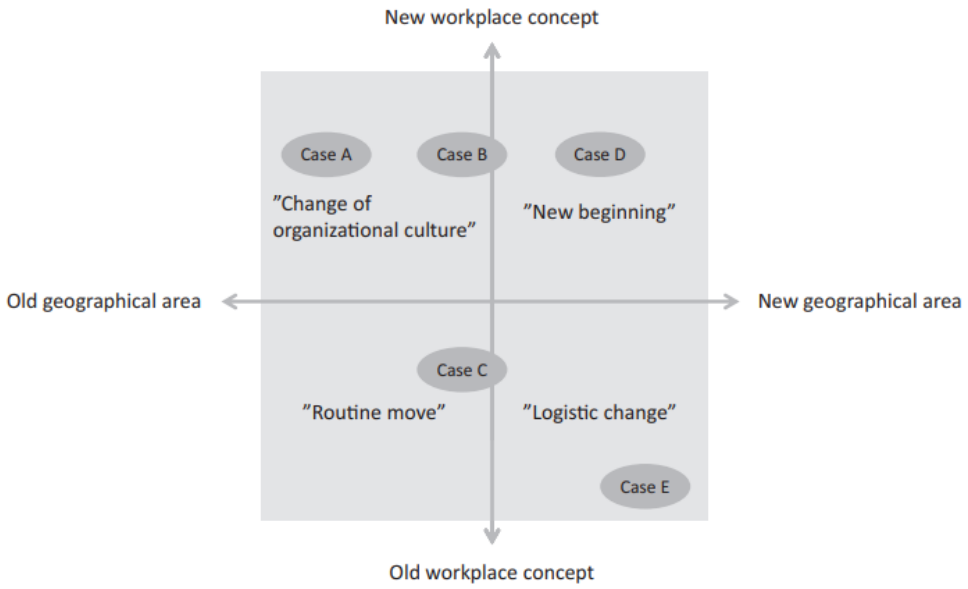


Figure 9. Level of change in relocation with five case examples (Rothe & Heywood, 2015)

Since each case demonstrates how a relocation objective can range between new and old geographical locations together with workplace concepts, the nature of the project not only implicates but also reflects the strategy needed for a specific project (Rothe & Heywood, 2015). So, even if a standardized business project management approach is applied, governance may not be uniform across all projects (Kerzner, 2013). From a business strategy to an operational transfer, the level of change during the relocation process and the influence of the management approach on project results are critical.

2.3.4 Supplier selection

According to Saputro et al. (2022), supplier selection is a crucial purchasing activity that plays an integral role in the strategic planning process of businesses since their

operations and competitive advantages depend on partnering with skilled suppliers. Without a proper sourcing strategy and supplier selection decision-making process, uncertainties or failures may occur in one of the primary competitive criteria of quality, delivery, flexibility, and pricing factors (Vijayvargiya & Dey, 2010). Therefore, the supplier must be flexible to meet customer demand. Xu et al. (2013) state that in the past, suppliers were chosen based on factors such as price, quality, and delivery date. Although it concerns mostly business between product and component suppliers, since the globalization of procurement has increased competition, companies now analyze every decision-making element to minimize expenses and maximize profits.

The requirements of the supplier selection procedure are adjusted based on categories. Selecting suppliers must align with the competitive goals of the organizational strategy (Saputro et al., 2022). Types of procurement require distinction and classification in some form because of the complexity of the decision-making process. In supplier selection, several decision matrices can be used to weight criteria to make informed decisions about the selection; one such example is a weighted sum model (WSM). The weighted sum method is a technique used to reduce a multi-objective optimization issue to a common goal (Yang, 2014). The weighted sum model evaluates each option on each criterion and then computes a weighted score for each alternative by multiplying the score for each criterion by its weight. The total score for each option is then calculated by adding the weighted scores for all criteria.

Choosing a set of criteria to define competitive bidders is a fantastic way to keep prices low and quality high (Gelderman & Weele, 2003). A selection criteria method provides relevant elements to consider when making a final decision on a vendor (Kaviani et al., 2020). For example, implementing the process of finding a reliable moving company through a competitive bid process is essential; rather than selecting a firm only based on cheap prices, it considers the full range of criteria. According to Saputro et al. (2022), established selection criteria allow for the decision-making process to be more objective, systematic, and thorough. To restrict and filter out the selection, the customer must

evaluate the most prospective service provider after determining suitability. The manner of evaluation depends on the type of service and the quantity of data accessible (Gelderman & Weele, 2003). Depending on how important the purchase is, a pre-defined tendering qualification should define a supplier's selection. After the decision, a contract specifies in advance what is included in the overall cost of service (Saputro et al., 2022). In conclusion, a selection process supports organizations in analyzing suppliers and identifying the best option for strategy requirements (Kaviani et al., 2020). In selecting a moving company, especially for a relocation operation, an established list of criteria is crucial. To ensure a seamless transition, it is crucial to have a well-prepared plan that is agreed upon by both the customer and the service provider (Cullen & Willcocks, 2003).

2.3.5 Transition performance

According to Altman (1991), the most significant concern about relocating is due to non-financial factors. A systematic strategy for integrating relocated personnel into a new site would help both the organization and the individuals. A transition's effectiveness is based on many important intervals, including successful knowledge transfer, the formation of new governance structures, and the execution of new deployment methods (Parikh & Gokhale, 2006). A company's ability to manage shifting from one place to another is known as transition performance in relocation. Depending on the type of organization, it involves things such as reducing downtime, ensuring a seamless transition of operations, preserving productivity, and adhering to any contractual responsibilities (Beulen et al., 2011). The success of a relocation project depends on the organization's ability to adapt to the move plan and achieve its goals (Petersen and Aase, 2016).

According to studies by Beulen et al. (2011), relocation transfers take approximately three months on average. Although the duration of the transition period depends on the size, complexity, and specific requirements of the relocation, transition is defined by Cullen and Willcocks (2003) as "implementing the new way of operating." The purpose of the relocation transition is to achieve operational efficiency, which entails verifying

scope, costs, and responsibilities and ensuring adequate levels of supplier performance expectations (Lacity & Willcocks, 2000).

Transitioning is a critical period in which a company moves operations from one location to another (Beulen et al., 2011). Beulen states that the aim is to minimize any downtime related to organizational operations. The process involves physical relocation of machinery, equipment, offices, the workforce, inventory, and changes in the supply chain operational systems. Effective planning, controlling, and managing operations during the transition period can ensure smooth and efficient relocation execution, minimize disruptions to production and the supply chain, and keep customers satisfied (Williams, 2008; Hassanain & Ibrahim, 2021). Coordination between various internal departments, such as production, logistics, finance, HR (human resources), and communication with customers and suppliers, is crucial during the transitional time. Petersen and Aase (2016) suggest that when a company is planning to relocate, the timeline for a transition period during the relocation process is highly dependent on pre-planning and the available resources. Companies have two options: either complete the relocation quickly or process orders jointly from two locations; the second option affects the level of business downtime in the long term. Consequently, organizations must be ready to face unforeseen events while implementing a relocation plan.

2.3.6 Risks and challenges in relocation

Before the relocation, it is essential to evaluate the risks associated with the move from multiple perspectives. BBM (2021) suggests that, in terms of company relocation initiatives, they can be less effective if the risks and challenges faced throughout the process are unknown or unprepared for. Thus, risks and challenges in relocation projects are best assessed when designing appropriate management approaches. Hassanain and Ibrahim (2021) investigated the challenges encountered during the relocation planning process. They identified several challenges that must be addressed, including effectively managing costs and budget constraints, dealing with limited time for planning and execution, thoroughly evaluating company requirements, making urgent relocation decisions, and

developing a comprehensive plan and well-documented relocation strategy. When implementing a relocation strategy, an organization should consult with landowners, specify space requirements, and comply with all applicable laws and regulations.

During factory relocation, customers tend to place more orders than usual due to the impending closure, which can create additional challenges for the firm during an already tough time (Petersen & Aase, 2016). These emphasize the importance of an effective relocation plan that considers a variety of factors and considerations to minimize disruptions and ensure a successful move.

Hassanain and Ibrahim (2021) identified the following risks and challenges associated with relocation projects:

- Insufficient preparedness
- Failing to develop a dynamic timetable with critical milestones
- The inability to receive top management support
- Lack of influence on the operation or employees
- Failure to recognize the specific requirements, activities, and complexities within the organization
- Failure to involve external resources at an early stage
- Inadequate assessment of relocation resources.

The decision to relocate employees to a new site depends on transportation routes and accessibility, which might pose potential challenges. However, in most cases, the current transportation routes will undoubtedly alter (Rothe & Heywood, 2015). As a result, workers are challenged to decide whether they should adapt and accept the relocation decision or terminate their employment contract and seek another job. However, it is important to also illustrate these as risks indirectly affecting organizational operations. Although risks can be found in everything, the key to recognizing and managing them must happen through a set of processes.

3 Research methodology

This chapter aims to present a clear and concise understanding of the research technique and approach adopted for the study. It includes a comprehensive overview of the research design, methods, data gathering strategies, and data analysis employed. Moreover, the chapter highlights the quality assurance methodologies implemented to ensure the reliability and validity of the results and findings presented in Chapter 4.

3.1 Research design

The study uses a mixed methods research approach involving the collection of qualitative and quantitative data. Mixed methods research recognizes the benefits and strengths of exploiting both qualitative and quantitative methods to achieve a comprehensive understanding of a research question (Fetters et al., 2013; Creswell, 2014). Creswell (2014) highlights that quantitative data collection involves using a limited method to evaluate elements that can be measured or statistically analyzed. Qualitative data, in contrast, is collected through observation, interviews, or surveys using open-ended questions, as well as behavioral observations or the analysis of patterns and themes. The choice of method depends on the nature of the research (Fetters et al., 2013). By utilizing the capabilities of these methodologies, researchers can obtain a more thorough understanding of the subject under examination. The research approach of the study also includes reviewing relevant literature.

To lay a solid foundation for relocation schedule planning, it is crucial to have an all-encompassing comprehension of relocation projects. However, owing to the broad scope of the subject, this research focuses on areas such as project planning, project management methodology, risk assessment, and supplier selection processes. The study's objective is to identify crucial components and prepare for the relocation transition project in advance. Additionally, it aims to introduce the case company's project management methodology model, establish a schedule, and evaluate risks for a

successful move. The supplier selection process comprises evaluating transportation options to determine the most fitting choice.

The research design incorporates qualitative and quantitative methods to generate concepts and viewpoints about a particular topic or event and to use a mathematical approach in deciding between various transportation services, respectively. Combining both methods is essential to gaining a more comprehensive understanding of the research questions. Thus, the study employs a mixed methods research design with distinct levels of emphasis placed on each method. The data collection instruments are suitable for a mixed methods research design because using solely qualitative methods would have been inadequate. Therefore, the inclusion of quantitative methods that use numerical data was necessary. As the research utilizes both numerical and textual analysis, a mixed methods approach is appropriate for the research design.

3.2 Research method

The chosen research method for this study is the case study method. Case study research is linear and iterative (Yin, 2009), and the choice of research method is influenced by the specific questions being investigated. Case studies are an empirical research approach with a specific and narrow focus that aligns with the study objectives while also offering flexibility to adapt to different research needs (Creswell, 2014). This allows for the implementation of diverse data collection methods, including qualitative, quantitative, and mixed methods, which add depth to the study and enable versatility in the research method.

Diverse types of case studies exist that can be conducted based on the research aim (Creswell, 2014). In this case, the descriptive case study approach is employed in this research. Descriptive case studies aim to uncover the underlying factors of complex occurrences or causal relationships, providing a detailed account of a specific scenario, occurrence, phenomenon, or group of individuals (Yin, 2009). Descriptive sequences can be utilized in mixed methods. A descriptive case study is utilized when a comprehensive

explanation of “how” an event occurred is necessary to address a research problem rather than “why”. The aim of this research approach is to provide a thorough story of the event.

Interviews with key stakeholders, document analysis, and observation may be used in the research approach to gain a deep insight into operations and discover variables that contribute to project planning success or challenges. The case study method is a suitable research approach as it can address both research questions. The research method that investigates the research question is called the unit of analysis (Yin, 2009). In case study research, the unit of analysis is the basis for forming the case. The unit of analysis is an important phase in the research design process since it dictates what will be examined as well as how the data will be gathered, processed, and interpreted. The research will concentrate on the factory relocation project as the unit of analysis.

Case study methods are used for unique and complex research (Creswell, 2014). The case study method was found suitable for supporting the research aim due to the unique nature of relocation projects, as seen from the nature of the cases investigated for the study theory. This study aims to explore the essential factors and prepare for the relocation transition by planning a factory relocation project. The relocation project case examines several factors, including project management methodology, move planning, supplier selection, and risk management. Best practices and lessons learned are also studied to provide a solution that supports the case company project team in constructing a relocation planning strategy.

3.3 Data collection

Researchers incorporate multiple data collection methods to obtain more compelling findings from diverse sources (Yin, 2009). To conduct effective case studies, the author suggests utilizing various sources of information. The data collection methods used in the study are described, along with their application and utilization. Three methods to collect data for the research are presented.

Table 3. Data collection and analysis

Research method	Data collection	Analysis
Qualitative	Semi-structured interviews	Best practices and lessons learned from previous relocation projects.
Qualitative	Workshops	Open-ended discussions, observations, and group activities.
Qualitative and Quantitative	Documents	Decisions of relocation, inventory master list, risk assessment and supplier selection.

Considering the range of factors examined in the project, diverse data collection methods were used to conduct a comprehensive analysis. Table 3 outlines the data collection methods and types of analysis employed for each research question. Based on these factors, the descriptive case study research method was deemed suitable for the study.

3.3.1 Semi-structured interviews

The case study was conducted by completing a set of semi-structured interviews to gather data. Unlike structured interviews, semi-structured interviews have a set of primary questions that form a framework; the interviewer can also ask additional questions and modify the questions during the interview (Gill et al., 2008; Bryman, 2012). This elasticity allows for a more comprehensive understanding of the interview theme, and the interviewer can use leading questions to guide the conversation and keep it on track.

Implementing semi-structured interviews represented an opportunity to examine previous factory relocation project cases of similar scale to provide valuable insights into lessons learned as well as potential challenges and best practices for implementing successful relocations. The participants were selected from previous cases involving transportation service providers and other relocation projects. In this research, the semi-structured interview questions focus on identifying previous challenges faced and

lessons learned from these relocations. The questions presented for the semi-structured interviews are found in Appendix 1.

Table 4. Semi-structured interview participants

Participants	Roles of the interviewed persons	Organization type	Duration	Date of interview
Respondent 1	Managing Director	Manufacturing	41 min	19.01.2023
Respondent 2	Development Engineer	Manufacturing	38 min	27.01.2023
Respondent 3	Real Estate Coordinator	Manufacturing	45 min	8.2.2023
Respondent 4	Technical Support Manager	Test laboratory	39 min	9.2.2023
Respondent 5	Critical Systems Product Line Finance Manager	Warehouse	37 min	16.2.2023

To ensure the quality of transportation service providers, the study required participants to provide a contact person for reference interviews. However, some participants declined due to confidentiality concerns. Evaluating references from previous projects was advisable before selecting a provider. This can be achieved through various methods, such as reviewing documents, conducting interviews, and analyzing offers. In this study, semi-structured interviews were conducted with five participants who had significant roles in their relocation projects. All interviews were conducted remotely and used as a basis for identifying best practices and lessons learned to support the case study, providing information about the selected transportation service provider.

3.3.2 Workshops

The relocation preparation process was enhanced through a series of workshop meetings. The workshops were attended by a multidisciplinary team composed of functional managers from manufacturing, warehouse and logistics, office, IT, and security departments. Additionally, representatives from the selected transportation service provider also joined the workshops. The workshops were conducted in person to gather information and develop a comprehensive plan, which included communication strategies

and contingency measures to address any potential issues during the process. The involvement of key stakeholders and experts from different fields allowed for a thorough assessment and the formulation of a comprehensive plan for the relocation process.

Workshop 1 – Kick-off meeting
Workshop 2 – Draft project relocation schedule timeline
Workshop 3 – Introduction and project presentation for selected supplier contractor
Workshop 4 – Project risk assessment
Workshop 5 – Weekly move plan and resource assessment
Workshop 6 – Structure of the detailed move plan and resource assessment
Workshop 7 – Schedule risk assessment
Workshop 7 – Detailed schedule and resource assessment

Workshops can capture a variety of data types, depending on the research question and analysis methodologies employed. Depending on the analysis method, the data may be qualitative, quantitative, or a combination of both. The participants in the workshops collaborated to develop a relocation plan for all transferable equipment and functions of the organization, considering available resources and potential risks. These plans will be used to execute the factory move for the case company. The information collected from the workshops will be used to present the project planning process and risk assessment in the qualitative research. The move plan created after the workshops will be monitored and controlled, and any necessary adjustments or enhancements will be made leading up to the actual move implementation.

3.3.3 Document analysis

In this research, the case company provided several types of documents related to the relocation and supplier selection processes. However, the availability of these documents was limited due to their level of confidentiality, such as layouts used to map relocated areas or the case company's project management methodology model. Despite

this limitation, the research introduces the function and purpose of these documents in relation to the relocation project.

In addition, one of the documents used to evaluate suppliers is a Request for Proposal (RFP) form. The RFP is part of the document data collection method used in the tendering process in which a company requests information from suppliers to make prudent decisions about which supplier to go with (Westfall et al., 2013). A list of specifications, and other criteria that the supplier must satisfy are included in an RFP. Although it is a specialized approach to acquiring information to use in decision-making through quantitative analysis. The study uses the document as a closed-ended data collection method to gather information from suppliers. Each contractor who participated in the process contributed by filling out a document form. The document worked as a request for proposal (RFP) form to filter potential offers. This data is used to accumulate quantitative data for further analysis of the supplier selection.

3.4 Data analysis

The research utilized a mixed methods approach to analyze data in an iterative process to identify specific causal relationships and overall trends for a case study analysis. The study employed a narrative analysis technique to analyze semi-structured interview data to understand best practices and lessons learned from previous factory relocation projects. Narrative analysis is a common qualitative research method for analyzing interview data and identifying recurring themes and patterns within narratives (Creswell, 2014). By analyzing the experiences shared by interview respondents, the case study can gain a deeper understanding of the factors that contributed to the success or failure of previous relocation projects, as well as the challenges that were encountered and how they were overcome. The information collected through these data analysis was then used to prepare a case study for company relocation, risk assessment, hierarchical scheduling, and project planning.

The project planning process is based on data collected through workshops and documents obtained during the project. This data is analyzed to determine key factors and their relationships. The research involved analyzing various data sources and connecting them with the hypotheses presented in the literature to identify causal relationships. The findings of the case study will be presented in Chapter 4.

The study utilized document analysis as a data collection method to identify and present the calculations of the weighted sum model (WSM). The WSM produces weighted criteria and a variable scoring model with a weighted average for every supplier. The selection of a moving company involves examining weighted factors, which were developed based on multiple criteria, as presented in Figure 10.

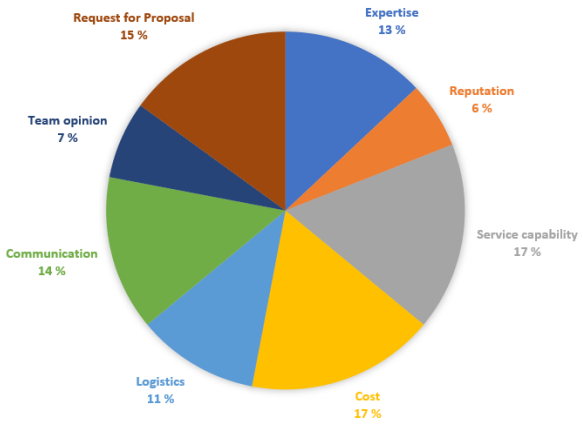


Figure 10. Weight criteria for supplier selection

The weighted average provides a more precise summary of a collection of data than the standard average model. The weight given to certain variables in the data set determines the precision of the figures obtained using this approach. The weighted sum model was used in tendering transportation service providers (TSP) by multiplying each criterion against a set of score variables. *Z = w1x1 + w2x2 + w3x3 +... + wnxn* constitutes the formula for the weighted sum model. The *wn* are the weights assigned to each criterion, *xn* are the supplier's performance scores on each criterion, *n* is the number of evaluation criteria, and *Z* is the total score (Yang, 2014).

3.5 Research validity and reliability

This section explores measures taken to ensure the research's validity and reliability, highlighting the importance of maintaining high research standards throughout the process. The practices for ensuring acceptable research validity and reliability are provided and explored in the chapter on results and findings. However, the quality of a case study analysis or empirical research study are typically evaluated using different variables while conducting case studies (Yin, 2009). According to Lincoln and Guba (1985), the quality of a quantitative research study is measured by its validity and reliability, whereas the quality of a qualitative research study is evaluated using criteria including authenticity, fairness, verifiability, stability, and usability.

This study utilizes trustworthiness and triangulation in data collection. Trustworthiness involves quality measures for qualitative research, while triangulation employs multiple sources of data to validate study findings. To support the results, the study uses semi-structured interview data, workshop processes, and document analysis, which utilize standardized data collection approaches to ensure valid and reliable data. Additionally, in this study, trustworthiness and triangulation methods have been identified as effective means to enhance research quality assurance. However, in some cases, an unstandardized approach may be necessary when the subject matter requires a more flexible data collection method (Creswell, 2014).

The chosen criteria and the WSM were verified by a supply chain manager to ensure their reliability. The supplier selection process was carried out collaboratively within the project. As this process involved a significant purchase, the final selection decision was made by executive stakeholders. Relying solely on subjective opinions without conducting a thorough assessment can result in numerous uncertainties during the process. To ensure the validity and dependability of the research, it is essential to establish proper research procedures. In addition, the researcher participated in the project's planning aspect.

4 Case Study of the factory relocation

This chapter presents the results of the case study conducted on the factory relocation project. It begins with a brief overview of the organization, then outlines the research objectives, and finally addresses the research questions by presenting the findings. The case study is described from the perspective of the case company, drawing on previous research discussed in the literature review chapter and data collected from multiple documents. Therefore, to develop the case study, different data collection methods were employed. Consequently, the results and findings are presented in subsequent sub-chapters.

4.1 Introduction of the case company

The case company is one of the leading manufacturers of power management solutions. Although the company operates in various industry sectors worldwide, the study focuses on its Finland-based manufacturing facility, which manufactures three-phase power supply system is known for their high quality and reliability. The company employs approximately 300 employees in Finland at present, with the mission to provide reliable power protection and backup for commercial, residential, and industrial clients in various environments, ranging from offices to data centers. The three-phase power supply system is also known as an UPS (uninterruptible power supply). The UPS ensures electrical appliances during power peaks and protects against voltage fluctuations. In addition, the system acts as energy storage. They are utilized in large data centers, ship navigation systems, and hospitals, as well as other locations where systems must operate without interruptions.

The company has been operating in its current location for more than 30 years. However, it has decided to relocate due to limited growth opportunities in the current location. The main reason behind the move to larger premises is the increased demand for products manufactured, as well as the need to centralize three warehouses into one location

to improve efficiency. Before relocating, the company investigated the possibility of expanding the current factory but discovered that the opportunities were limited.

The decision to relocate was made after considering various push and pull factors, which have been categorized as internal and external factors. The case company decided to execute the move primarily due to several internal push factors, such as limited factory floor space, expanding product concepts, increased demand for products, testing capacity issues, material flow bottlenecks, and the need to centralize three warehouses. In addition, the decision to relocate is seen as an external pull indicator due to more modern facilities, factory attractiveness, and a better geographical location.

4.2 An overview of the relocation management methodology

In this section, the case company's project management methodology (PMM) model is briefly defined to provide a better understanding of how the relocation project planning stage is established within the current relocation management model. The PMM model is a structured framework that defines procedures, practices, and guidelines for managing projects. Its aim is to provide a systematic approach to project management that guarantees consistency in project delivery and enhances success rates, as highlighted in the literature review. A typical model includes phases such as initiation, planning, execution, monitoring, and closure. These phases outline specific tasks, roles, and responsibilities for project stakeholders at each stage. Depending on the project, the process is adjustable to the requirements of a relocation project. Consequently, the case company's relocation project model follows a slightly altered PM model that divides the phases of the project life cycle into several stages, as shown in Figure 11, to structure a more comprehensive and suitable process exclusively for relocation projects. The prevailing project management methodology in the case company determines its use as an implementation procedure for the project. Hence, the model is a standard policy used for relocation projects within the case company.

Figure 11. Relocation project process

The objectives, goals, and scope of the project are defined at the initiation phase. In the strategy phase, the overall relocation plan is developed based on the organization's needs and constraints. The detailed planning phase involves developing a thorough project plan that includes the schedule, resource allocation, and risk management on which this study focuses. The transition setup phase is responsible for preparing the new site for the relocation. The move and validation phase completes the relocation process with a transition plan and verifies that everything operates as expected. At launch, the operation is scheduled to be back in full operation. A post-project review that includes lessons learned and project documentation occurs during the project closure phase. The relocation project process is crucial to its success, and each stage is significant. The process is carried out through a sequence of stages.

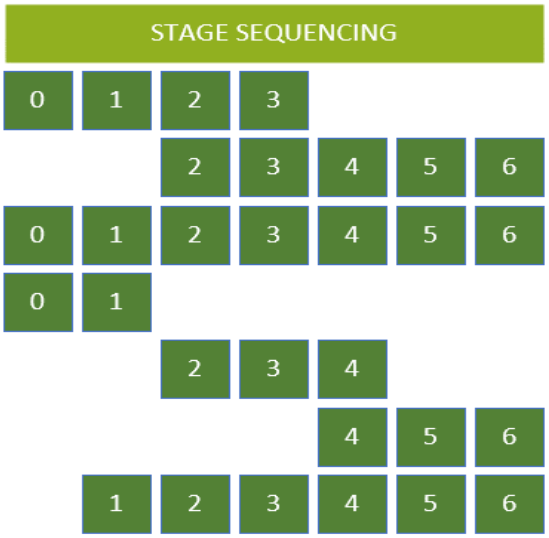


Figure 12. Project life cycle stage sequencing

For each stage, there are a set of activities applicable to one or multiple stages with an appropriate status. The stage proceeds to follow a work breakdown structure (WBS), an activity schedule matrix, that determines what needs to be relocated. Each part of the WBS provides a clear set of directives for knowing what procedures are required to be accomplished at each stage. Also, in the relocation project process, each stage needs to obtain approval in the form of stage-gate approval, which serves as a milestone to ensure all task requirements of that stage have been fulfilled before proceeding to the next stage. In addition, the model incorporates project templates and guidelines as support documents during stages. Hence, such a comprehensive and agile management model assists the project manager in navigating large and complex processes. In summary, the PM model is versatile due to its stages and can be applied to diverse relocation scenarios, such as managing transitions between manufacturing locations or within the same organization. The project management model is also applicable for plant closures.

The research concentrates on the detailed planning phase of the relocation project process model. Therefore, with the guidance of the PMM model planning stage, this study aims to provide a more comprehensive account, with the main emphasis on certain areas, such as developing a relocation schedule and assessing risks that may occur during the move. In addition, the relocation project model incorporates project management tools and techniques as support for completing objectives during the process phases to ensure that the project is completed within scope, on time, and within budget. During the phases of initiation and strategy, the project budget was allocated for distinct operational departments. The amount of the budget allocated depends on the severity of the action and its impact on the relocation.

Using the project model ensures that projects are managed efficiently and effectively to achieve the desired project objectives. The project management model utilized by the case company is designed to conform to agile project management principles. However, its appropriateness for large-scale projects is more aligned with traditional project management methodologies. Consequently, a hybrid approach that is adaptable to a large

project requirement, given the various requirements inherent in different projects, is more suitable. Although the model serves as a guideline structure for relocation projects, it must be customized on a case-by-case basis. Thus, the unique size and requirements of each relocation project can make it difficult to anticipate and address potential issues.

During project progress, proper project documentation is obligatory as it captures lessons learned and best practices, allowing for evaluation of project performance and improvement for future relocation projects. Moreover, due to confidentiality and limited access to relocation project documents, companies may be hesitant to disclose this information. Therefore, alternative methods, such as interviews, may need to be employed to obtain best practices and lessons learned information.

4.3 Selecting a transportation service provider

The selection of a transportation service provider (TSP) plays a crucial role in defining the relocation plan's success. Considering this, a list of potential suppliers was compiled, and an official request for proposal (RFP) form was issued. This form is included in Appendix 2 and is designed to gather detailed information from interested TSP companies, which will then be evaluated as part of the tendering process to identify the most suitable contractor to facilitate the transportation of relocation projects. Moreover, according to the interview respondents' feedback, it is of paramount importance in determining the relocation plan's success. Consequently, the case company aims to collaborate on a detailed move plan with an effective TSP to carry out the relocation. Thus, a tendering process for selecting an experienced TSP is needed since the case company project team lacks experience with relocation projects. Service providers being experts in the field, TSP is selected to consult and work with the team in developing a detailed relocation schedule plan. Therefore, to guarantee a successful move, it is essential to evaluate the capability of the selected TSP. As a result, a tendering process was initiated to further develop the relocation plan. Table 5 presents criteria for the transportation service provider tendering process.

Table 5. Selection criteria

Criteria	Description
Expertise	- Experience in moving industrial and manufacturing equipment. - Identifies unique requirements and obstacles for factory relocations.
Reputation	- Positive feedback from prior customer reviews and ratings. - Reliable moving business (industry recognition).
Service capability	- Adequate service capability (workforce, equipment, and vehicles). - Availability of additional services (installations).
Cost	- Total cost estimate for the move within the customer budget. - Comparison of cost estimates from multiple moving companies.
Logistics	- Logistic and operational solutions for the move. - Comprehensive transportation resources.
Communication	- Response time to customer inquiries. - Frequency of updates throughout the relocation process. - Availability of a dedicated point of contact for the customer.
Team opinion	- Feedback from project team members involved in the selection process (factory tours and meetings). - Overall impression of capabilities and professionalism.
Request for Proposal (form)	- Clarity and accuracy of the RFP response. - Proposed services align with customer requirements.

In selecting a transportation service provider, the first step involved identifying four potential suppliers. Creating a shortlist was an effective strategy to manage the extensive data analysis required. However, it is essential to exercise caution and avoid prematurely narrowing down the options, thereby excluding potentially suitable providers. To ensure fairness and impartiality for all parties involved, a weighted sum model was employed to evaluate the criteria and data in a comprehensive manner.

The process of selecting the TSP involved several stages. First, a list of criteria (Table 5) is customized to fulfill the needs and requirements of the case company. Second, criteria weights are presented with each company's performance score (Table 6). Then, a weighted sum model is implemented by multiplying each criterion against a set of score variables (Table 7). This necessitated an evaluation of four tendered TSP companies

against the listed criteria, with each having a determined set of score variables. The weighted criteria total is 100 percent, and each TSP performance score is evaluated on a scale of 0-10.

Table 6. Performance score and criteria weights

Criteria	Criteria weights	Company A	Company B	Company C	Company D
Expertise	13%	8	8	8	8
Reputation	6%	9	3	7	1
Service capability	17%	7	7	7	4
Cost	17%	8	8	4	2
Logistics	11%	5	3	2	2
Communication	14%	8	4	6	4
Team opinion	7%	8	4	2	2
Request for Proposal (RFP)	15%	8	8	4	4

Table 7. Weighted sum model for TSP supplier selection

Criteria	Company A	Company B	Company C	Company D
Expertise	1,04	1,04	1,04	1,04
Reputation	0,54	0,18	0,42	0,06
Service capability	1,19	1,19	1,19	0,68
Cost	1,36	1,36	0,68	0,34
Logistics	0,55	0,33	0,22	0,22
Communication	1,12	0,56	0,84	0,56
Team opinion	0,56	0,28	0,14	0,14
Request for Proposal (RFP)	1,20	1,20	0,60	0,60
Total weighted sum	**7,56**	**6,14**	**5,13**	**3,64**

The total weighted sum model in Table 7 showed that TSP company A received the highest score of 7,56 and was deemed the best decision by the weighted sum model. However, a list of pros and cons for all TSP candidates remains to confirm the choice.

Although the TSP with the highest score was the preferred option, the executive stakeholder's opinions were considered during the final decision-making process.

After completing the tendering process, the transportation service provider and the case company come to an agreement that outlines the project requirements and deliverables. To guarantee a successful relocation project, the case company needs to ensure that the chosen TSP can estimate the required transportation resources and integrate them into the relocation project schedule efficiently with realistic time constraints. Additionally, the scoring criterion provides extra points for TSPs (Transportation Service Provider) that offer customer references for best practices and lessons learned interviews, thus enhancing their credibility.

4.4 Analyzing best practices and lessons learned from previous projects

In this section, the evaluation and discussion of best practices and lessons learned from previous relocation projects will be presented. To gather information, semi-structured interviews were conducted with industry professionals. Thus, the intention is to gain valuable insights and information that could contribute to the efficiency and success of the company relocation project. Collecting information on best practices and lessons learned from prior relocation projects may provide significant insights and expertise to help plan a new relocation project. The process of finding large business facilities that have undergone a relocation project was challenging due to the rarity of such moves. As a result, potential interviewees from the transportation service provider selection process were identified by requesting that TSP participants provide customer references for interviews.

Customer references for transportation service providers were solicited from companies A and C. Company A provided two contacts, respondents 3 and 4, while Company C provided respondent 1 for the interviews. Respondent 2 represented a separate logistical solutions management consulting firm, and respondent 5 participated in an internal company's warehouse relocation project. The information provided by respondents 2 and 5 was not related to the TSP process. TSP companies B and D did not provide

customer reference contacts, which impacted their tendering evaluation. The respondent roles, type of organization, duration, and date of the interview were presented in the chapter on semi-structured interviews.

The interviews yielded insights into the implementation of relocation projects. The duration of the projects varied significantly among the respondents, with implementation for respondents 3 and 5 lasting about two years, while respondent 4's relocation was completed in just one week. Additionally, respondent 1's project execution spanned two months, whereas respondent 2's relocation project lasted for two weeks. Each relocation project was unique and had a vastly different schedule. Weekends were typically used as transition periods to minimize disruptions in production and operations. Stretching out a move strategy over an extended period may delay the transition, but it allows for flexibility in scheduling changes and ensures the adequate allocation of resources, particularly when relocating a significant amount of goods. According to interviewees, creating an inventory list of the materials to be moved before relocating was found to be critical in every project as it helped accurately map the volume of materials to be relocated.

In all relocation projects, apart from one, a tendering process was employed to select a moving company. Most projects did not select the cheapest option, but rather a company with a credible and satisfactory overall service concept, evaluated using various criteria, weights, and recommenders. All the projects had a project manager assigned by the transportation service company, and most respondents provided positive feedback for these companies, except for one.

The relocation project of respondent 5 used a 3rd party logistics (3PL) as the transport service provider for their move to a bordering country. However, the project was delayed by one and a half years due to a lack of cooperation with the 3PL. The exact reason for this was not available, but significant issues overall related to moving the inventory, auditing the warehouse, and insufficient resources. However, the focus was on the

warehouse management system (WMS) and how the resources and material were ramped up on time, which did not go according to plan. In retrospect, it was realized that designing the process and configuration of WMS either before or after the move would have enabled the team to concentrate solely on the relocation initially.

As stated in the literature, relocation projects that involve longer distances tend to carry higher risks, which may have contributed to significant delays in some cases. However, some respondents reported that they adhered to their relocation plans and experienced only minor delays that could be easily mitigated by adjusting the schedule. Respondents 2 and 4 encountered delays in commencing their moves due to issues with completing the new location, necessitating rescheduling to complete the move within the specified period. To facilitate a comprehensive and detailed move schedule, both respondents divided departments into areas, although doing so made the schedule more susceptible to restructuring. During the move, daily meetings were held to address any scheduling problems and to formulate corrective actions and plans for the following day, according to respondents 1 and 3. All respondents indicated that they employed either Excel or project software to plan, monitor, and control the move schedule.

In respondent 1's project, multiple contractors and moving service providers were utilized to minimize risks, as the transportation of certain equipment required the expertise of specialized experts and machinery manufacturers. In contrast, other projects engaged only one transportation company. Therefore, three respondents emphasized the significance of effective internal communication within the project team to keep track of the relocation's progress. Coordinating with personnel at both locations was noted as a necessary procedure to ensure a seamless transition, including scheduling the shipment and delivery of goods as well as verifying material hauling routes and destination points.

During the relocation, the respondents encountered a variety of successes and challenges. Some projects were hampered by the limited number of available personnel and the limited use of space when working at floor level in the new facility, resulting in

installation work challenges. Moreover, the transportation service provider (TSP) companies could have considered augmenting their workforce to ensure seamless operations. At the same time, emptying the old site necessitated additional resources. In addition, respondent 2 stated the move went smoothly due to careful marking of location areas at both locations. In one project, there were shortages of equipment during the relocation process, specifically related to charging electrical hauling forklifts. Additionally, apart from the challenges mentioned by respondent 4, the presence of narrow passageways and limited elevator access presented difficulties in moving heavy items into their designated locations. It would have been advantageous to proactively verify the designated routes in advance to mitigate such challenges.

To enhance the safety of top-selling products, respondent 1 employed sales forecasting, which involved comparing the duration of downtime. Testing systems, estimating transfer times, and completing simulations were found to be effective methods to minimize risks, according to three of the respondents. Respondent 2 highlighted the significant impact of these practices when implementing a detailed schedule, particularly in manufacturing areas. Moreover, a more detailed schedule using Excel was created for the most critical processes of the operation.

According to the interview with Respondent 2, who works for a consulting firm, most moving contractors plan the schedules for dismantling and installation, as well as negotiate the number of personnel required for the move, with the customer. Overall, the interviewees believed that the moving plan schedule should be developed in collaboration with the project team, important contractors, and the transportation service provider. This was likely because employees were needed at both locations to perform dismantling, installation, and assembly work. Moreover, all respondents stated that they were responsible for emptying the old premises and recycling goods, either independently or through the transportation service provider, after the move.

Respondent 3 noted that in their project, all employees were committed to the move, and department supervisors shared responsibilities, which motivated everyone involved. This approach was also seen in other projects where companies aimed to avoid laying off their employees during the relocation. Respondents 1 and 2 further explained that involving internal employees in loading and unloading helped conserve resources. In general, respondents observed that empowering individuals to take on responsibilities could boost motivation and accountability, leading to better project outcomes.

The respondents reported that out of three of the projects, an expert task force management style was employed, while the remaining two utilized an orchestra management style. One-man-show and democracy management styles were not preferred in any of the relocation projects. The project management style used in relocation projects is often affected by the organization's guidelines. Subsequently, in terms of more effective project management, it is essential to utilize effective techniques for managing project participants. However, as the respondent 5 used in their relocation project the same management methodology model as the case company, describing the model as both linear and iterative since it had the flexibility to adjust to changing project requirements. Additionally, the respondent proposed to use the model along with other project tools and techniques, as it provides a rigid framework for the project lifecycle. In contrast, the framework implements all stages as a project guideline.

Most respondents experienced a temporary halt in production during the relocation process. The relocation was carried out in phases, with the larger equipment being moved first and production being gradually shifted to ensure delivery reliability. Sales forecasts from previous years were used to ensure the best time for relocation and manufacture products in advance of the move, but forecasting proved challenging for some due to the project-based nature of the orders. Although many components were adequately addressed through good stock inventory and monitoring, the impact of global logistics on ensuring uninterrupted production operations was significant. This is a significant factor to consider in relocation projects.

Respondents provided several recommendations for effective project management during a relocation project. These included booking more moving equipment than personnel, thorough planning of tasks and schedules, and setting minimum and maximum transfer goals for each day. The best practices also involved creating an effective project team, setting clear definitions of roles and responsibilities, planning a schedule at an early stage, and effective communication between stakeholders. According to respondent 2, “no matter how good a plan is already made, the best of all is the latest plan”. In contrast to respondent 3, “a good schedule is a good result”. However, respondent 5 proposed “plan the move so that all parties are on the same page”. Although, in general, the respondents encountered diverse obstacles, prompting them to devise various approaches to overcome them. Thus, observing obstacles faced in previous projects is beneficial for future relocation projects.

4.5 Factory relocation planning

The factory relocation project has various stages in its lifecycle, and each stage has its own specific progress. Although this relocation plan focuses on certain aspects of a detailed planning phase, the content has been predetermined by the case company’s project management methodology model procedures. The project’s planning phase itself was conducted through a process that conducted all relocation-related aspects by organizing several workshops to assess the core project team and supporting functions, map current and future facility material flows, create a relocation timeline for the move, select a transportation service provider, conduct a risk assessment, and develop a detailed project schedule.

In the initiation phase, the project team developed a project charter that considered the project scope and deliverables required for the factory relocation. A plan was then created to determine the necessary tasks for project planning and implementation. The factory relocation plan of the case company involves the transfer of an entire manufacturing facility, including personnel, equipment, inventory, and infrastructure, to a new location.

Accordingly, a critical aspect of the project planning process is to develop an efficient schedule that considers the duration of the move and manages risks that may disrupt the plan during the project. Furthermore, tasks should be allocated using a work breakdown structure to ensure smooth project execution. Defining the project scope involves establishing the objectives of the relocation plan, such as the expected outcomes, the timeline for completing the project, and developing a detailed transition schedule plan. The project's objectives are derived from the outputs of subprojects, as they significantly influence the project's content and scope. By determining the project scope, we can ensure that everyone involved in the project has a clear understanding of the deliverables that need to be achieved. Nonetheless, the case company established the project scope and objectives prior to the project planning phase, indicating that the project scope was predetermined. However, the project aims to target relocation plan objectives as goals to achieve throughout the planning process.

The factory relocation project was managed through a series of workshops to address its complexity, with collaboration from all stakeholders. For efficiency, the workshops consisted of only the employees needed to prepare the plan. Updates on the project were given, progress was reviewed, and a relocation schedule was drafted. The selected transportation service provider was involved in risk assessment and the development of a detailed move plan with resources needed during the move. The project deliverable for the case company consisted of a detailed relocation schedule and action plan compiled based on a high-level project timeline. Moreover, it is essential to conduct a comprehensive evaluation to select the most efficient relocation service provider for the detailed development of the relocation plan. With the help of the selected transportation service provider, the case company set up workshops to plan the schedule and the resources necessary for the move.

Furthermore, it is essential to inspect all materials arriving during the relocation process to determine when and by whom any damage has occurred. If any damage occurs during transportation, the responsibility lies with the transportation service provider (TSP);

otherwise, it falls on the company. To prevent damage, appropriate measures, such as proper packing, securing, and labeling of equipment and machinery, should be taken in preparation for transportation. Working with the TSP to ensure the appropriate means of transport, including transportation vehicles and equipment, and the route to the new facility, should also be established and communicated to all established project stakeholders. Additionally, the TSP is required to notify the municipality if the material moved obstructs daily traffic. The relocation process involves disassembling and removing the equipment from the old location, transporting, and unloading it to the new location, and finally reassembling and validating the equipment to ensure it functions correctly at the new location.

4.5.1 Stakeholder analysis

To ensure effective communication, it is essential to identify the project's stakeholders. In the initial phase of the project, the categories of stakeholders must be identified, and a stakeholder analysis can aid in outreach efforts. The interviews revealed that proper stakeholder analysis enhances project operations efficiency. Therefore, creating a proper information communication channel in collaboration with the company's organizational departments was a critical component for cross-communications in the creation of the relocation plan. Thus, identifying stakeholder roles and interests in the project is vital to gathering accurate information and contributing knowledge to the project. Establishing a project core team and supporting department employee roles was a critical step in establishing communication channels among participants for effective relocation. The project core team comprised a relocation project manager, subproject managers, and a manager from a transition service provider. Each subproject manager supervised specific subprojects in production, warehouse and logistics, IT and security, office, and electrical infrastructure. The core team frequently met to discuss and evaluate progress, with constant communication from the start of the planning process to the plan's evolution. The core project group consisted of individuals with diverse backgrounds and a shared interest. The supporting department teams included all organizational functions, as they

provided additional support by performing project tasks or supplying materials and resources to the core team during the factory relocation process.

The stakeholders may have varying levels of involvement and contribution, and their potential influence on the project should be assessed based on their level of involvement. Nonetheless, the project team will be directly accountable for establishing strategy, supervising the migration of subprojects, and connecting them all under one project. The relocation manager is responsible for the implementation and coordination of the complex entity. Consequently, the relocation project adopted for the project core team an orchestra management approach in which a leader manages the project's task group. Figure 11 presents the core team and support departments for the case company relocation.

Figure 11. Structured project core move team and support functions

To effectively communicate information about the relocation, it is essential to identify all parties with a direct connection to or interest in the project. This information is crucial for all employees, who are not only interested in the relocation's progress but are also required to understand its schedule and procedures affecting department operations. Monthly all-employee meetings are organized to share the latest information on the new factory and relocation plans. Additionally, interested employees were offered a tour of the new factory site to observe progress firsthand.

Employee involvement is critical to the success of company relocations, as limited involvement can pose risks. Therefore, increasing employee involvement by providing them with the necessary information channels and opportunities to participate can lead to greater motivation in activities such as packing and cleaning the current facilities. The progress of the relocation project must be communicated to all departments within the organization through multiple distribution channels, including displays in the corridors, email distribution, and internal website channels. Lastly, to create a work breakdown structure, stakeholder analysis must be in place to identify all necessary participants and stakeholders.

4.5.2 Work breakdown structure

The Work Breakdown Structure (WBS) is a crucial element of the factory relocation plan as it breaks down the complex process of relocating an entire manufacturing plant into smaller, more manageable short-term actions. It assists in identifying the resources needed for the project, including personnel and equipment, by allocating tasks set as actions during the relocation project workshops.

Two types of WBS were utilized in the project. The first WBS involved department-specific task allocation, which included all core and support team tasks for the project's entire duration. Microsoft Planner software was used to allocate tasks in this WBS. The second WBS was developed for the tasks required for project schedule planning and focused only on the core team's tasks. To ensure project effectiveness, this WBS included all the activities required for the relocation process in separate phases: planning, preparation, relocation, and post-relocation activities.

Each activity was broken down into smaller tasks with clear deadlines, responsibilities, and dependencies due to the many tasks associated with the relocation project. Planning activities included transportation service provider selection, high-level planning, risk assessment, and stakeholder analysis. Preparation activities included inventory

management, detailed schedule planning, packing instructions, and equipment dismantling preparations. Relocation activities included logistics, transportation, resource allocations, hauling, and equipment installation. Post-relocation activities included quality control, commissioning, employee training, documentation, and lessons learned. Although not all objectives were included in the WBS, these tasks were included in the high-level timeline for easier monitoring of project progress.

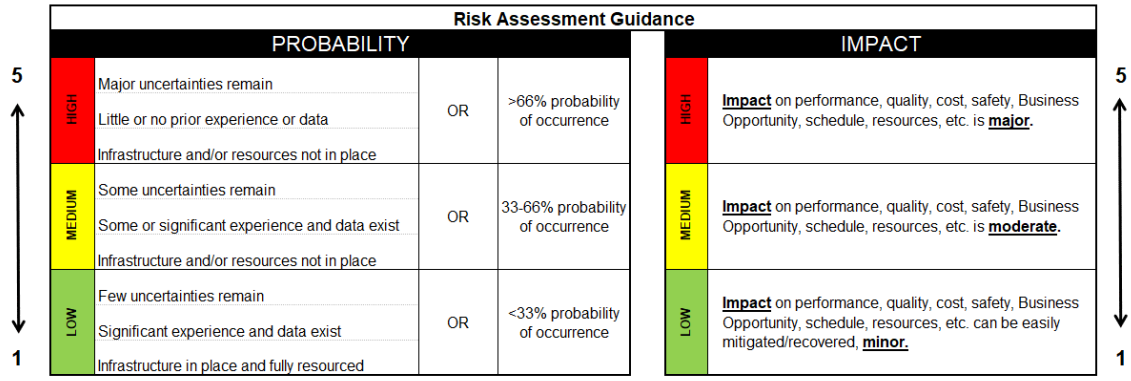
The workshops held during the relocation project focused on defining and refining the project deliverables, with the necessary activities recorded as actions and documented into software for monitoring purposes. This approach avoids unnecessary activities and results in a more effective project plan. In summary, the WBS was designed during the preliminary stages of project planning to ensure that all activities are linked to the project's expected deliverables.

4.5.3 Risk assessment

The risk level is proportional to the risk's probability and impact. Identifying and managing risks entails identifying potential relocation-related risks and devising a plan to mitigate them. Thus, the risk management plan defines the structure for actions that will be performed throughout the project to mitigate and manage risks. Although the management plan utilized in this project consists of a risk management approach used to identify, analyze, plan risk responses, and take control steps to mitigate potential risks related to the factory relocation. With thorough risk assessment and by conducting an analysis process, the project is asserted as part of the monitoring and control of the relocation project, which occurs throughout the project management lifecycle. The use of risk assessment ensures that the process is designed to prevent failures rather than take reactive actions after they occur.

During relocation planning, the project core team defined the risk and impact to address multiple risk factors associated with the project’s effective relocation. Although, only identifying risks is insufficient. Therefore, the project is implementing a risk mitigation

process that involves evaluating and handling the risks by conducting a risk assessment worksheet. In the project risk assessment, the probability and impact are evaluated using a risk matrix as the scoring system. The scores can be allocated based on levels of probability and the low, medium, or high impact of risk. Furthermore, it is critical to identify the individuals responsible for taking corrective risk mitigation actions.

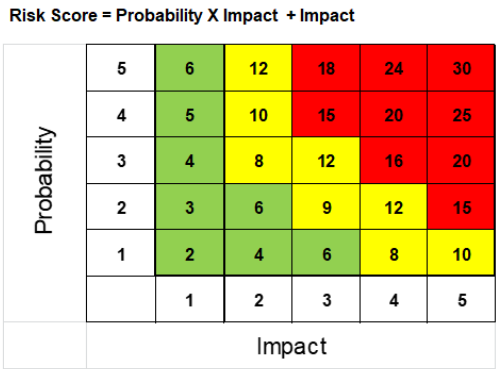


Risk Assessment Guidance

	PROBABILITY			IMPACT	
5	HIGH	Major uncertainties remain Little or no prior experience or data Infrastructure and/or resources not in place	OR	>66% probability of occurrence	**Impact** on performance, quality, cost, safety, Business Opportunity, schedule, resources, etc. is **major**.
	MEDIUM	Some uncertainties remain Some or significant experience and data exist Infrastructure and/or resources not in place	OR	33-66% probability of occurrence	**Impact** on performance, quality, cost, safety, Business Opportunity, schedule, resources, etc. is **moderate**.
1	LOW	Few uncertainties remain Significant experience and data exist Infrastructure in place and fully resourced	OR	<33% probability of occurrence	**Impact** on performance, quality, cost, safety, Business Opportunity, schedule, resources, etc. can be easily mitigated/recovered, **minor.**

Figure 13. Risk Assessment Guidance

The risk evaluation process involves several factors, including observations, intuition, and common sense. The risk assessment guidance (Figure 13) is focused on managing risks for the detailed planning phase. Subsequently, risk score matrix (Figure 14) is used to analyze risk assessment objectives and measures whenever a risk or uncertainty is detected, by calculating the *Risk Score = Probability x Impact + Impact.*



Risk Score = Probability X Impact + Impact

Probability						
	5	6	12	18	24	30
	4	5	10	15	20	25
	3	4	8	12	16	20
	2	3	6	9	12	15
	1	2	4	6	8	10
		1	2	3	4	5
		Impact				

Figure 14. Risk Score Matrix

To assess risks, four steps are followed in the risk management implementation process for the relocation project. At first, to identify a risk, the following method is used: if *X* risk happens, then *Y* risk could result. Therefore, risks should be written in an "*if/then"* fashion. For example, when the "*if*" is the risk probability, the "*then*" helps to evaluate the impact to determine a risk level. Second, the risk analysis dissects the probability (1–5) of the "*if*" risk happening and the impact (1–5) of the "*then*" risk if the risk occurs. The third is response planning, known as mitigation strategies. It considers responses and detailed actions, as well as assigning a risk mitigation action to an employee. And lastly, controlling the risk by tracking and monitoring the progress and effectiveness of the risk response strategies, the project utilizes risk responses to address specific risks with avoidance, transfer, mitigation, and acceptance risk response strategies. Risk avoidance involves removing the threat entirely, and risk transfer shifts risk responsibility to another entity, such as an external contractor. Although risk mitigation reduces the probability or impact, risk acceptance accepts the risk and its potential consequences.

After assessing the risks, the project utilizes assorted styles of risk responses depending on the type of risk, and each strategy can be implemented in a unique way. Within the project, these risk responses for the factory relocation are avoidance, transfer, mitigation, and acceptance risk approaches, which are utilized to implement the risk responses. For example, in the case of poor packaging of equipment, manufacturing interruptions, in-house hauling routes, and miscommunications during a relocation, a suitable risk response can be utilized depending on the response that the risk requires. It can mean incorporating an avoidance risk response through proper packing and handling instructions during transportation, along with insurance coverage for equipment. Mitigating manufacturing interruptions by establishing a detailed schedule for critical manufacturing processes, avoiding in-house hauling route risks by transferring the risk to a third-party logistics company, and outsourcing the hauling process can mitigate risks caused by miscommunication. However, the option of accepting a risk is considered an acknowledged risk. Thus, small risks can be accepted, such as transferring office desktops without disassembling them. Because the distance to be moved is short, it is more

convenient to make several trips than to dismantle and reassemble the desks. In summary, the risk assessment worksheet is implemented in the project to map out significant risks associated with the factory relocation and plan appropriate risk responses to prevent the risk from occurring. The risk assessment worksheet is presented in Appendix 3.

The risk assessment worksheet first defines the risk in terms of its probability and impact. Then the risk score level for avoidance, transfer, mitigation, or acceptance will be defined. After the risk is mitigated, the project team defines how the risk level will decrease based on the measures taken. Although developing a comprehensive schedule for the relocation project can be challenging due to numerous variables, the relocation project risks were identified and evaluated within project workshops and through interviews with previous best practices and lessons learned. This helped identify potential hazards and risks that need to be addressed to achieve a successful project. The risks from the project's schedule were well thought out in the risk assessment.

4.6 Hierarchical schedule

To develop a detailed schedule for the project, a hierarchical process was followed. This process involved dividing the project planning into three levels, with each level becoming increasingly detailed. The hierarchical schedule was designed as a relocation schedule process, starting with a high-level timeline to support the overall relocation schedule, followed by a weekly plan of materials to be moved, and finally, a detailed move schedule to allocate schedules for divided areas and resource allocations for contractor parties. This approach allowed for a comprehensive and organized plan, ensuring that all tasks and timelines were systematically accounted for.

The hierarchical schedule is structured as a guide, where the following sections are divided into distinct levels with controllable schedules. The development is to ensure that the timetables are realistic by involving stakeholders at diverse levels of schedule planning and working together in workshops. In this study, the hierarchical schedule is

constructed with levels and different structural formatting styles. Since the structure of each level is different, it provides a different viewpoint depending on the period and milestones. To construct a detailed move plan and allocate resources accordingly, the move plan will be constantly monitored and controlled for necessary additions and improvements. Thus, even after this study, the plan will be continuously developed as the date of transition approaches.

4.6.1 High-level project timeline

For the project to progress and be monitored in the long term, a high-level project timeline must be created when the objective is to perform extensive and detailed planning in preparation for the transition interval phase of the project. This means considering a holistic view of requirements and inspecting them in detail during the planning phase, so major changes will not be necessary in the later stages of the project. The relocation project utilizes Microsoft Project software to create the high-level timeline. The high-level is used as a project timeline (overview) and a comprehensive project schedule and task management system for the core project team. These tasks are associated with the responsibilities for preparing relocation arrangements for the areas. Although it is an overall project timeline to indicate and define major milestones and deliverables, the high-level timeline also works to initiate the pre-relocation activities, where the project team prepares plans to implement the relocation activities and then conducts a suitable transportation service provider search for a smooth transition. Also, it includes installation preparations for subprojects for the new sight building, although the building process of the new sight will have its own separate project.

Preparing and monitoring the project's relocation schedule is a major milestone for the timetable, high-level schedule, and preparation management of the case company project management model. The high-level presentation delivers an overview of the project planning phase. Planning a project timetable for a short-distance manufacturing relocation necessitates developing a timeline of tasks and activities that must be done before, during, and following the move, as presented in two parts, Figure 15 and Figure 16.

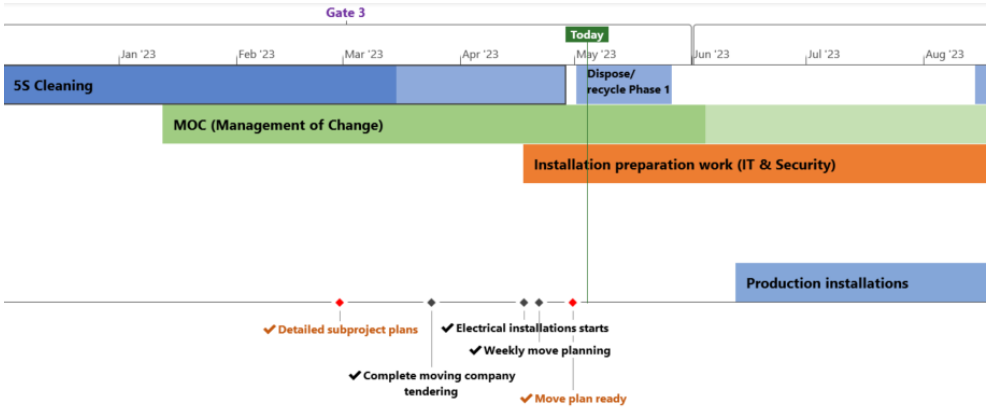


Figure 15. First part of the high-level project timeline

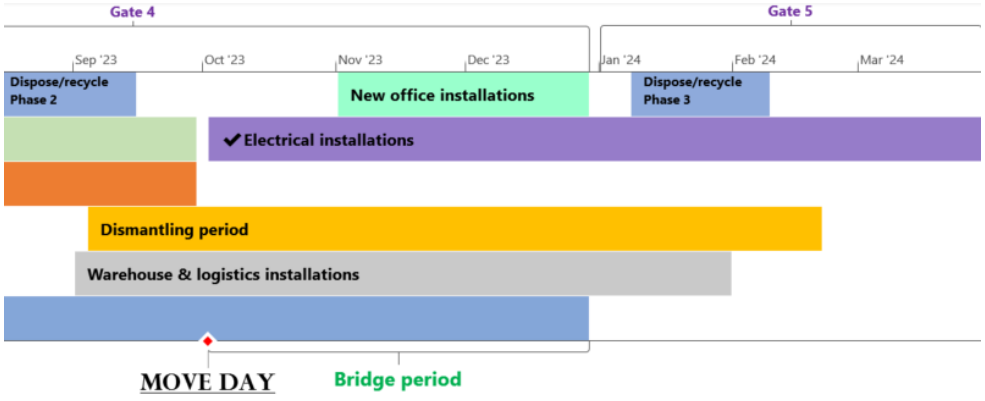


Figure 16. Second part of the high-level project timeline

The Gantt chart was developed to ensure a smooth transition, support the project, and provide a visual timeline for the factory relocation phase. The project's technical plans consist of implementing a detailed subproject plan and preparation work, completing the selection of the transportation service provider, dismantling the old factory, and conducting a management of change (MOC) assessment for equipment. Since the high-level structure is also a work breakdown structure, the figures above each present the main categories with important remarks.

The case company has implemented recycling phases to enhance workplace organization and cleanliness, leading to increased safety, productivity, and efficiency. The

implementation of cleaning or recycling stages as part of the move plan ensures a reduction in the number of truckloads required, resulting in cost savings and an efficient allocation of resources. Prior to factory relocation, implementing a recycling stage can prove extremely beneficial, as it facilitates the organization and decluttering of the new factory and simplifies the determination of equipment and materials to be moved. To facilitate efficient material transfer, the internal cleaning and restoration process is scheduled to occur in three phases. The first stage begins well in advance of the move, followed by the second stage, which occurs just prior to the relocation, and the final stage, which occurs after the move has been completed. Through the implementation of a factory cleaning process, excess items can be eliminated, equipment has the potential to be organized for transportation, and the entire factory can be restored, which enables easier relocation, enhances employee safety and productivity, and facilitates the creation of an inventory master list. Moreover, an inventory capacity evaluation list is a vital part of relocation as it distinguishes between transferred and recyclable goods.

To ensure a smooth and organized factory relocation, an inventory master list must be created that includes all the items and equipment in the factory, along with their specifications and locations. This list helps the relocation team plan and organize the move more efficiently, ensuring that everything is accounted for, and nothing is left behind. It can also identify items that require special handling or transportation, such as fragile equipment or hazardous materials.

To develop the inventory master list, each project team member was assigned the task of formatting the list by mapping areas. Additionally, inventory management capacity planning is crucial for creating a detailed move plan. This involves evaluating the amount of goods that need to be relocated and determining the number of resources, such as trucks, workforce, and hours required.

Management of change (MOC) assessment is implemented to guarantee the safety of transitioning equipment during the relocation process. The subproject managers need

to ensure that all health and safety regulations and protocols are followed according to the MOC guidelines. It allocates all movable items and requires a re-evaluation of the reason for the move for each piece of equipment. Management of change (MOC) must be performed on all to-be-transferred assets, and in this case, company health and safety must review all plans to guarantee all standards are met. The purpose of MOC is to document the significance of the planned change. It requires the inclusion of all relevant background information and the completion of an MOC significance checklist. The MOC list is required to be completed for all items, excluding repairs or replacements of identical equipment or components, changes in operating conditions that do not exceed defined limits or parameters set by the case company, routine maintenance that requires a startup or shutdown, and work instruction or procedure updates that do not impact health and safety risks or controls.

During workshops, the main deliverables of each subproject will be determined to ensure that the relocation project includes its desired outcomes, such as completing the bridge period as effectively as possible. The bridge period, also known as the transition phase, is the period when both factories are in partial operation at the same time. Therefore, when both factories are operating at the same time, the crucial factor becomes transition time, and a significant aspect of the event is carrying out an efficient transfer operation process. Consequently, the bridge period lasts for three months. Accurate planning of the schedule determines the success or failure of the relocation project. Thus, the objective of developing the schedule is to minimize downtime, maintain service levels, ensure safety, assess risks to perform the move, assess transportation resources, and perform the move effectively weekly.

4.6.2 Weekly move planning

The intermediate stage of relocation planning involves more than just a mere visual representation of the move. It includes a mapping of the areas to be relocated, using layout pictures to aid in the weekly schedule plan of materials to be transferred. This stage identifies transferable area entities and facilitates a more detailed schedule plan for the

subsequent stage of the relocation project. Although the high-level project timeline presents the project planning, the weekly move plan is more accurate regarding the definite factory relocation.

The weekly departure timeline presents a comprehensive project network that identifies the areas to be relocated on a weekly basis. With the help of layout plans, the areas are marked with block markings in the layout, where each organizational department, production line, and testing laboratory represents a block or entities of areas for weekly relocations. In this manner, the weekly departure schedules for the divided areas are easier to estimate and outline the space constraints and resources caused by the packing, hauling routes, and unpacking of the areas. As Figure 17 illustrates, the number of areas relocated in the last few weeks of departure is significantly less than in the beginning due to the requirement that the factory be left in the same condition as before it moved there for final cleaning and restoration.

Table 8. Relocated areas

RELOCATED AREAS			
Number	Area	Number	Area
1	M Test Bay	20	Warehouse
2	H Test Bay	21	Production Support Office (1)
3	T Test Bay	22	Production Support Office (2)
4	Production Line 1	23	NPI office
5	Production Line 2	24	Customer service, IT and Quality departments
6	Production Line 3	25	Administration and Finance departments
7	Production Line 4	26	Middle floor
8	Production Line 5	27	Inbound
9	Production Line 6	28	Outbound
10	Production Line 7	29	Service department
11	Production Line 8	30	Sales department
12	Battery C	31	IT and Security room
13	Production Line 9	32	Spare parts warehouse
14	Quality control point (1)	33	Heavy machinery
15	Quality control point (2)	34	Hot workstation
16	Inbound checkpoint	35	NPI laboratory
17	Quality laboratory (1)	36	HIL laboratory
18	Quality laboratory (2)	37	Demoroom
19	Repair department	38	Compressor

The weekly departure and the relocated area information were gathered during the workshops. The participants were the case company core and support teams and representatives of the transportation service provider. Consequently, the relocated factory has been divided into 38 areas.

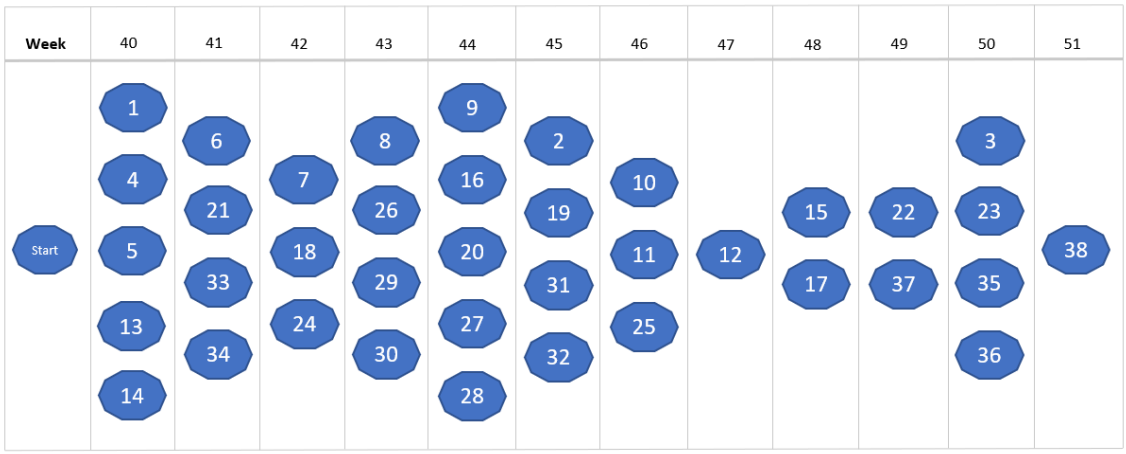


Figure 17. Weekly departures

The weekly plan is constructed by segmenting areas within the old and new factory layouts. With the help of layout floor planning, the areas to be moved were highlighted with area markings on the layout. The location of the transferred material is marked in both factory areas, so it is easier to identify transport routes when mapped as regional entities. Hence, it is simpler to visualize an area when creating a detailed schedule and record the transferable material volume.

The production lines will be relocated in a sequential process where the lines will be dismantled in a specific order. Weekly departures have been planned to ensure that the manufacturing process continues to operate during the move. It is important to note that the transfer schedule of the testing laboratories and test bays must be synchronized with the manufacturing process to ensure that product testing from production can take place in this area.

During the move, extensive warehouse operations and component availability are considered by maintaining enough material in both locations and implementing inbound and outbound traffic for efficient material hauling. Moreover, the most critical personnel required to maintain the operational activities of the production process must be identified and well thought out. The rest of the employees will be placed in remote offices as they pack their belongings in moving boxes, except for manufacturing personnel, who will pack during the relocation. Although planning a weekly move is important to determine a critical schedule, a detailed schedule must also be developed to ensure a comprehensive relocation strategy.

4.6.3 Detailed schedule

The process of planning a short-distance factory relocation requires a detailed schedule that outlines the specific tasks to be completed before, during, and after the move. This schedule includes a breakdown of each action, its duration, and the dependencies between tasks. To create this schedule, the case company utilizes a combination of internal documents and workshops with the selected transportation service provider.

The factory relocation will be executed using the department block method, where each organizational function will be divided into a section. The transfer process will be standardized, with predefined instructions provided to each department area to ensure a consistent approach. To ensure a clear and straightforward relocation strategy, an operator will be assigned to complete individual tasks in the project's detailed schedule. This operator can be either an internal employee of the case company, a representative from the transportation service provider, or an external contractor. Additionally, the relocation project will involve several installation contractors to ensure the successful transfer of equipment and machinery. By using this work breakdown structure and task allocation system, the project team can efficiently coordinate the efforts of all parties involved and ensure a smooth relocation process.

To minimize manufacturing process downtime during the factory relocation, the project team had to identify and prioritize all major actions within the weekly move planning framework. This resulted in the development of a detailed move plan that serves as the relocation plan's focal point. By utilizing Microsoft Excel to configure the plan, the researcher took a systematic approach and divided the sub-projects into separate schedules for effective documentation. The sub-project worksheets were then integrated into a master schedule, enabling the project team to identify interdependencies, and overlapping activities between established areas. The improved area configuration ensures that resources are efficiently allocated, timelines are achievable, and risks are minimized. Sub-project managers and supporting functions were responsible for providing information on the detailed transfer plan for each department. It is crucial to document the definitive relocation dates for each area and communicate them to the sub-project managers. The transportation service provider reviews and approves the plan by assessing its available resources. Finally, a joint meeting is organized to approve the detailed plan.

The case company has developed a detailed relocation plan, which includes a comprehensive schedule for each action. Appendix 4 contains the detailed project schedule. To ensure minimal disruption to the manufacturing process or dedicated areas, action steps have been assessed for their importance and potential impact. For manufacturing areas, the relocation process involves stop, decommissioning, moving, installation, commissioning, validation, and startup transition phases. For other areas, such as offices, a simpler approach is used. Consistency in the schedule formatting is maintained by using the same structure for each area with minimal modifications to the content. The materials to be moved in the office subproject include department offices, breakrooms, and meeting rooms. The IT and security subproject focuses on the transfer of electronics, such as servers and computing systems. The warehouse and logistics subproject involves three warehouse locations with component material, storage pallets, racks, and waste recycling containers, as well as inbound and outbound logistics. The production subproject consists mostly of several production lines, all with the same design format, which facilitates line installation and commissioning. The electrical subproject, which comprises

test bays, power hubs, battery cabinets, and testing equipment, requires cautious work when operating with electricity. Additionally, the relocation of larger machinery was scheduled at specific interfaces to prevent potential delays caused by time-consuming procedures.

To ensure effective monitoring and control of the project throughout its lifecycle, it is essential to consistently evaluate and update the detailed project schedule. This will ensure that the project stays on track and that any necessary adjustments can be made expeditiously. Potential risks or delays that may arise or affect the schedule are considered in risk assessment contingency plans to mitigate these risks.

4.7 Main findings

This chapter presents the main findings of the thesis, with the main emphasis on exploring the takeaways and significance of the case study regarding the relocation. Therefore, the study aimed to answer the research questions by investigating the factors contributing to the success of a factory relocation plan and developing an implementation plan for the case company to prepare an effective relocation in advance. A case study was conducted to assess the case company's project planning, which involved examining the aspects discussed in the literature review and the measures taken during the project planning phase. The first subsection aims to address RQ1: what factors contribute to the success of a factory relocation plan, while the second focuses on answering RQ2: how can the case company prepare for an efficient relocation in advance.

4.7.1 Factors contributing to a successful factory relocation plan

Based on the data collected from the case company with the support of the literature review, several factors were identified that address the first research question regarding the key factors that contribute to the success of a factory relocation plan This section will provide a comprehensive overview of the resulting factors from the research.

Based on the case study results, it is recommended to implement a suitable project management methodology for the relocation to provide a structured process throughout the project life cycle. The planning for the execution procedures of a relocation should be well-thought-out and based on the nature of the company and the implementation model of a traditional, agile, or hybrid approach suited for the relocation project. Additionally, it is crucial to implement a risk management plan to monitor and control the project plan by identifying and mitigating risks affecting the implementation of a successful factory relocation. Therefore, conducting thorough risk assessments and contingency planning to minimize potential disruptions to the project schedule, structuring project deliverables and work activities with a clear project scope, and maintaining effective communication with all stakeholders throughout the relocation process are significant factors contributing to a successful plan.

Regular meetings, follow-ups, and workshops facilitate the evolution of the relocation plan and allow for rapid resolution of any issues that arise during the process. Developing a structured work breakdown and identifying all relevant stakeholders are essential for ensuring that the project is well organized and that any issues are resolved expeditiously, hence keeping it on track. A well-organized strategy can make the relocation process more manageable and less intimidating for the project team, allowing them to focus on the current task.

Depending on the distance of the move, selecting an appropriate transportation service provider based on their service capability, resource availability, and cost-service ratio can determine the success or failure of the project. Furthermore, identifying and addressing the challenges encountered in previous relocation projects can be advantageous for future projects.

4.7.2 Case company preparations for an efficient relocation

To optimize the relocation process, it is advised that the case company initiate the implementation of a well-planned and structured relocation plan. The case study results

revealed procedures and recommendations identified by the project team and implemented to enhance the preparedness for the factory relocation. Given the uniqueness of the project and the organization's lack of experience in relocating factories, it was clear that external knowledge and expertise were necessary to devise a realistic and workable plan for the successful implementation of the move.

The project management model utilized by the case company is an agile model, although due to its suitability for larger projects, it is more comparable to traditional project management methodologies. Given the structured nature of the relocation project and its iterative stage modeling, a hybrid approach is deemed to be more appropriate for the project's nature. While the agile model approach is particularly beneficial when dealing with diverse project requirements, it can pose a challenge when applied to a rigid project. Therefore, while the model may serve as a framework for relocation projects, it should be tailored to meet the specific needs of each project. As such, the relocation project methodology guideline for project operationalization sets the tone for developing the planning stage and any other phase of the project process.

The hierarchical schedule can dictate the project planning weekly timeline and the detailed relocation schedule. To ensure a successful relocation for the case company, it is more effective to develop a comprehensive hierarchical schedule that includes discrete levels of planning for monthly, weekly, and daily actions. This allows for a more cohesive and realistic strategy to be constructed for the project schedule when the main emphasis is placed on the transitional period. By doing so, the relocation plan was able to be implemented more efficiently and effectively. Although conducting thorough risk assessments and contingency planning to minimize potential disruptions to the project schedule is important, additionally, establishing a precise work breakdown structure, identifying all relevant stakeholders, maintaining effective communication, and providing clear task allocations to all stakeholders throughout the relocation process, such as the project core and support teams, helps break down the complex process of relocating an entire manufacturing plant into smaller, more manageable short-term actions by implementing

a strategy of developing separate moving plans for each machine or area that facilitates the relocation process.

A well-conducted risk assessment decreased the risk of the project. Risk evaluations were performed to identify potential factors that could affect the project's success and mitigate any associated risks to ensure a seamless transition. Since analyzing previous relocation projects, best practices and lessons learned, the findings have supported and increased the efficiency and effectiveness of creating the project schedule. The interviews conducted in the study implied that reviewing the successes and challenges from previous projects helped identify areas for improvement in the case of the company project.

Based on the feedback from the respondents, it is recommended to delay the implementation of the new warehouse management system until after the relocation project. The project team has taken this advice into account and decided to follow this approach. The respondents pointed out that implementing the new system simultaneously with the move could pose significant risks and potentially disrupt the relocation project. Therefore, it is suggested to focus on the relocation first and then proceed with the implementation of the new system as a separate project to ensure a smoother transition.

According to the respondents, they encountered a variety of obstacles, which necessitated the development of numerous solutions. Based on the responses, it may not be possible to avoid or mitigate every possibility that could cause a project delay. Therefore, they stated that the best strategy is to recognize the risk and plan accordingly, such as by completing a worksheet on risk assessment. However, we discovered from the interviews that setting realistic expectations with stakeholders, adjusting project timelines, and implementing contingency plans were actions taken in previous projects to prevent delays in project schedule planning. Besides, most respondents stressed that the experience of TSP with large-scale relocation projects is critical, as their performance

determines the efficiency of the transitioning process. Therefore, we found that tendering a transportation service provider is a crucial factor for the efficiency of a relocation plan.

To ensure the selection of a suitable transportation service provider, a thorough tendering process was conducted. The process involved using a set of predetermined selection criteria to evaluate potential providers based on their service capacity and available resources. The selected TSP was not solely based on the decision of the weighted sum model but was assessed through a pros and cons evaluation, referenced customer feedback from semi-structured interviews, and presented for approval from the organization's executive stakeholders. The tendering process involved evaluating four potential transportation service providers to determine their service capability and resource availability before making a final selection. This approach can help ensure that the selected TSP can complete the relocation within the planned schedule and provide valuable input during the planning phase.

The study found that the case company can prepare in advance by utilizing its employees effectively throughout the move. With monthly all-internal employee conferences, it enabled employees to present questions concerning the future work environment. Besides, the change management process improved stakeholder communication and emphasized the progress of the project. In summary, although respondents faced various obstacles, all emphasized the significance of schedule planning in relocation projects. The experiences and approaches shared can provide valuable insights for overcoming challenges in the case of the company's relocation project. Moreover, organizations that lack the resources to successfully implement project processes and procedures are more likely to set the project up for failure.

5 Conclusion

This thesis investigates the key factors that contribute to a successful factory relocation and develops a set of implementation procedures to facilitate an efficient relocation process for the case company. The research methodology involved a mixed methods approach that included semi-structured interviews, workshops, and document analysis. The semi-structured interviews were conducted using a qualitative approach with key personnel who played a significant role in previous factory relocation projects, and the insights gained from the interviews were used to inform the selection of a transportation service provider and develop best practices for successful relocation implementation. In addition, using a qualitative approach and a multidisciplinary team, numerous workshops were conducted to collect data, develop a comprehensive plan for the relocation process, and identify potential communication strategies and contingency preparations. Additionally, the study utilized a document data collection method, which yielded both qualitative and quantitative data for data analysis. Moreover, a mixed-methods approach was used to analyze the collected data, which included a descriptive case study analysis of relocation project preparations and a narrative analysis to identify recurring themes and patterns in semi-structured interviews. Consequently, several key findings have emerged.

The implementation of a relocation management methodology was identified as a crucial factor in facilitating an organized and efficient process for factory relocation planning. The methodology provides a structured, stage-by-stage process for planning and executing the relocation, thereby minimizing the risk of delays, and increasing the probability of a successful outcome. This result is consistent with prior research regarding the significance of project management methodologies for complex undertakings.

According to the interviews, the selection of an appropriate transportation service provider (TSP) impacted the relocation plan's success. The more experienced a transportation service is with relocation projects, the more it can contribute to the success of a relocation. The TSP's capabilities and resources were key criteria in the selection process,

and the case company's utilization of TSP references to assess potential TSPs was found to be an effective method for evaluating service providers. Moreover, the use of separate weekly move planning in the case company for relocating each department division area and constructing a cohesive strategy for the whole project was found to be an effective approach to managing the relocation. This technique made it easier to define, combine, and adapt department areas into the schedule by moving the areas as separate units within the detailed schedule. In the main findings, factors indicate that these are essential for the success of a factory relocation plan during the project planning phase. Furthermore, identifying prior relocation project best practices reveals significant insights that can be used in relocation projects to assure success and limit risks and negative effects on business operations.

The results indicated that there must be a methodology that is suitable for the project in question, choose a transportation service provider for the factory move, analyze best practices and lessons learned to implement strategies for success, develop a comprehensive, detailed schedule with resource, stakeholder, and risk assessments and an effective work breakdown structure. These procedures were implemented in the case company to prepare in advance for an efficient relocation by ensuring that all factors are considered and addressed accordingly. Thus, this study has contributed to the understanding of the factors contributing to the success of a factory relocation plan and provided implementation procedures for the case company to prepare in advance for an efficient relocation. The findings of this study can be beneficial for other organizations planning to relocate their factories in the future.

In conclusion, this study provides insights into the factors contributing to the success of factory relocation plans and offers practical recommendations for companies undertaking similar projects. This study may provide valuable information for project management, supply chain professionals, and academics researching complex relocation project management. Overall, this study highlights the importance of careful planning and preparation for a factory relocation project. By implementing a relocation management

methodology, selecting a suitable TSP, and using a flexible approach to the project schedule, companies can reduce the risks associated with factory relocations and increase the likelihood of a successful outcome. The study recommends that businesses seek specialized knowledge or industry experience and set clear work breakdown structures to facilitate effective project teamwork between departments. Although understanding the project planning process and project execution of previous relocation projects may give significant insights to companies facing comparable relocation challenges, as mentioned in the literature, as the distance of the move increases, so do the risks.

Subsequently, relocation schedule planning is a dynamic process. Therefore, the detailed schedule is due to be refined regularly for changes during the monitoring and control phases as the project approaches its execution date. One of the interview respondents expressed as such: “no matter how good a plan is already made, the best of all is the latest plan”. Indicating that constant monitoring and control are essential to ensuring success and that adjustments should be made, as necessary. Moreover, the new factory premises with a different layout will require considerable time to restore the function to its previous level. The factory operational restoration process is a long-term effort as a new location and system are involved, which can be a topic for further research.

Also, further research is needed to evaluate the success of factory relocation projects, identify areas for improvement, and to examine the impact of relocation on employee change management. Effective project management is crucial to the success of such initiatives, but the optimal project structure and management approaches for large-scale relocation projects remain unknown and require additional research. Future studies can also explore the selection decisions and building constraints related to new factory locations. Moreover, the impact of relocation on employee satisfaction is a topic of interest, as it is challenging to predict how factors like work environment and distance may affect employees' decisions to stay with the company. This area may require further research after the relocation takes place.

Future research could explore the use of other project management methodologies and techniques for factory relocation projects and examine the impact of factors such as operational benefits and effective change management on relocation outcomes. The implementation of the new warehouse system can also be carried out with further research.

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Appendices

Appendix 1. Interview questions

1. Kauanko muutto kesti kokonaisuudessaan?
2. Oliko muutossa mukana yksi vai useampi urakoitsija?
3. Miten päädyitte valitsemaan kyseisen muuttoyrityksen?
4. Millainen oli valitun muuttopalvelun hintataso verrattuna muihin kilpailijoihin?
5. Mitä kriteereitä huomioitte valintaa tehdessä?
6. Miten muutto sujui aikataulun kannalta, pysyttiinkö aikataulussa?
7. Kestikö muutto aikaisemmin luultua pitempään, tai menikö se nopeammin kuin suunniteltiin?
8. Miten muuton aikataulua valvottiin?
9. Mitä onnistumisia ja haasteita esiintyi muuton aikana?
10. Voitko kuvailla kriittisiä menettelyjä, jotka olivat tarpeen tehokkaan muuton varmistamiseksi?
11. Miten muuttosuunnitelman aikataulu laadittiin? Ketkä olivat mukana?
12. Oliko muuton aikana käytettävissä riittävästi resursseja?
13. Vastasiko todellisen siirrettävän tavaramäärä muuttopalvelun ennusteita?
14. Oliko muuttofirman puolelta käytössä projekti päällikköä?
15. Miten koitte muuttofirman projektipäällikön osallistumisen muuton suunnitteluun ja itse muuton toteutukseen?
16. Millaista johtamistyyliä projektissa käytettiin?
    a) Orkesteri, projektipäällikkö johtaa työntekijöiden työryhmää.
    b) Demokratia, vastuullisuus on annettu työntekijätyöryhmälle.
    c) One-man-show, 1–2 henkilöä hoitaa kaikki tehtävät itsenäisesti.
    d) Asiantuntijatyöryhmä, projektikoordinaattori johtaa hanketta varten muodostettua asiantuntijaryhmää.
17. Miten hoiditte vanhan toimitilan tyhjennyksen / tavaroiden kierrättämisen?
18. Miten muutto vaikutti yrityksen toimintaan?
19. Suosituksia parhaista käytännöistä muuton valmisteluun liittyen?

Appendix 2. Request for Proposal form

Detailed offer request	
Company name	
Contact person	
Phone	
Email	
Capable of disassembling and installing production and testing labs? Answer [Yes/No]	
Information on previous company reference contact details (approximately the same size)	
Reference company name & Contact details	
	All prices (VAT 0%)
Budget offer [Sum of Total price]	
Payment structure	
Project manager €/project	
Number of hours included	
Office move [Total price]	
Meeting rooms *[A from separate list]*	
Office furnitures *[B from separate list]*	
Other areas *[C from separate list]*	
Office workstation installation	
Safe (2pcs) & Compressor (1pc)	
Archive shelfs (200 meters)	
Phone booths	
Small (9 pcs)	
Large (4 pcs)	
Number of truck loads (incl. price)	
Number of working hours/days (incl. price)	
Production move [Total price]	
Number of truck loads (incl. price)	
Number of working hours/days (incl. price)	
Warehouse move [Total price]	
Number of truck loads (incl. price)	
Number of working hours/days (incl. price)	
Carage move [Total price]	
Number of truck loads (incl. price)	
Number of working hours/days (incl. price)	
Electrical infra move [Total price]	
Number of truck loads (incl. price)	
Number of working hours/days (incl. price)	
Labour hours €/h	
Project manager €/h	
Foreman €/h	
Packing help €/h	
Move person €/h	
Extra hours €/h	
Working hours	
Non-working hours	
Night	
Weekend	
Holiday	
Extra delivery drive (Espoo-Vantaa) [€/drive]	
Van (eg. IVECOdaily)	
Lorry (eg. IVECO65)	
Truck	
Move material	
Move box (rent/day) [rent period 1-2 months]	
Trolley (rent/day) [incl. back wall and shelf]	
Sticker	
Packing material delivery/pick up	
Recycling	
Mixed waste (€/kg)	
Electrical waste (€/kg)	
Paper (€/kg)	
Confidential material (€/kg)	
Furniture (€/kg)	

Appendix 3. Risk assessment worksheet

	Risk level						Risk level after		
Title	**Probability (1-5)**	**Impact (1-5)**	**Risk Score**	**Impact**	**Owner**	**Avoidance / Transfer / Mitigation / Acceptance**	**Probability (1-5)**	**Impact (1-5)**	**Risk Score**
Relocation project delay	4	5	25	Business	Project Team	Assign tasks and monitor project, plan thoroughly by setting realistic deadlines, allocate additional resources by adding more manpower to the project team.	2	4	12
Delays in obtaining necessary permits and approvals for the new location (move day)	3	3	12	Business	Project Leader	Set a date for the permit and approval process at an early stage, and follow up regularly with the new site building schedule, corrective actions for unqualified constuctions.	1	3	6
A lack of expertise with large-scale relocation operations	2	4	12	Business	Project Leader	Partner with a moving company / transition service provider.	1	1	2
Inadequate space for assembly, hauling routes, and moving heavy or challenging objects	3	5	20	Health	Project Team	Material delivery plan between sites. Thoroughly assess both location layouts and routes before finalizing the decision; look for alternative routes if necessary.	2	3	9
Hauling routes interfere with functioning activities	5	5	30	Business	Project Team; Transportation service provider	Order of first-to-last move (one area at a time). Plan a weekly move schedule and use the layout to guide and obtain all effective routes at both locations.	3	4	16
Unexpected construction issues (incorrect measures, requirements, or material unavailability)	3	5	20	Business	Project Leader	Close communication about the schedule for the completion of the new location.	2	5	15
Manufacturing interruption during relocation (downtime)	4	5	25	Business	Production	Plan a comprehensive relocation schedule carefully, have a backup plan for production, maintain inventory levels, and move manufacturing in stages.	2	3	9
Inadequate space preparations for operations	2	3	9	Business	Project Team	Conduct a thorough assessment of requirements, ensure adequate space and facilities, and optimize layout and processes. Mark movable objects so that they may be located in the correct areas.	2	1	3
Warehouse management system (current decentralized warehousing)	3	5	20	Equipment	Warehouse & Logistics	Implement a new WSM after the relocation, and in the meantime, implement the current warehouse management system.	3	3	12
Logistics, delayed or disrupted delivery of raw materials and finished goods	2	3	9	Business	Warehouse & Logistics	Plan logistics and transportation carefully, establish backup plans, maintain adequate inventory levels. Correct inbound and outbound preparations. Prepare a buffer stock / increase warehouse component availability.	1	2	4
Comissioning delays for electrical testing laboratories / limited testing capacity during relocation	2	5	15	Equipment	Electrical	Plan relocation of laboratory equipment, ensure compliance with regulatory standards, obtain necessary certifications and accreditations for full deployment.	2	3	9
Delays or disruptions with the transportation service providers	3	5	20	Business	Transportation service provider	Tender the process of selecting a suitable transportation service provider, establish backup plans and contingency arrangements, establish clear communication channels, and examine capabilities.	2	4	12
Inadequate or insufficient packing equipment or machinery for transportation	3	3	12	Equipment	Transportation service provider	Packing instructions from the transportation service provider	1	3	6
Miscommunication between stakeholders	2	3	9	Business	Project Leader	Establish contact persons, clear communication protocols and channels, stakeholder analysis, regular daily or weekly meetings, and updates. Create a joint Teams channel between the core project team and the transportation service provider firm	1	2	4
Personnel policy and employee information; instructions and communication about schedule and changes	3	2	8	Business	Project Leader; Project Team	Change management. Motivating personnel for changes, increasing community spirit, involvement of personnel, equality/justice, encouragement.	2	2	6
Equipment could be damaged during transportation	3	5	20	Equipment	Transportation service provider	Proper packing and handling during transportation. Insurance coverage for equipment	2	4	12
Waste sorting	2	2	6	Equipment	Warehouse & Logistics	Ensure all waste is sorted and disposed of properly before the relocation begins and ends.	1	1	2
Site security during the relocation	2	3	9	Health	IT & Security	Limit the access management for uninvited persons by acquiring security. Permits for employee, authorization relevant permissions	1	2	4
Incident after move to the new site. People are not aware about the possible risks related to new facility, equipment or procedures	5	4	24	Health	Health & Safety	Safety / introduction for new equipments and site. Define needs for safety and user trainings for employees, visitors and suppliers. Organize needed trainings to ensure safety at site	2	2	6
Inadequate detailed move plan cross-check for subprojects	5	4	24	Business	Project Team	Effective meeting practices; Regular meetings, Planning meetings and Daily Tier meetings during move	3	3	12

Appendix 4. Detailed project schedule