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Metrics contributing to the implementation of successful projects

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Abstract

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The aim of this thesis was to improve the usage of metrics in project management within the target organization. The main objective was to identify suitable metrics for measuring the successful project. Metrics are an essential part of project management and therefore there is a need for researching the measurement process so that the organization can implement projects successfully.

The research was conducted as a qualitative case study. Data was collected through semi-structured interviews, which were conducted for project managers in the target organization. Results were analyzed with thematic analysis by using an abductive approach and the main themes for the interviews emerged from the literature.

The development part of this study suggests the metrics for the target organization. Important elements for the implementation of the successful project are introduced based on the interview data and the literature. Target organization is currently establishing a project management office and the results of this thesis provide the data to support the development of project management practices.

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1 Introduction

The success of the project has traditionally been measured with cost, time, and output (called The Iron Triangle). However, the Iron Triangle model only focuses on three aspects, while there are more context-specific issues to measure the projects (Bronte-Stewart, 2015, 19). In this study, further project measurement metrics are being examined.

The aim of this thesis is to improve the usage of metrics in project management by examining project measurement metrics and the elements, which are affecting project success. The objective is to find suitable metrics for measuring the successful project. Measurement is important part, because metrics measure the quality of the project and good quality correlates with the success of the project. The purpose of the metrics is to show the right direction for the work that is implemented in the projects and therefore the project work will be improved according to the measurement results. Another objective was to recognize essential elements that affect to implementation of successful projects.

The commissioner of this thesis is Government ICT Centre Valtori, which maintains, develops, and protects Finland's largest ICT environment. Amongst the other tasks, Valtori is also completing a remarkable number of internal projects in the organization yearly, but also a big number of projects are implemented for the customer organizations each year. Organizational change was conducted in Valtori during the year 2022 and project management is still under further development. Therefore, it is a suitable time to research and develop the important aspects of project management. Metrics are one essential part of projects to measure the project success.

There are four research questions. The main research question is "What are the suitable metrics to measure a successful project?". Sub-research questions are "What kind of project can be defined as a successful project?", "What are the elements of implementing a successful project?" and "How it is measured that quality is obtained."

This study was conducted by using the case study method as a research strategy. A case study was used as a research strategy because the researcher wants to gain a deeper understanding of the subject. The research approach was qualitative research approach. The research method, which was used was semi-structured interviews. Semi-structured interviews were conducted with six randomly selected project managers in the organization to gain more understanding of how project managers consider the quality and success of projects and how metrics are utilized in

project management. Interviews were analyzed by abductive thematic analysis, whereby the main themes were created deductively based on a literature review. Part of the sub-themes emerged inductively from the collected data.

The selection of metrics was created as a development task based on the research. The organization has currently two different metrics in use, so it is advisable to have more metrics available to support the success of the project with the right metrics. Projects are unique and therefore the same metrics are not suitable for every project. That is why it is advisable to have a variety of metrics available.

2 Projects and measuring the project success

This chapter introduces the projects and their management methods. Project success is also reviewed with Iron Triangle and Square Route criteria and the quality of the projects is examined. Also, potential of artificial intelligence in the future is introduced. Measurement and metrics are researched in this chapter as well.

2.1 Definition of project

Projects have a start and an end, and they go on for a limited time. Projects are something that has never been done before and they bring people together with different kinds of expertise and backgrounds. Investments are needed in projects in the form of capital resources, which are money and funds. Projects also naturally need human resources, which brings their effort and time to the project. (Nieto-Rodriguez, 2021, 28-29.)

According to Atkinson (1999, 337-342), Reiss (1993) states that a project can also be described as "a human activity that achieves a clear objective against a time scale". Dobie (2020, 3-4) states that a project is temporary and therefore project produces a unique product or service that is somehow different from all the other services or products. Projects make rather revolutionary changes, which means it is a complete change that project produces compared to operational work. Projects have flexibility in planning and in operation to achieve the desired result. Projects include also risks. Differences between the projects and operational work are described in the following table:

Table 1. Differences between the projects and operational work (modified from Dobie, 2020, 4).

Projects:	Operations:
Unique	Repetitive
Finite	Ongoing
Revolutionary change	Evolutionary change
Unbalanced objectives	Balanced objectives
Transient resources	Stable resources
Flexibility	Stability
Risk and uncertainty	Experience

Projects differ from daily operations in many ways. The aim of the project is to achieve certain objectives and they are one-time investments, while operations are day-to-day activities in an organization. Projects have a time limit, as well as a budget. Also, temporary team members are included. Both project managers as well as operation managers need similar kind of skills such as people management, diplomacy, and negotiation skills. The difference is that the project managers need to work throughout the organization with many people, who bring their views together. When the project is completed, the deliverables and outcomes are often moved to the operational side in the organization. That is where the anticipated benefits must be successfully sustained and achieved. (Nieto-Rodriguez 2021, 32.)

The project's life cycle consists traditionally of initiation, planning, implementation (monitoring, reporting, testing), and closing (Nieto-Rodrigues, 2021, 58). Organizations use different terms for these project stages: for example, initiation can be called a concept and implementation can be called as development. It can be confusing, but most important it is to understand that the project is split into different phases to implement the project effectively. (Simon & Murray-Webster, 2018, 37.) Nieto-Rodriguez (2021, 44) also states that project management is the combination of competencies, techniques, and tools that help people plan and implement projects successfully to achieve the determined benefits.

2.1.1 Project management methods

Traditional project management methods are called waterfall or predictive approaches. These methods should be applied to projects that have medium complexity and uncertainty, such as reorganizations and merger integrations. These kinds of projects need detailed plans and a clear definition of requirements before implementation starts. These phases are then closely viewed with progress monitoring. (Nieto-Rodriguez, 2021, 48.)

According to Wysocki (2019, 40-42), the traditional project management approach (waterfall/predictive) can be used when the client has set a clear goal for the project and the project team knows how to reach the goal. The focus is on delivering in time and in budget and they rely more on compliance to plan than creating business value. Projects implemented according to the traditional method, are familiar and they have low complexity. There should be as less as possible scope change requests because else requests will affect staying on schedule. For the traditional method, there should be only a small number of risks anticipated, because the projects are known and predictable. Also, technology infrastructure is known well beforehand in this type of project management method.

Nieto-Rodriguez (2021, 50) suggests that when scope, requirement, or specifications are not known beforehand, adaptive (agile) approaches should be used. In these cases, there is a lot of uncertainty about the outcome. Also, scope and requirements possibly change throughout the life cycle of the project. The most used agile methods of agile project management are Scrum and Kanban.

Hybrid methods are not welcomed many times in the agile community, because the agile community thinks that the hybrid method is going to corrupt the agile way of doing projects. The hybrid method is going to succeed, when the project is clearly divided in parts done by agile way and other parts done by the predictive traditional method. These parts are handled independently from each other's. (Tolbert & Parente, 2020, 52.)

It is stated by Nieto-Rodriguez (2021, 53) that too many companies stay in one method of project management. It is a big risk for the success of the project not to have the flexibility to choose the right kind of project management method. A few organizations have already changed the way they operate project management. Practices have been improved and they are now focusing rather on outputs and benefits instead of scheduling and inputs.

According to Nieto-Rodriguez (2021, 31), centralized management of the organization's projects is called project portfolio management. This portfolio management selects projects and prioritizes them as a portfolio of investments. When portfolio management is done successfully, it increases business value in the form of best use of limited resources, building synergies between projects, and going towards the organization's strategic direction. Organizations can have one or multiple amounts of project portfolios. Recently, the responsibility of the project portfolios has been given to the PMOs. According to Pöntinen (2019, 57), the International Project Management Association IPMA (2017, 5) defines project portfolio management as the centralized management of portfolios to achieve strategic objectives. Pöntinen (2019, 57) also states that according to IPMA (2015, 24), to be able to achieve the strategic objectives, portfolio management is a dynamic management process whereby projects are evaluated, and the right projects are chosen and prioritized. Rad et al (2005, 296) says that the ideal portfolio consists of a number of projects, which are aligned with the organization's strategy.

It is suggested by Nieto-Rodriguez (2021, 57) that project management methods should be simplified. Instead of project management methods being too complex to be easily understood by non-experts, methods should be quickly understood by most of the employees. Successful management methods are linked to a few simple frameworks. Nieto-Rodriguez (2021, 132) states that the level of uncertainty at the beginning of the project determines if it is worth using traditional project management or agile methods. Nieto-Rodriguez (2021, 135-136) says that if the project scope is uncertain, it is better to use the agile methods. Agile methods were planned for software development.

2.1.2 Development of project management

For decades, project management has been focused on the inputs – planning, estimation, cost, time, scope, and risk management. Outputs, which include for example value, benefits, impact, and strategy were not part of the earlier project management definition. (Nieto-Rodriguez, 2021, 44-45.)

Nieto-Rodriguez (2021, 45) states that most traditional project management theories start with the life cycle of the project, which means that each project should be divided into stages or phases whereby one stage needs to be completed before moving to the next one. However, this is not how projects proceed in real life. Projects are different. Uncertainty is always included while doing

something new as a projects. Many projects need to be worked on in multiple phases in parallel to be able to adapt to the realities. Traditional project management also concentrates on the project deliverables. It was assumed that the benefits, value, and impact will be revealed when outputs are produced within the budget, time, and requirements.

It was until the 1990s that most project management metric systems placed focus on "things" attributes in the projects, which meant schedule, cost, and resources. This system still dominates in organizations, which have not developed their metric system further. Since the 1990s, other attributes have also involved, and these are people and the enterprise. (Rad et al, 2005, 11.) Before the 1990s only few organizations had metrics system in use, but after that decade, project management has been recognized as an important and competitive tool to achieve the planned business performance (Rad et al, 2005, 279).

Theorists and experts of the original project management took an example from operations management. They believed they could replicate and apply the philosophy of operation management, which meant they believed in the efficiency and standardization methods that aimed at predictability and consistency in practice. It was believed that it would guarantee the success of all projects if a standard project management methodology was applied to all projects. Most organizations and governments adopted the standardized management technology, and they applied it to all projects no matter what the project's type, size, scope, or other criteria. This method was known as the waterfall or predictive method. (Nieto-Rodriguez 2021, 45.)

Wysocki (2019, 40) states that the business world is constantly changing, and it is also fast-paced. He has collected information from all over the world and the data shows that around 20 percent of the projects are likely to fall into the traditional project management approach. This kind of project are familiar to the organization and similar projects have been completed many times before.

In the past decade, agile methods such as Scrum and Kanban originated from the tech world, whereby IT developers looked for more flexibility and freedom to achieve the scope of the project without the control of the project manager. During those times many considered the agile methods as cool and fresh, while traditional project management was totally opposite. In many instances, the agile systems were drastically implemented throughout the whole organization. (Nieto-Rodriquez 2021, 46.)

The group of software project managers declared the Agile Manifesto in 2001 where they defined the principles of agile project management. It was declared because it was seen that it is difficult to specify the requirements of the software projects, they abandoned the traditional project management method. (Morris, 2013, 90.)

Modern project management focuses on benefits with an abundance of methods. Many projects have failed because of using either one of two opposites; either traditional or agile methods. Now it is believed that project success relies on the right method in the right type of project. Some projects need the agile method, while some other projects need the predictive management approach. Also, a hybrid method can be used. (Nieto-Rodriguez, 2021, 46.)

2.1.3 Increasing significance of completing tasks by projects

Nieto-Rodriguez (2021, 22-23) indicates that the number of the projects is increasing as it is the worldwide trend to complete tasks as a project. It has also been researched that the number of individuals working in project-based roles will increase from sixty-six million to eighty-eight million in the US during the years 2017-2027. Based on this, it is evident that project-based work is increasing. It also means that professional careers will be more project-based.

Projects are everywhere. Organizations will shift their focus more than ever on projects. Projects are a new norm for staying in business and for creating value. Organizations create value nowadays through successful project management. (Nieto-Rodriquez 2021, 28.) People are participating more and more to project work as more knowledge work is done in projects. (Harrin, 2022).

It is forecasted that there will be a continuously widening gap between the availability of project professionals and employer's need for skilled project management labor across the globe. Skilled workers are retiring as well. At the same time, there is a huge increase of jobs, which require project-working skills. (PMI, 2017, 1.)

2.2 Project success

According to Nieto-Rodriguez (2021, 54-55), more than half of the projects were unsuccessful according to the third of the respondents which consisted of project professionals and senior executives in 2020. 20 percent of the respondents did not know the return on investment (ROI)

that their projects produced for the organization. Nieto-Rodriguez (2021, 55, 57) states that the main idea of the projects is to produce benefits and therefore if the benefits have been reached, the project is successful. According to the Standish group, just 35 % of the projects are completed as successful while 65 % of the projects are not successful. This results in wasted resources and budgets, but also to the lost benefits. If the bigger number of projects could be successful, it would bring a big impact in improvement in financial and other benefits to societies, individuals, and businesses.

Nieto-Rodriguez and Viana Vargas (2023) state that one reason for a poor success rate of projects is the low level of maturity of technologies available to manage the projects. If artificial intelligence and technological innovations could be applied to project management, the success ratio of projects could improve by 25 %. It is a matter of time when artificial intelligence will be effectively applied to project management.

According to Townsley (2023), outdated technology is one significant contributor to the poor success rate of projects. Traditional tools and methods, for example, spreadsheets, slides, and project management software have not changed much over the recent years. These methods have been sufficient for measuring project success a decade ago, but they are not enough nowadays. Artificial intelligence can also help organizations to boost their success rates in projects by increasing efficiency, decreasing costs, and improving performance.

According to Atkinson (1999, 337-339), Oilsen (1971) suggested cost, time, and quality (The Iron Triangle) as the success criteria for the projects already decades ago. Since that time these criteria have been included in the description of project management. Projects, which are measured with cost, time, and quality are measuring the delivery stage and if something is done right. Atkinson (1999, 339) states that Meyer (1994) describes these as Results Measurement and suggests performance measurement for organizations that deliver products to the customer. Therefore, performance measurement can be an essential success criterion.

Success in project management also affects the organizational success in many projects. Sometimes if the project fails or if the performance of the project is poor, the organization learns from it and can improve projects later in the future. It can be difficult to understand how to measure a successful project and most important is to define when the measurement should be performed. Project success can mean many different things. It can be measured by an iron triangle (budget, time, and quality), but the success can also be evaluated by customer satisfaction. The success can also be measured further by the project's output, for example, the developed product and its

lifecycle. Project success can also be measured by critical success criteria and key performance indicators (KPIs). Success can also be evaluated in the final report. (Korhonen, Jääskeläinen, Laine & Saukkonen 2023, 3.)

According to Korhonen et al (2023, 3), project managers and project owners can affect to success. The project manager ensures the project is implemented well and the project owner understands the business case expectations well. When considering the project's success, it is worth looking behind, but also to look forward while evaluating. It is also suggested to use leading performance indicators to evaluate the project's success already at the beginning of the project. It has also been observed that there should be further research on different projects to understand what brings success in different cases. Atkinson (1999, 339) states that according to Struckenbruck (1987), success criteria should be considered amongst the four most important stakeholders, who are the project manager, top management, customer-client, and the team members.

Wu (2020, 8) states that stakeholders have different views of what kind of project is a called successful project. The financial department sees the project as successful if it has been completed within the budget while the customer sees the project as unsuccessful if the output was having poor quality. Rad et al (2005, 33) also suggest that the client usually sees success in project deliverables while the project team might consider projects as successful when means of producing deliverables is successful.

Westcott (2004, 126) suggests that project success is tied to the scope, objectives, and schedule. He says that the most common measures at the end of the project are accomplished objectives, achieved deliverables and outcomes, and if the project stayed within budget and deadline. Wysocki (2019, 42) suggests that the success of the projects implemented through the traditional method is measured by compliance and delivery.

Project success is dependent on the effective project team and their performance. Success is also dependent on the individual's performance. Each member of the project team should understand the objectives of the team, but also the individual objectives. Everyone's roles and responsibilities should be defined to support teamwork. The goal of the project team is to produce the final deliverable of the project cost-effectively and efficiently through best practices while keeping up the good teamwork spirit. (Rad et al, 2005, 97-98.)

According to Nieto-Rodriquez (2021, 56), project managers and project sponsors should become project leaders, who are as embedded in the goal as they are in the means of achieving it. He suggests that project managers should think as executives and vice versa. To be able to increase

project success, project management should be taught to strategists and leaders. Strategy and project management are dependents, and they should be part of the executive development.

It is also questioned by Wu (2020, 8), how successful project is recognized. As it has already been stated, project success is measured by the iron triangle. Projects can also be considered as successful if stakeholders are satisfied with the output that is achieved. Sometimes project can be seen as successful, if there are no bigger challenges while implementing the project. It can also be questioned if the project is successful if the resources are not enough and the project team feels exhausted when finalizing the project. Also, Atkinson (1999, 337) suggests that stakeholder benefits are important in assessing project success.

2.2.1 Triple constraint vs the Square Route

The quality of the project has been used to view as the Iron Triangle containing time, cost, and quality (Morris 2015, 65). Nieto-Rodriguez (2021, 59-60) also says that a traditional vital tool for project management is the so-called triple constraint – also known as the Iron Triangle. Internally focused triple constraint illustrates the challenges between scope, time, and cost, all of which affect the quality. Some experts say the triple constraint is the most important concept in the history of project management. For example, Basu (2016, 33) relies on the concept and states that it is generally thought that is minimum success criteria of the project when the project is completed on time, within budget, and to quality.

Kerzner´s (2017, 29) suggestion is that the term triple constraint should not even be used anymore. There can be more than three constraints and therefore it should be called" competing constraints", because the amount of the constraints can vary from project to project. Nieto-Rodriguez (2021, 60-61) suggests also looking at the benefits through the new outward-looking triple constraint. In these constraints, the project leader must be looking at the outward elements of the project's success, for example, the benefits and the engagement of the project team to measure the performance.

Atkinson (1999, 341) states that writers such as Turner (1993), Morris and Hough (1987), Wateridge (1998), deWit (1988), McCoy (1987), Pinto and Slevin (1988), Saarinen (1990) and Ballantine (1996) includes the Iron Triangle as a necessary criterion to measure the project management process. Constraints of the Iron Triangle are introduced in the following figure:

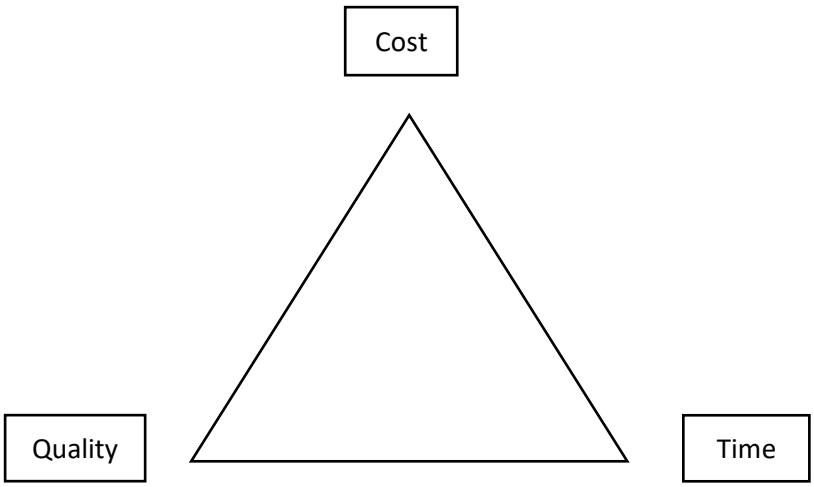

Figure 1. The Iron Triangle (modified from Atkinson, 1999, 338).

There was a list of writers above, which Atkinson mentioned and who supports the Iron Triangle. According to Atkinson (1999, 341), those writers also included other criteria, which could be used to measure the success of the project's post-implementation phase. These criteria are the technical strength of the resultant system, the benefits to the resultant organization (direct benefits), and the benefits to a wider stakeholder community (indirect benefits). Atkinson (1999, 337) questioned the Iron Triangle as success criteria for the project because it excludes the long-term benefits from the success criteria. Instead, he suggests a new framework to measure project success, The Square Route. The following figure describes the Square Route:

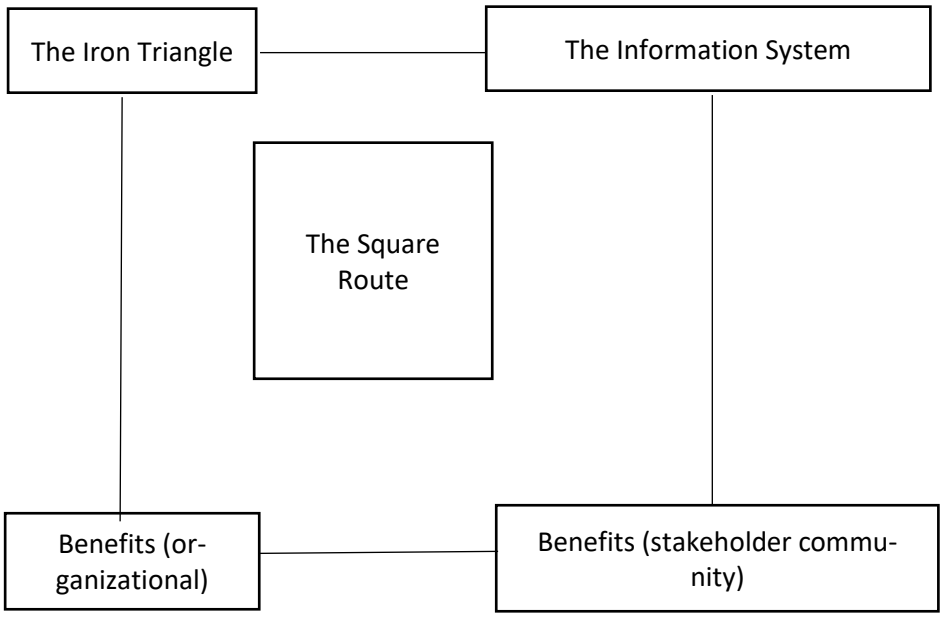

Figure 2. The Square Route (modified from Atkinson, 1999, 341).

In the above figure, Iron Triangle (cost, time, quality) is introduced as one element. Information system means maintainability, reliability, validity, and information-quality use. Benefits include the matters, which are introduced in the following table:

Table 2: Benefits in the Square Route framework (modified from Atkinson, 1999, 341).

Benefit to the organization:	Benefits to the stakeholder community:
improved efficiency	satisfied users
improved effectiveness	social and environmental impact
increased profits	personal development
strategic goals	professional learning
organizational learning	contractor profits
reduced waste	capital suppliers
	content project team

2.2.2 Successful management of the project

Planning the project includes several tasks. All the tasks should be identified, the costs of tasks should be estimated, completion times of tasks should be set, dependencies between the tasks should be identified and both start and end dates of each task should be set. It is also important to figure out the critical path. After the plan is completed, a Gantt chart should be created whereby the project plan is presented. The Gantt chart shows the project schedule derived from the work breakdown schedule (WBS) (Nieto-Rodriguez, 2021, 143).

Wu (2020, 7, 10) states that project managers need both technical and soft skills to manage the negotiations, motivate and guide the team, and fulfil the expectations of the stakeholders. Project success should be achieved when working efficiently and effectively while applying the right management tools and techniques. Hyväri's (2017, 15) empirical study has indicated that the experience of the project manager and project team has a remarkable impact on the success of the project, especially when change management is concerned. It is important for the project manager that knows how to handle the available tools, but also it is important to manage the people.

Tayntor (2010, 33-34) has defined critical success factors for the characteristics of a successful project manager. The project manager should have experience in project management, especially

when implementing a large project. One can naturally learn from failed projects and improve on the next ones. The project manager should have interpersonal skills, which include problem-solving skills and to be able to motivate the team members. The project manager should be able to conduct the meetings starting from the prior agenda, keeping the meeting on schedule and inviting the right persons to the meetings. Verbal and written skills are important for the project manager as well. Decisions must be documented.

Rad et al (2005, 106) suggest also critical success factors for project managers: client/team communications between the management, team, and the client, assignment of the right people to the right tasks, project planning to meet identified constraints, project estimating to meet identified constraints, client's commitment and involvement, documentation, technology currency and awareness, stress management, monitoring and controlling deliverables and organizational astuteness.

The project manager's duty begins after the project idea is chosen and the business case has been validated. A project manager is responsible for scoping, planning, and completing the project deliverables, but usually, little attention is paid to the benefits of the project. When implementing the project according to these stages, benefits start to show during the closing phase and after the closure. Instead of the traditional life cycle, Nieto-Rodrigues suggests that project management should be focused on these three areas: (1) innovation, (2) managing deliverables and outputs after the project is finished, and (3) focusing on the benefits that the project produces. (Nieto-Rodrigues, 2021, 58.)

As the project manager is a critical part of the project's success, so is the project team as well. Team members contribute to the project's success, and they are active participants in implementing the project. It is suggested to keep the core project team as small as possible because a smaller team is more effective. If there are huge projects and lots of team members, it is advisable to divide the project into pieces or even to create sub-projects. While selecting the team members, it is important to have skilled and experienced team members. It is also important that the team members have time and commitment to the project. (Tayntor, 2010, 103-105.)

Rad et al (2005, 288) suggest that well-defined and well-executed project management processes indicate good project management maturity and a higher likelihood of project success. Rad also states that it is important that the project team is aware of project management practices, is trained, and the project team must have the right tools needed to successfully implement the project.

Kerzner (2017, 107) suggests that it is important to communicate between the project manager and stakeholders and hear what element each of them considers as success on the project. According to (Nieto-Rodriguez, 2021, 103) it is also important to have meetings with the steering committee regularly and often. If the steering committee meets seldom, it is possible that not all the participants show up and some hardly remember what the project is all about. When the steering committee meets regularly and often, the project is likely to be more successful.

Already at the beginning of the project, it is advisable for the project manager to do a detailed plan of the project requirements and get it approved by the customer. There will be probably fewer change requests during the project if the scope definition is clear and requirements have been analyzed well. An in-depth scope definition will reduce the unplanned quality audits. When project requirements and scope are defined well, defects should likely decrease, also the time and cost to fix them will decrease. (Rad et al, 2005, 14.)

It is suggested that if there are any changes to scope, time, quality, or cost, the quality plan should be updated. All the changes should be documented and submitted to the project manager. It is also important to keep in mind that poor change management impacts the quality and results in poor quality. There is a small chance of completing a successful project, if the control is not maintained over the scope, time, budget, and quality. (Snedaker, 2005, 298.)

To be able to successfully manage the project, it is important to identify the possible risks, evaluate the impact of the risks, and plan how to mitigate the possible risks. The risk tracking form helps to track the number of risks recognized, risks that were encountered, and the impact of the risks. (Rad et al, 2005, 31-32.)

Also, Nieto-Rodriguez (2021, 153, 155) suggests that risk management is an essential task for the project manager. If the project fails, the failure is a result of a risk. Project fails, if it has exceeded either the schedule or costs or both. The project fails also if it does not deliver the aimed output. It is essential to identify and manage the risks. If the project is uncertain, effective risk management should be completed. Many projects can fail if some risk has not been considered so well. The earlier the risk has been recognized, the less costly it is.

2.2.3 Completing the successful project according to the project canvas

Nieto-Rodriguez (2021, 9) has compiled a new project management framework, so-called" project canvas", which introduces the elements or so-called domains, which are included to complete a successful project. Nieto-Rodriguez (2021, 71) states that the canvas must be applied throughout the project's life cycle to stay on track in the process and to ensure all the elements stay valid until the completion. The canvas also helps leaders to estimate if the project has successfully met all the identified benefits. This is the opportunity for project managers and executives to start applying this new project management method; project canvas, which is simple and will lead to better outcomes in the organizations.

Project canvas differs from all the other project management methods in different ways. It is a simple, fast, and flexible method, and it is designed for everyone: managers, executives, students, and newcomers to the profession. The project canvas can be applied to all types of projects: traditional, agile, and hybrid. It can also be applied to programs and strategic initiatives as well. This project management method focuses on benefits and value, instead of controls and processes. It also focuses on implementation instead of detailed planning. Project canvas also includes the pre-project and past-project phases, which are not included in the traditional project management methods. (Nieto-Rodriguez, 2021, 70-71.) Project canvas consists of three main parts: foundation, people, and creation. The following figure describes the project canvas:

Table 3. The Project Canvas (modified from Nieto-Rodriguez, 2021, 70).

Foundation	**People**	**Creation**
Purpose	Sponsorship, Stakeholders, Resources	Deliverables, Plan, Change
Investment	Benefits	

According to canvas, the first stage of the project is foundation. The project's purpose must be evaluated as to why the project was created (Nieto-Rodriguez 2021, 9). Nieto-Rodriguez (2021, 73-74, 81) suggests that if this foundation part is skipped, it likely increases the chance of project failure. The foundation consists of three parts:

- purpose: tells why the project will be done, the problem which you want to solve and what will be achieved with it, what makes the project unique, and what will be remembered from the project in the future.
- investment: the total cost of the project including capital, funds, and resources needed on the project and to achieve its benefits and purpose.
- benefits: the outcomes of the project: what is the project going to bring to the organization, to the city, and the region, and how stakeholders will benefit from the project.

The next section of the canvas involves people: sponsors accountable for the project, the project manager, the project group, and the skills needed to deliver the project. Stakeholders are also important groups of people affected by the project and they will benefit from the project. (Nieto-Rodriguez 2021, 9.)

During the creation part of the canvas, deliverables must be taken into consideration, because those are the outcome of the project. The creation stage includes a plan, which states how and when the project will be implemented. The creation section also includes considering the change: engagement of the stakeholders and risk management. (Nieto-Rodriguez 2021, 9.) Nieto-Rodriguez states that if all these elements are focused on by organizations, leaders, and other individuals, the success of the project is guaranteed.

2.2.4 Benefits and value in project management

Projects are done because of the benefits and all the projects should achieve benefits that meet the goals and strategies. Quantitative measurement can be used when measuring benefits, for example, benefits can be measured financially or by market share. Benefits can be measured also qualitatively, for example how security has been improved. To be able to manage the benefits, the project deliverables should be identified clearly, and measures should be derived for the benefits. It is called benefits management when benefits are realized during the project and program implication and in the operating environment. (Morris, 2013, 189.) Benefits are "the measurable improvement resulting from an outcome" (Morris, 2013, 84).

Also, Tayntor (2010, 88-90) agrees, projects are initiated because of benefits. Benefits are the opposite side of costs, and they are considered more important than costs. Benefits could be categorized into four categories: cost reduction and cost avoidance, quality improvement, and increased functionality. Increased functionality and quality improvement may be difficult to quantify, but quality improvement shows for example as an increased sale due to better quality and increased functionality can reduce the product's entering time to the market.

The value must be achieved after the project has been completed to be able to say the project is successful. If the project has been completed according to time and cost constraints, it does not guarantee the project has produced value. (Kerzner, 2017, 28.) According to Kerzner (2017, 29), it can be challenging to choose the value component of success when finishing the project, because the value cannot be seen yet during the completion. It should be considered how long it must wait until the true value can be assessed.

Nieto-Rodriguez (2021, 87) states that stakeholders must be involved so that they know what is expected after the project is completed. A benefit card is a useful tool also for the stakeholders to define what kind of benefits they are expecting from the project. Investors can be assured about the project's credibility when pointing out link between the project, its benefits, and strategy. A benefit plan is an essential part of the project, which should be created by the project manager and accepted by the steering committee. A benefit plan shows when the project brings value. Benefit management hardly includes in project management nowadays. Because the project's success is measured by achieved benefits, the steering committee should define which benefits have been achieved and evaluate if the project has been successful. During the project, the benefit plan should be tracked, and benefit milestones should be set. It is more important for the stakeholder to know when the benefits are achieved than when the deliverables are achieved. If

it is impossible to deliver the benefits or if the benefits are not important anymore, it means it is possibly better the project is canceled.

Nieto-Rodriguez (2021, 89) suggests that the so-called benefits triple constraint reflects the success of the project better than the iron constraint (the Iron Triangle). Three constraints in this model include value, risks, and sustainability. When all these constraints are well completed, the benefits are produced. Constraints of benefits triple constraint are introduced in the following table:

Table 4. Elements of benefits triple constraint (modified from Nieto-Rodriguez 2021, 89).

value: tangible and intangible value	Benefits
risks: higher the risk, higher the benefits, but also higher risk for the failure	
sustainability: one-time benefits or long-term benefits	

Rad et al (2005, 346) say that there should be a good metrics system, which is a tool to show sustained organizational benefit, which is achieved mainly because of good project management practices. Measuring the values should not only be in check-the-box style because such a simple report only satisfies the timely audits.

2.2.5 Critical success factors (CSF) and key performance indicators (KPI)

According to Kertzner (2017, 107), some companies define success in terms of CSFs and after that select the right metrics and key performance indicators (KPIs) to see if the CSFs are met. Typical success factors are for example: adherence to schedules, budget and quality, proper scoping, identifying the risks, understanding the expectations of customers, and agreement with project objectives. Critical success factors measure the result at the end.

KPIs are non-financial measures that are not expressed in any currencies. They are also measured often, for example weekly and they have a significant impact on CSFs. KPIs focus on certain activ-

ities, and they are understood by staff and what kind of corrective actions can be made. (Parmenter, 2015, 15.) When KPIs are targeted to projects, KPIs define what are the important points for the stakeholders to observe in the project (Kerzner 2017, 122). Typical metrics as KPIs are for example cost and schedule performance index, resource utilization, and percentage of turnover of key workers (Kerzner, 2017, 101).

Project Management Institute (2021, 95-96) divides KPIs into two categories, which are called leading indicators and lagging indicators. Leading indicators estimate the changes and trends in the project. If the change or trend is negative, the project group takes action to change the trend by evaluating the root cause of the leading indicator measurement. Leading indicators reduce the performance risk when identifying possible performance problems before they become unacceptable. Leading indicators can be quantified such as the size of the project, but they can also be challenging to quantify. For instance, the lack of a risk management process or uninterested stakeholders are examples of leading indicators when project performance can encounter risk.

Lagging indicators are used to measure project deliverables and therefore they indicate past performance. They are also easier to measure compared to leading indicators. Examples of lagging indicators are for instance the number of deliverables completed, the schedule, or a number of resources used. Leading and lagging indicators have a positive effect on the project performance, especially when identifying the areas for improvement. (Project Management Institute, 2021, 96.)

Wysocki (2019, 42) suggests that the skills and competencies of the project team are critical success factors in all projects. The project team learns from past projects and improves their skills, so past projects are good for learning and developing competencies. Also, Rad et al (2005, 94-95) agree that intellectual resources are critical success factors, because of the knowledge, experience, and behavior of the employees. Hmina & Hniche (2022, 300) suggest also that the competency of the project team as well as the effectiveness of consultation with stakeholders are critical success factors from the beginning to the end of the projects.

2.2.6 Quality in project management

Quality is a critical part of every project and managing quality involves all the parts of the projects (Snedaker, 2005, 260). Snedaker (2005, 284) says that it is the project manager's goal to deliver the best possible quality within the project constraints. It has also been assumed that it costs

more to produce good quality, but that is not necessarily true as it has been researched that producing quality saves money and time, especially after establishing the quality program. There is also positive ROI (return on investment) for quality programs that are well-established and managed.

It must also be remembered that quality has an impact on the organization's reputation. If the organization produces software or hardware of poor quality, the customer will be reluctant to make a new purchase from the organization or recommend it to anyone. If the project is implemented internally in the company with poor quality, the company must be ready to do repairs and maintenance afterward. Quality can be improved either by establishing a quality program or by building quality without the additional quality program. (Snedaker, 2005, 284-285.)

Project quality is seen as the philosophy when following the standards during the whole project's lifespan. Project quality and project excellence links success criteria with success factors. Project excellence means delivering sustainable outputs to the stakeholders on the entire project's life span, especially at the end of the project. (Basu, 2016, 9.) According to Basu (2016, 33-34), generally quality means "meeting the customer requirements", but it can also be seen as "consistent conformance to customer expectations". Snedaker (2005, 287) also says that quality indicates how well project's output meets the user's expectations when viewing functions and errors.

It is questionable if quality should even replace scope as one of the project constraints to reach customer satisfaction. It is not enough if the project is completed on time and within the budget if the project does not fulfill quality and does not meet customer expectations. (Tayntor, 2010, 191.)

According to Snedaker (2005, 288), quality management has four components as follows:

- User satisfaction
- Prevention vs. correction
- Continuous improvement
- Management commitment

As it was stated earlier, user satisfaction means how well the project deliverables meet the customer's requirements. If requirements are defined well, deliverables are equivalent to what has been agreed with the customer. Project results must meet the customer's real needs. It is important to build the quality already at the beginning of the project than to start correcting the

quality later during the project implementation, which can be time-consuming and increase the costs. (Snedaker, 2005, 288.)

Continuous improvement means that implementation is planned first, the project is done, results are checked, and possible actions are taken to improve the project planning processes. Successful projects include usually executive support when thinking of quality. Management and executives must make investments in projects to ensure good quality. Management should give enough resources, time, and money to be able to implement the project with good quality. (Snedaker, 2005, 289.)

During the project planning phase, it is important to determine what needs to be done to achieve quality results and which actions and measurements lead to the desired result. The project team can choose and decide the right metrics to measure that quality is produced. The quality management plan is one part of a project plan, and it indicates how quality will be planned, monitored, and tested. There are functional and technical specifications. Functional tells what the deliverable should do and technical tells how the deliverable will reach the functionality. After the quality is planned, it is important for the project manager to monitor the project so that the quality is produced. This is called quality assurance (QA). The quality checklist can be created, and it can be used during the whole project to ensure the quality is maintained. During the status reporting, it is important to understand the actual versus planned performance to be able to make possible corrections to ensure quality metrics are met. (Snedaker, 2005, 297-298, 303-304.)

Quality assurance can also be called defect prevention, which starts with good planning and identifying risks and how to mitigate them. Defect correction includes inspecting and testing the project's deliverables and therefore correcting errors that are defective. That is a classic way of doing quality control. The project team must consider each error or defect, learn from them, and use them as an opportunity to prevent future errors. Each error should be also evaluated, the root cause should be found, and it should be considered if the same error can happen somewhere else in the project. It is advisable to write down the error log, which offers important information to the project team and helps in the projects in future. (Tayntor, 2010, 192.)

Total quality management (TQM) refers to the good business practices that will lead to customer satisfaction because of deliverables with high quality. The quality plan must contain clear criteria for each project work package. Customers could use these criteria to evaluate and accept the product or service. (Rad & Levin, 2005, 24-25.)

It is important to minimize the costs of quality in the projects. Prevention of defects can cause costs related to quality and remedy of failures if the prevention of the defects is not successful. Prevention-related costs are for example training, inspections, modeling, and process improvement while defect-related costs are for example error analysis, rework, and testing. (Rad et al, 2005, 26.)

2.3 Measuring the project performance with project metrics

Project performance is assessed by measurement whereby metrics are used to evaluate the optical performance. Metric means the description of the project attribute and how to measure it. (Project Management Institute, 2021, 93.) Metrics are linked between planning, delivering, and measuring the work. Metrics designates the work performance if it is proceeding as expected or if the performance is progressing negatively or positively. Performance can also be not acceptable. When deciding the right metrics, it is good to keep in mind the phrase “only measure what matters”. Metrics that are linked to the product are meant to estimate the deliverables that are going to be developed. Metrics linked with schedule and budget performance are often designated by organizational standards and relate to the baseline or to the accepted budget and schedule to where the actual results are compared. (Project Management Institute, 2021, 66.)

Tayntor (2010, 196) states that developed metrics determine the project’s success and therefore it is essential that reliable measurements are used. Tayntor (2010, 199) also says that project managers should create a control plan at the same time when metrics are identified. The control plan lists metrics used in the project and shows variances, which are accepted. There should be an action plan telling what should be done if unacceptable variance is faced. Actions in the plan are ways to correct the problem. It is also important to remember to report the metrics to the project team and to stakeholders.

Snedaker (2005, 260-261) also suggests that if wrong things are measured, the project team will focus on wrong things as well and therefore the results will not be as planned. Pries & Quickley (2012) state that we do not know where we are and where we are going if metrics are not utilized. The project manager should enforce the use of metrics already at the beginning of the project. If the metrics end up being meaningless, it is time to give up on such metrics.

According to Project Management Institute (2021, 98), when deciding what to measure, it depends on what are the objectives of the project and the planned outcome of the project. It helps

to get the holistic picture of the project performance, the project itself, and the outcomes as well when there is the right set of metrics chosen.

The project manager's role is to identify the suitable metrics that need to be measured, managed, and reported to be able to complete the project successfully (Kertzner, 2017, 121). While meeting the customer, the project manager should agree with the client on what determines the project's success. The project manager also discusses with stakeholders and agrees on the project's success. There can be therefore many views for what a successful project is. The project manager together with stakeholders and the client agree on the metrics, which is used when assessing the success of the project. The project manager with PMO will create the dashboard, which will track the metrics. PMO will collect the project success metrics that are suitable also for the projects in the future and therefore PMO will produce templates that can be used to assess the project success and success metrics. (Kerzner, 2017, 30.) Metrics measure the quality of the processes to reach the end output and accomplish the CSFs (Kerzner, 2017, 108). Atkinson (1999, 339) states that when measuring the process criteria for project management is the same as measuring efficiency.

Kerzner says that project managers should create the metrics that cover the whole entity, such as the business value that will be produced, achieved benefits, productivity, quality of the output, and team performance. Code-related metrics can be used in IT projects. For proper performance evaluation, it is better to form a group of metrics instead of a single metric. (Kerzner, 2017, 87.) Metrics do not have value if they cannot be interpreted by stakeholders. It is important to understand who will benefit from the metrics. The importance level can vary depending on the stakeholder. It must also be understood that metrics need to be updated. It is advised to review the metrics occasionally because the metrics age and might not bring value or information anymore that is expected. Metrics should be selected after the project is approved. There should also be an owner in the organization for the metrics. The owner will maintain the metrics library. The owner is responsible for performing the improvement of metrics and their measurement techniques, supporting PMO in estimating the validity of each metric and acting as a mentor for individuals using the metrics. PMO can act as an assistant in selecting the right metric since project managers do not always have the right expertise to choose the correct metrics, KPIs, and CSFs. (Kerzner, 2017, 104-106, 109.)

While monitoring the progress, so-called review points can be established in certain milestones to make sure that deliverables meet intended specifications before moving to the next stage. For

example, quality metrics can be measured in these milestones to see the progress and if the objectives are reachable. Metrics used to measure in this point could be for example related to the defects of the deliverables. This data could help the project team to identify and resolve quality-related matters in time. It must be ensured that the quality of the deliverables meets the customer's expectations. (Rad et al, 2005,25.)

2.3.1 Metrics for project management

Well-established metrics system helps the project team to minimize the costs, shorten the duration, improve the quality, and maximize customer satisfaction. With the help of a well-defined metric system, there is a chance for learning in each project, which benefits the whole organization. If all the data is well documented, it is also a good source of data for projects in the future to avoid the same kind of mistakes. While establishing the metric system, it is possible to look for organizations that have already established successful metric systems and learn and adapt from there. When thinking of the metric system, it is also worth considering for example if an organization normally achieves the planned results and if objectives and client success criteria were reached. (Rad et al, 2005, 3-4.) According to Kertzner (2017, 99-100), metrics can be divided into four categories:

Table 5. Categories of the metrics (modified from Kertzner 2017, 99-100).

Category of metrics:	Example of metrics:
business-based / financial metrics	for example, return on investment (ROI), net present value (NPV), profitability, cost reduction
success-based metrics	for example, achieved benefits and value, achieved goals and milestones, stakeholder, and user satisfaction
project-based metrics	for example, time, cost, scope, amount of scope changes, quality, risk mitigation, customer satisfaction
project management process metrics	for example, benchmarking, continuing improvement, accuracy of the estimates and measurements

There can also be subcategories to the above-mentioned four types of metrics: quantitative metrics, practical metrics, directional metrics, actionable metrics, financial metrics, milestone metrics, and results. Each constraint must have selected metrics for measurement or else the constraint cannot be controlled. (Kertzner, 2017, 99-100.)

Project Management Institute (2021, 98) has divided metrics into following categories:

- deliverable metrics
- delivery
- baseline performance
- resources
- business value
- stakeholders
- forecasts

Deliverable metrics include for example information on errors or defects; the source of defects, number of defects identified and solved. It also includes metrics measuring performance related

to system operations, for instance, accuracy, size, reliability, and capacity. Technical performance measures also belong to this metric category. These metrics measure technical performance to ensure that system components meet the technical requirements and therefore help to achieve the planned technical solution. (Project Management Institute, 2021, 98.) The resultant system (product) could be also one criterion to measure the success of the project (Atkinson, 1999, 339). According to Atkinson (1999, 340), DeLone (1992) suggested six post-implementation systems criteria for measuring the success of a project. These systems measures are system quality, information quality, information use, users' satisfaction, individual impact, and organizational impact.

Metrics associated with delivery are typically used in adaptive project management approaches. Delivery measurements, for example, lead time, cycle time, work in progress, and queue size can be measured. Lead time indicates the amount of elapsed time from a story that is entering the backlog to the end of the delivery. When the lead time is low, the more effective the work done, and project team is efficient. Cycle time means how long time it takes for a project team to complete a task. Naturally shorter time means an effective project team. Work-in-progress metrics mean the number of items which are being worked on in certain time frame. This metric helps the team to keep the number of items in a manageable size. Queue size metric, which measures the number of items in the queue can be compared to work-in-progress metrics. (Project Management Institute, 2021, 99.)

Baseline performance is based on the most common baselines, which are cost and schedule. Start and finish dates are good examples of baseline performance metrics. Schedule metrics typically measure the actual performance compared to planned performance. Actual effort and duration can be measured when compared to the planned effort and duration. The result indicates if the amount of work and time that the work takes are valid. Cost metrics include for example actual cost compared to planned cost. This metric measures the actual cost of the resources to the planned or estimated cost. (Project Management Institute, 2021, 100.) Regarding the WBS, Rad et al (2005, 17) suggests that there can be a metric also for WBS to evaluate the effectiveness of the WBS. Also, there can be metrics, which can measure the effectiveness of developing the WBS chart further.

As Kerzner (2017,99-100) also pointed out NPV and ROI measurements are business value measurements. Project Management Institute (2021, 102) suggests in addition to those measurements that the cost-benefit ratio is one of the metrics used to evaluate the business value. Cost-benefit ratio metrics measure the initial cost to the expected present value of an investment. It is used to indicate if the costs of a project are greater than the benefits. If costs are greater than the

benefits, it is not worth continuing the project. Planned benefits delivery compared to actual benefits delivery is one of the business value metrics. Value can be seen as a benefit that will be delivered after completing the project. Benefits delivered during the life cycle of the project, measuring the benefits delivered and the value of the benefits, can be compared to the business case and therefore it can be concluded if the project is worth continuing or canceling. (Project Management Institute, 2021, 102.)

Resource measurements are linked to cost measurements because resource variances usually lead to cost variances. Planned resource utilization compared to actual resource utilization compares the actual usage of resources and planned usage of resources whereby planned usage can be subtracted by actual usage. Planned resource cost compared to actual resource cost compares the actual cost of resources to the planned cost. When subtracting the estimated cost from the actual cost, the price variance can be calculated. (Project Management Institute, 2021, 101.)

According to Project Management Institute (2021, 103-104), surveys can be used to evaluate the stakeholder's satisfaction. Mitchell (2022) categorizes improved customer satisfaction into business impact metrics. Also, Atkinson (1999, 339) suggests that benefits to the project's stakeholders (such as users, customers, and the project staff) could be measured to measure the success of the project. (Project Management Institute (2021, 103-104) states that net promoter score (NPS) and mood chart are metrics used to measure the stakeholder's satisfaction. NPS measures if the stakeholder is willing to recommend a product or service to others but also measures customer loyalty. Mood charts can be used to track the project team's reactions and therefore the potential issues and improvements can be identified in time. A mood chart can be done at the end of the day or week by choosing the right kind of emoji for example. The morale of the project team can be measured with the survey whereby the team evaluates their agreements with a scale of 1-5, for example, "I feel my work contributes to the overall outcomes".

There are different kinds of quantitative methods, that can be used when forecasting the future. Quantitative forecasts include for example estimate to complete (ETC), estimate at completion (EAC), variance at completion (VAC), and to-complete performance index (TCPI). These quantitative forecasts use past information to evaluate what possibly happens in the future. Forecasts can also be qualitative, whereby experts are forecasting the future. (Project Management Institute, 2021, 104.)

Rad et al (2005, 289) suggest the usage of capability metrics, which means that the project manager can evaluate if the project performance meets the customer requirements or not and if the

project result fills the needs of the business. The performance variances should be within a certain range, which is seen as business success. Results show the area of improvement. Capability metrics are effective in measuring the performance to be able to gain the planned success factors.

Rad et al (2005, 288) suggest that compliance metrics mean that there are existing project management standards of knowledge and practices as well. The project team should follow these practices. Compliance metrics evaluate the project team's loyalty to those practices and the appropriateness of those practices. These metrics also assess the project management tools. (Rad et al, 2005, 288.)

PMO functions can also be evaluated by metrics, such as the success of projects, staff competency, employee morale, and the maturity of the whole organization. PMO metrics also measure the performance both in project-specific groups and enterprise-oriented groups. These metrics evaluate the effectiveness of PMO in organizational functions, but also the contributions PMO produces to the profit and loss in the organization. The effectiveness of PMO can also be measured for example by net profit and shareholder value. PMO metrics are so-called project metrics. It can be said that if projects are successful, then PMO is successful as well. (Rad et al, 2005, 291.)

Rad et al (2005, 94-95) suggest people metrics, which are targeted to evaluate if the project team members are implementing their tasks well. People metrics can also include measurements of conflict management, collaboration, teamwork, competency, and communication. People metrics can be seen as a measurement of the kindness of the organization towards the project team and kindness amongst the project team.

It is essential to conduct a survey to the customers to be able to achieve an understanding of customer satisfaction. Customers could complete the survey at the end of the project. The survey could measure the project performance with all the requirements, the success of the project team in meeting the requirements, and customer satisfaction with the deliverables. (Rad et al, 2005, 26.)

There can be a metric also for the organization and with such a metric it can be measured how much effort the organization is placing for project management improvements. Metrics can indicate whether the efforts for improvements are increasing, decreasing, or staying on the same level. (Rad et al, 2005, 279.) There can be also improvement metrics, which means how the project management can help the organization to move to a higher level regarding the profit. These kinds of metrics can be for example about the importance of tools and techniques that affect the profitability of the whole organization. Project management also can evaluate if introduced

changes in project management are effective or not. To be able to suggest improvement, the project team must understand the strategy and business goals of the organization and the risks and priorities related to them (Rad, 2005, 289.)

According to Atkinson (1999, 337-342), Shenhar (1997) compiled the results from 127 projects and decided the criteria for project success. Most of these criteria were in the post-delivery phase, including metrics such as business success, measurable one to two years after the project is finished. Preparing for the future is also one metric, which is measurable after four to five years. Shenhar (1997) suggested project managers should look for long-term benefits. Impact on the customer is measurable within a couple of weeks after the implementation.

2.3.2 Selecting the metrics

Part of the project work is to establish the metrics with the project team and stakeholders. After establishing the metrics, then to gather and analyze the data, make decisions, and report project status. (Project Management Institute, 2021, 115.) Rad et al (2005, 95) also suggest that project people should be involved when planning the valuable metrics if tools are intended to be successful. All the team members should understand the aims of the project metrics and how the metrics also affect the objectives of the organization. The project team should be also able to tell their own recommendation if a certain metric should be stopped or some other metric should be started. Atkinson (1999, 340) suggests that the success criteria customers and users consider important should be included when assessing the project. Snedaker (2005, 296) states that defining the metrics during the planning phase is essential because metrics can be used in quality monitoring and quality testing. Metrics in IT projects could be for example how much downtime is accepted or how much uptime is required. The metrics can be reviewed later when project details are developed.

It is important to select a suitable number of metrics as too few metrics do not provide enough essential information and decision-making can be challenging. When selecting the metrics, it is essential to choose the metrics that are needed. Selected metrics should be informative and worth collecting. During the project implementation, the metrics should be evaluated occasionally to make sure the metrics that are used are correct. (Kerzner, 2017, 102-103.) It is important to agree and understand the chosen metrics together with the customer to confirm that targets are met at the end of the project (Pries & al, 2012, 20).

It takes time and effort to measure, so it is essential to use time wisely and measure only what is relevant and what matters. Effective metrics are measurements, which are specific, meaningful, achievable, relevant, and timely. Timely means that information is up-to-date and not too old. Measurements should be linked to the business case, baselines, or requirements. It is effective to measure something that is linked to meeting objectives or to improve performance. (Project Management Institute, 2021, 97.) According to Kendrick (2005), the focus must be on process improvement, not on punishment. It is advisable to select a few metrics, which are objective, easy to understand, and collect, and which are important. The measurement process must be clear, and metrics must be accepted by the stakeholders. For each metric, units, and precision, frequency, and related measures must be defined. Also, it must be decided, how the metrics will be used.

Metrics bring value when they are understood by stakeholders and experts and therefore possibly the corrective plan is created (Kerzner, 2017, 104). According to Project Management Institute (2021, 114), the aim in measuring and displaying the data is to learn and improve. It is worth measuring something that improves project performance, prevents project performance from deteriorating, helps avoid problems, helps make decisions, and allows the project team to learn. Right measurements contribute to creating business value and achieving project outputs. Rad (2005, 346) agrees that metrics are not one-time exercises, rather they are continuing initiatives for being more effective and productive.

Metrics systems should be a tool for organizations to evaluate performance and to identify ways to improve business performance continuously. Traditional business metrics do not include the requirements of projects, it is only a few metrics that indicate transforming the business requirements into project objectives. Some of the organizations have implemented tools to estimate what has succeeded well in the project and what has failed. (Rad et al, 2005, 280.)

When planning the metrics program, it is essential to identify the project management system, select and define suitable metrics, and integrate these metrics into daily project management processes. The project management metrics program must be implemented in such a way that it supports organizational improvement and project management excellence. After the well-planned metrics system, the project team will recognize the long-term benefits of the metrics. Communication is extremely important when implementing the metrics system program. It is important to get the acceptance for the metric system and for the cultural change from the organization's participants. Workshops and briefings can be arranged to make employees aware of the purpose of the metrics system. (Rad et al, 2005, 346-347.)

2.3.3 Challenges in measurements

It is good to be aware of the pitfalls linked to the metrics and to select the right metrics for the right purpose. Measuring something can affect the project team's behavior. For example, if the team's output of deliverables is measured, it might encourage the team to place focus on producing a large number of deliverables despite customer satisfaction. This is called the Hawthorne effect. There can also be vanity metrics, which do not produce useful information for making decisions. It is not worth measuring something that is not achievable, because the project team's morale falls when they see it is almost impossible to meet the goals. The focus should also be on metrics that matter and not on metrics that produce less important information. It is also important not to confuse the correlation of two variables when interpreting the measured data. For example, if the project is behind the schedule and over the budget, it might be understood that projects behind the schedule exceed the budget. It is not true, instead, there are possibly other correlating factors that are not considered, for instance not managing risks properly, not managing changes actively and challenges with skills in estimating. (Project Management Institute, 2021, 112.)

Kendrick (2005) also presents measurement failure modes. Metrics fail if it cannot explain what is happening and if it is not motivating. Metrics should be utilized and not only used as report cards. Measurement also fails, when measurement goals are achieved, but overall goals are not achieved. Metrics should relate to business objectives and key decisions, or else metrics fail. Rad et al (2005, 346) also suggest that it is not worth measuring certain metrics only to fulfill the organizational requirements. If the metric system is not implemented well in the organization, it might be that no kind of data is being collected. Data might be also collected, but only part of it will be used in the measurement. Lastly, plenty of non-valuable data is collected.

It is challenging to measure the people's capacity for knowledge, skills, and abilities which they gain through education and expertise. Organizations cannot either capitalize on the benefits of improved knowledge or training costs. Competent people as a benefit to the organization do not appear in financial reports. Therefore, if there is no suitable method to measure human resources, there is a risk that resources are not allocated well in the organization. (Rad et al, 2005, 95.)

Even if the metrics system is aligned with the organization's strategy, performance reporting is accomplished in different units. For example, the quality department might measure the quality

at a certain time, the finance department might report their number at a certain time, and the operations side might report delivery metrics every day. (Rad et al, 2005, 280.)

2.3.4 Presenting the measurement information

While measuring is important, it is also important what is done with the measurements. It is advisable to present the information with visual displays, for example in dashboards. Dashboards can collect the data electronically and create charts. Dashboards often display information as stoplight charts, also known as RAG (red, amber, green) charts, pie charts, or bar charts. Information can be displayed also in information radiators, which are also called big visible charts (BVC), whereby information is shared for example with the whole organization. Information should be updated frequently. Task boards show the status of the tasks while burn charts show the number of work done compared to the number of works, that should be done. (Project Management Institute, 2021, 106, 108-109.)

2.4 Artificial intelligence in project management

As it was stated earlier, only 35 % of the projects are completed successfully today. One reason for the low rate is that technologies are not yet utilized well for project management. Gartner's research states though that 80 % of project management tasks will be accomplished by AI (big data, machine learning, and natural language processing) by the year 2030. It can be said that the project management field will undergo major shifts by that time. Technology will help to improve project selection and how to prioritize projects. It will also help to monitor the progress of the projects and speed up reporting and facilitate testing. Project managers can focus more on coaching and stakeholder management instead of administration and manual tasks. Project managers will be aided by virtual project assistants. (Nieto-Rodrigues & Viana Vargas, 2023).

Also, Chiancone (2023) states that AI will provide important tools for project managers to improve efficiency and productivity, decision-making, and gain better project success in the future. AI will produce accurate and relevant information and it can identify patterns and trends. AI will have a major role in project management by automating repetitive tasks and analyzing large amounts of data with algorithms and machine learning. Also, intelligent virtual assistants and robotic process

automation will be included in AI technologies. AI will help in identifying and optimizing resource allocation. It can also identify potential risks and predict their impact on the project.

The development of AI is progressing slowly due to the lack of investment from private companies. Progress has only been developed in the universities and in the public research organizations. It is likely that in 25 years' time, there will be an AI existing, which is capable of managing the entire project with some form of human supervision. The project managers will still have a crucial role, even when the AI is fully developed. The project manager will work as part of a team together with the AI to interpret the data and do the decision-making. (Gil Ruiz, Martinez Torres & Gonzalez Crespo, 2020, 61).

The Association of Project Professionals Finland (2024) did a survey to project professionals in the Spring of 2024. More than half of the respondents have said that they have a positive attitude towards AI in project management in their organizations. Of those, who have utilized AI in their work tasks, 80 % experienced AI as a benefit. 90 % use AI only occasionally in their work tasks. So far, 90 % have not received any training for using AI in their organizations. The survey also revealed that the majority of the organizations have only considered utilizing AI so far in the future, and only a very small part is already planning AI for the future.

2.5 Summary of the literature review

This chapter introduced the definition of projects and project management methods as well as future insights into the tasks completed on a project basis. It can be concluded that the number of projects is increasing in the future. Therefore, it is essential to pay attention to the successful project management practices. Different project management framework was introduced, and among these frameworks, Square Route was utilized in the development task of this thesis. The benefits and value of the projects were discussed, and the conclusion was that the benefits are crucial when considering the output of the project. It is obvious that if the project does not produce benefits and value, it is advisable to stop the implementation of the project. Benefits should be emphasized more during the implementation of the project. Elements affecting the successful implementation of the project were reviewed and it created a good basis for the practical research work. Themes for the semi-structured interviews were created according to the literature. These themes were quality, metrics, and success.

Metrics for project management were introduced as well, and examples of the metrics were explained. This is an essential part of this research because the purpose was to find suitable metrics to measure the successful project. Selecting the right metrics is introduced and it is vital information regarding this work as it is essential to identify, which metrics are worth using. It is also important to understand how to present the measurement information. A development plan for metrics was created based on the literature review and interview data. Artificial intelligence was discussed briefly in this chapter. Artificial intelligence is an opportunity for the future, and it needs deeper research on how to utilize it in the organization.

3 Government ICT Centre Valtori

Government ICT Centre Valtori (later Valtori) is an organization, which provides sector-independent ICT services for the central government. Valtori maintains, develops, and protects the largest ICT environment in Finland. Valtori also provides information and data communications technology services as well as integration services, which meet the requirements of high preparedness and security. Valtori's services are a combination of its own service production and commercial services provided by trusted partners. Valtori acts as an integrator. Valtori's employees and partners play an important role in service integration. (Valtori 2024.)

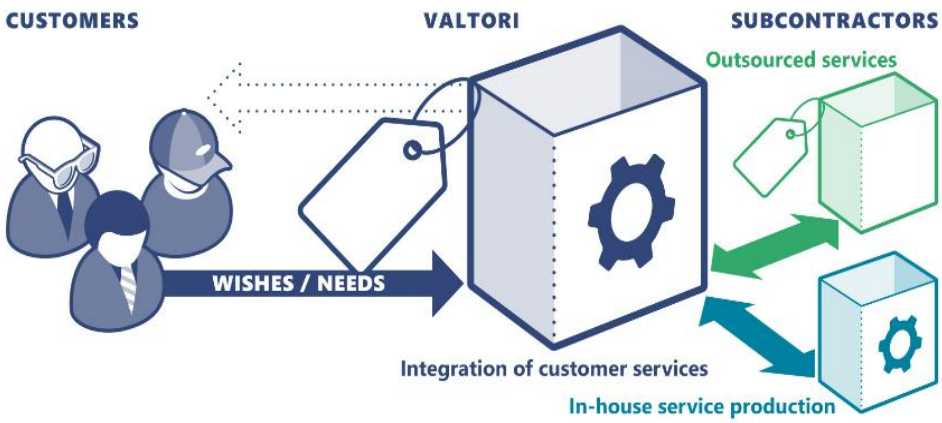

Figure 3. Valtori's operating model for integration (Valtori 2023).

Valtori has a large number of customers, for example, all the government agencies and institutions belong to Valtori's wide customer base. Also, government-owned corporations, other public authorities, bodies governed by public law, and the parliament are part of Valtori's customers. There are also customers, such as funds that are not within the scope of the government budget and companies or organizations, which have public administration or service responsibilities. (Valtori 2024.)

The objective of Valtori is to provide high-quality and reliable IT services to the customers and therefore customers can offer their services to citizens and companies. The aim is also to achieve savings via harmonized services and processes. There are around 1500 employees in Valtori, and offices are located in many parts of Finland. (Valtori 2024.)

3.1 Measuring the project success in Valtori

Currently, Valtori is measuring the delivery time as one of the metrics to measure successful projects. The planned schedule of the project is compared to the actual schedule of the project. As was mentioned in the literature review, this is one of the baseline performance metrics. Project managers report if their projects are proceeding according to schedule or not by filling in the correct data to the project management tool monthly. Portfolio owners combine this data provided by project managers and compare the planned finish date to the actual finish date. It is acceptable if the schedule has exceeded by 5 %. Every completed project is measured. Results of the measurement are reported to the Ministry of Finance monthly. Data has been collected since 2022 internally and there is variance in the accuracy of projects' delivery time. Each project's delay must be justified as to why the project was not completed on the agreed finish date. Yearly the data is compiled, and it is calculated how many percentages of the projects are completed in agreed delivery time. (Valtori, 2024.)

Changes in schedule, budget, and scope must be reported in the project management tool called Valtikka. Delays in projects are caused by either the customer, organization, or suppliers. If the delays are due to an organization, there is a need for improvement naturally. Sometimes the delay happens because the customer wants to broaden the scope, or a force majeure situation has happened. In that case, the delay is well justified, and it is acceptable. (Valtori, 2023.)

It should be considered how big changes of scope are allowed on the customer's side because this naturally has an impact on the delivery time. Project managers must also know what is expected from them because reporting deadlines are important. It is also worth considering what is being measured with the metrics; for example, is project management performance measured or the agreed deliverables measured. (Valtori, 2023.)

Another metric in Valtori is to compare the planned budget to actual costs. The success of the project regarding the budget is measured by comparing the budget in the P2 decision point to the actual costs in the P4 decision point. Every completed project is measured. Valtori is using a project management model developed by Project Institute Finland (currently Kumura Ltd). In this model, P2 means the point when the decision is made to start implementing the project. While P4 means the point when the decision is made to finish the project. (Valtori, 2024.) Portfolio managers compile the budgets of the projects in P2 point to the project management tool so that in case of changes, the data of the original budget is known. Portfolio managers compare the data

of planned costs to actual costs monthly. The costs of the projects are reported by project managers monthly. (Valtori, 2024.)

Valtori is also reviewing customer satisfaction with questionnaires and interviews. These are completed in each project. The results of the questionnaires and interviews are compiled on the portfolio level as well as in the whole organization. The questionnaire is also directed to the project group whereby opinions of the project group can be perceived about the project's success. The project owner is also interviewed on the phone about the project's success. It is worth considering if the questions are relevant, if they are producing the right information, and if there is a need to update the questions. It is also important that the right people are answering the questions. (Valtori, 2023.)

4 Research methodology

The research approach and research strategy used in this thesis are described and justified as well as data collection and analysis methods regarding this research. The aim of this thesis was to identify the essential metrics to measure the successful project and therefore research methodology is designed for that research problem.

Research methodology denotes a way how the research problems are solved. The researcher must know if the research technique or method is relevant and what would they designate and why. Researcher should also understand which certain techniques will be appropriate to certain problems and why some other techniques are not suitable. The researcher needs to know how to apply these techniques in research. Therefore, the researcher designs the methodology for the problem because it can vary from problem to problem. Research methodology does not only consist of the research methods, but it also includes the logic behind the methods and clarifies why a certain method is being used and not the other method. Research results should be able to be evaluated by the researcher himself or by others. (Kothari, 2004, 8.)

Research methods are techniques that take on a specific meaning according to the methodology in which they are being used. Selecting the research method is important because the chosen method impacts the research question, analysis, and results of the research. (Silverman, 2001, 11.)

4.1 Research approach

Research can be conducted either by qualitative or quantitative research. Research approach is chosen according to the research subject, but also both qualitative and quantitative research approaches can be used in research. In quantitative research, measuring the research subject is being used and therefore it is needed to know enough about the subject to know what to measure. If there is not enough information about the subject, qualitative research can also be used to define the subject of quantitative research. (Kananen, 2014, 12-15.)

There are many differences between these two research methodologies. Qualitative research is more about words and visual data, while quantitative research is more about numbers. The main

research methods linked to qualitative methods are participant observation, collecting and analyzing the texts, documents, photographs, or video recordings. Qualitative interviewing and group interviewing are also research methods in qualitative research. (Bell, Bryman & Harley, 2022, 363.) According to Seale, Gobo, Gubrium, and Silverman (2004, 206), participant observation is a research method, which is used to cover a mixture of observation and interviewing.

According to Vilkka (2007, 50-51), numerical dependencies cannot evaluate the functioning of individuals, and therefore numerical dependencies cannot be used in qualitative research. Qualitative research is subjective. It means that the researcher's own values and perceptions impact the conclusions and interpretations of the research. Valli & Aaltola (2015, 74) suggest that personal learning includes to the process of qualitative research and therefore researcher understands the research process better. It might not always be clear, how to do the qualitative process, but decisions related to data collection or even research progress will become more accurate during the process.

A qualitative research approach was used in this research with semi-structured interviews as data collection methods. The quantitative method is not suitable for this research, because numerical dependencies are not measured.

4.2 Research strategy

This thesis is a case study. According to Coombs (2022), a case study generates an in-depth understanding of a contemporary issue or phenomenon. A case study can involve data from many sources: interviews, observations, or documents. The goal of the case study is to gain an understanding of detail about the case subject and generate new insights. The case study is useful, when "how", "what" and "why" questions are involved in the researcher's interest. Case studies are divided into three categories: (single) instrumental case study, collective (multiple) case study, and intrinsic case study. In a single case study, the researcher focuses on an issue and selects one bounded case to illustrate the issue, such as one person from a specific group. In multiple case study, researcher chooses multiple cases to illustrate one issue. The goal of multiple case study is to compare cases to identify common patterns. An intrinsic case study is usually used, when the studied case is unique or rare and when the researcher wants to gain a deeper understanding of a specific issue.

It is stated that a case study is a general term for the exploration of an individual, group, or phenomenon. A case study is a comprehensive description of a certain individual case or matter and its analysis. (Starman, 2013,31.)

A case study is chosen as a research strategy in this thesis because the researcher wants to gain a deeper understanding of the project implementation regarding the quality, what has been measured, what could have been measured and what is a successful project. Because understanding intended to be gained from specific and unique issues, an intrinsic case study was used.

4.3 Research methods

Data collection methods in qualitative research can be divided into primary and secondary data. Primary data means all the data that is collected during the observations, interviews, and questionnaires and is associated with the studied phenomenon. Secondary data consists of the existing documents, which are linked to the subject matter. This kind of data is for example documents that exist already. (Kananen, 2017, 44.)

Starman (2013) suggests the retrospective case study method, which means that the research involves the collection of data relating to a past phenomenon of any kind. The researcher is looking back on a phenomenon in its historical integrity.

Interviews are the best method of data collection when the researcher's interest is to explore the interviewee's point of interest, clarify and confirm meanings from the gestures, and observe (Saunders & Lewis & Thornhill, 2019, 434). Saunders et al (2019, 437) suggest that a semi-structured interviews can be conducted with a predetermined list of themes and some key questions related to the themes. Those themes and questions guide to conducting the interview. In this research, semi-structured qualitative interview was chosen as a research methods, because it is possible to add more questions and clarify the replies from the interviewees. A semi-structured interview is a discussion, and it is likely that more data is collected through this method in this research compared to the questionnaire for example.

The theoretical framework of this thesis consists of literature: books and articles, websites, and theses. The data collection method used in the empirical part was semi-structured interviews.

4.4 Validity and reliability

The research will unavoidably adopt the views of the researcher as the researcher is the one filtering and interpreting the collected information (Yin, 2011, 11). The reliability of this research is ensured by using the same semi-structured questions for every interview.

The validity of the thesis is ensured by planning the themes carefully in such a way that they reflect the theory and research objectives. All the interviewees have years of experience working in the organization, so they have knowledge of the matters related to the research.

5 Data collection

The procedure of semi-structured interviews is introduced as a data collection method. Collected data was analyzed by abductive thematic analysis method after the interviews. The process of analysis is introduced.

5.1 Semi-structured interviews

Semi-structured interviews were conducted for project managers in TORI services in the organization. TORI services provide services used in the central government's shared network. Interviews were conducted to gain more understanding of the usage of metrics and to assess how quality and success are considered in projects. The interviews were held in April 2024. Interviewees were selected randomly amongst the project managers in the target organization Valtori. A number of six interviewees were considered sufficient for this research.

The main topics of the interviews were divided into three themes based on the literature review and the aim of the research. The following themes were used:

- quality
- metrics
- success

The interview questions were collected under these above-mentioned themes. Questions of the interviews are presented in Appendix 3. The aim was to leave some space for conversation in between the questions. It was also taken into consideration that questions are rather open so that interviewees could share their thoughts and comments freely. It must be noted that some respondents might answer to the questions with short replies, and some might share more of their opinions about the topic. Even though the interview is structured into themes and questions under the themes, it is possible to ask more specific questions further about the topic in case the interviewee answers very shortly.

Before the interviews, respondents were informed about the interviews concerning the research. It was also informed that the interviews will be recorded and transcribed. Due to the privacy of the respondents, only the length of the project management experience was collected. Other personal data, for instance, age or gender, was not collected for this research. All interviews were

conducted remotely by using Teams because the respondents work in different parts of the country, and due to that, it would have been challenging to do face-to-face interviews. The duration of the interviews was intended to be an hour at most.

As it was stated, interviews were recorded, but also transcribed into written form. Therefore, the interviews are more accurate compared to the written notes during the interviews. All the interviews were conducted in Finnish because Finnish is the working language in the organization.

5.2 Analysis method for semi-structured interviews

The aim of the analysis is to identify similarities and differences and compare the findings with literature and previous studies. Collected data was analyzed by using the thematic analysis method. Thematic analysis is considered to solely be qualitative compared to content analysis for example. Thematic analysis is a flexible method for qualitative analysis, and it can be applied to many research designs. (Humble & Mozelius, 2022, 5). According to Maguire & Delahunt (2017), important and interesting patterns and themes are identified within qualitative data in thematic analysis. The first step in any qualitative analysis, including thematic analysis is to become familiar with the data. In this research, the data includes semi-structured interviews. It is important to take notes at this stage.

The second step in the thematic analysis is to generate initial codes and organize the data in a meaningful and systematic way. Coding reduces big amounts of data into small bunches of meaning. The third step is to search for themes, which are patterns that apprehend something significant about the data. At the end of the third step, codes have been organized into broader themes that reflect something specific about the research question. The fourth step includes reviewing the themes. In this step earlier defined themes are modified, developed, and reviewed if they really make sense. The fifth step is to define themes and the aim of this step is to identify the essence of what each theme is about. The sixth step includes writing up the results. (Maguire & Delahunt, 2017).

As was mentioned codes are created in the second step. According to Espedal, Jelstad Løvaas, Sirris, and Wæraas (2022, 156-157) codes can be either semantic or latent. Semantic codes are descriptive, and they describe the explicit meanings of data. On the contrary, latent codes are codes that the researcher develops to identify what goes on beyond the data by identifying the

underlying ideas, assumptions, and ideologies, which have produced the patterns in data. Semantic codes show patterns in semantic content and publish the meaning of what is expressed, latent codes seek to determine what has produced those meanings.

Thematic analysis can be done in either deductive (top-down) or inductive (bottom-up) ways. While doing the inductive analysis, the data is coded without fitting the themes into a pre-existing coding frame or preconceptions of the researcher about the research. Themes are emerging from the data and the themes are linked to the data instead of the theoretical interest of the researcher in the topic. The deductive approach is researcher-driven and allows the researcher to analyze the data in relation to their theoretical interest in the issues, which are being investigated. A deductive approach is used by a researcher who begins the analysis with the themes that are identified through a literature review. (Dawadi, 2020, 63)

According to Dawadi (2020, 63), it is also possible to utilize both deductive and inductive approaches. A deductive approach can be used at first and it allows for analyzing the data in relation to the themes that have emerged from the review of the literature done for the study or research questions created for the study. On the other hand, all the interesting and relevant information (themes) that emerge from the data can also be considered. Also, the very unexpected themes can be taken into consideration for a better understanding of the phenomenon. That is why a big number of inductive codes can emerge while analyzing the data.

Thompson (2022), states that according to Coffey and Atkinson (1996) and Tavory & Timmermanns (2014), abductive data analysis is between inductive and deductive analysis, and it conducts parallel and equal engagement between empirical data and theoretical understanding. According to Thompson, Hurley et al. (2021) stated that abductive research does not aim to look for the singular objective truth. Thompson (2022) states that according to Coffey and Atkinson (1996) Hurley et al (2021), Peirce (1974), and Reichertz (2013) suggest that the objective of abductive research is to find the most logical solution and useful explanations of the phenomena. According to Thompson (2022), writers such as Reichertz (2013), Schwartz-Shea & Yanow (2013) states that a researcher is examining breakdowns when the empirical data differs from the theoretical background. Thompson (2022) states that according to Atkinson et al (2003) and Kelle (1997), the explanation and the clustering of themes should be guided, but not determined by existing theoretical background. Thompson (2022) stated that according to Coffey & Atkinson (1996), thematic analysis with abductive research design is a powerful tool for gathering deep understanding from the narratives of participants while ensuring that the finding has theoretical generalizability.

Crosley (2021) says there are three types of thematic analysis: reflexive, codebook, and coding reliability thematic analysis. Reflexive analysis takes an inductive approach, and it is flexible, and it allows the researcher to change, remove, and add codes while working through the data. Reflexive thematic analysis emphasizes the active engagement of the researcher in carefully reflecting on their assumptions, biases, and interpretations and how these affect the analysis. Codebook thematic analysis takes a deductive approach and contains defined, predetermined codes. These codes are typically taken from existing theoretical theories, empirical studies, and earlier knowledge of the situation. Coding reliability thematic analysis is meant for multiple coders.

The abductive approach was used in this research because the identification of the themes was guided already by the literature review. Also, new information emerged from the data, and this information was taken into consideration as an inductive approach to create new sub-themes / codes. Both semantic and latent codes were identified when going through the interview data and the codes were written down to the Word document. Semantic codes, for example, 'programs' in this analysis, describe the exact meaning of data. Latent codes are identified beyond the data, for example, 'frustration' belongs to latent codes in this analysis.

The reflexive thematic analysis method was used, which means codes can be modified when working through the data, in this research meaning the latent codes. Also, codebook thematic analysis was used, because the data contains predetermined codes from the literature and these codes got assurance from the data. These kinds of predetermined codes are for example 'objectives' and 'needs'. The researcher got familiar with the interview data, and analyzed, and interpreted the data several times. After all the codes were identified, themes were reviewed. An analysis is introduced in Appendix 1 whereby themes, sub-themes / codes, and descriptions are introduced. Codes are also introduced in the next chapter divided under each theme.

6 Results of the interviews

Six project managers were interviewed in this research from the organization's TORI services in April 2024. Project managers are referenced as PM1-PM6 in this chapter. Work experience amongst the interviewees as a project manager in this organization varied between 1,5 to 9 years. Most of the respondents had experience in working as a project manager earlier in some other organization or company. The interviews were divided into three main themes, which are quality, metrics, and success. The analyzed data from the interviews is explained in the following sub-chapters according to the analyzed themes.

6.1 Quality

When analyzing the data about the quality theme, following codes emerged from the data:

Table 6. Codes emerging from the theme quality.

Objectives	Needs	Benefits	Programs / Tools	Schedules
Challenge with resources	Definition of quality	Templates	Communication plan	Frustration

According to respondents, objectives are important in the projects, when observing the project's quality. Aims must be well understood. Projects are considered as fulfilling high quality if the objectives have been reached. It was obvious that a separate quality plan is not created by the respondents, but mostly the questions about quality are answered solely in the project plan template, which is offered by the organization. A more accurate quality plan was suggested as development.

Most of the respondents create analyses about stakeholders. Some just identify them, and some make a list of the stakeholders in the communication plan. It was seen as important to view the aims of the project together with the stakeholders and to listen to their needs. It was seen as important to view the quality requirements and benefits throughout the project to meet the quality after the project is completed. Benefits are not reviewed after the project every time though.

It is also important to remember the scope throughout the project. The benefits of the completed projects should be reviewed when considering the new similar kind of project. PM3 said, “it would be good to monitor the project benefits in the long term, because benefits do not show necessarily immediately after completing the project”.

Project management system Valtikka was not seen as a fluent tool for planning the tasks of the project. Valtikka was considered laborious and hard to use. Mainly the main tasks of the projects are listed to Valtikka by project managers. Excel was seen as a functional and more fluent program, whereby tasks, schedules, responsibilities, and status of the tasks can be listed. All the members of the project group do not have access to Valtikka, and it was seen as problematic because the whole project group cannot view the task lists and any information related to tasks in Valtikka. Excel, PowerPoint, and other shared documents were seen as better programs or systems to maintain task plans so that all the project group members can view the tasks and related documents. It takes more effort to maintain the task plans both in Valtikka and in other locations as well.

Resource planning was the most challenging and difficult task when also considering the quality of the projects. PM2 said, “Resource planning is difficult, because the need for resources is difficult to estimate, and some resources do not have any extra time”. Resources are requested for the projects according to the certain procedure in Valtikka. Mostly it was felt that the resources are difficult to obtain. Sometimes it is easier to ask the resources directly from the right people because resources are not always obtained through Valtikka. PM5 said, “I can request resources directly from the specialist or from the manager if I know who the right specialist is”. PM6 also said, “You have to know the resources”. There was the experience of not getting the resources through Valtikka and therefore project manager had to do the tasks of the specialists or project owner. PM4 said, “Quality of the project deteriorates when the project manager must do the job meant for specialists”. Therefore, the project manager is using more time on the project compared to what has been planned. Minority felt that the resources were well available, but it also depended on the project. PM4 suggested, “There should be quality related questions after the project whether the project manager obtained needed resources for the project”. Resources emerged as the biggest concern regarding the quality of the project. It was stated by PM6 that “project management is broken”.

Mostly it was seen that the specialists do not have enough time for the project work. It can be also the reason for exceeding the schedule in the project because specialists are not available necessarily at the right time, especially when the project plan is done for the long-term. Some

specialists are resources for many projects and therefore they lack time. It was also seen as challenging to receive realistic time frames from the specialists on how much time is needed to complete the given tasks. PM3 says, “Specialists prioritize their tasks and therefore projects are not necessarily the most important priority for them”. Because Valtikka is not seen as a fluent system to obtain resources, in some urgent cases the specialists have asked the assistance from other specialists to obtain the solution to the problem fast in the project.

Most of the respondents had an opinion that the budget and schedule are good metrics for monitoring the quality of the projects. These metrics are in use in the organization. Some suggested though that schedule and budget do not measure quality. PM4 stated, “It is not monitored how quality was obtained”. The customer satisfaction questionnaire was seen as a good method for measuring quality, but concern emerged about the relevance of the results depending on the customer’s feeling on the day of the estimation of the project. PM2 stated, “Customer satisfaction is a very subjective experience”. It was also questioned what is considered as quality in the project because projects are different and unique. Most had an opinion that quality should be monitored more strictly. PM5 said, “Work should be more meaningful if there was metrics in use”. It was also suggested that after the project there should be a post-evaluation phase whereby it is reviewed what was done well in the project, what could be developed, and what was learned from the project. Also, the feedback of the project for solely the organizational use was suggested. There emerged also suggestion of monitoring the reasons why the project got delayed and did not stay on schedule. Reasons might be for example that specialists did not have time to complete the tasks in time.

6.2 Metrics

Codes from the metrics were identified from the data and following codes emerged from the data:

Table 7. Codes emerging from the theme metrics.

qualitative metrics	quantitative metrics	surveys	benefits	post-evaluation	objectives
uniqueness	instructions	reports	automation	comparisons	plans

The most common metrics used by project managers during the project implementation are schedule and budget, as the organization also monitors these metrics in each project. Schedule and budget are baseline performance metrics, and they are also quantitative metrics. PM6 says, “Budget and schedule do not measure quality”. However, it was suggested that there could also be qualitative metrics available. PM5 stated, “It would be beneficial to have metrics for project management”. It was observed that atmosphere surveys, opinion polls, and feedback during the implementation of the project were used by many respondents as a metric. Some answers indicated that these are planned at the beginning of the project and introduced to the project group and steering group. It was also found out that objectives agreed for certain milestones are measured during the project implication in agreed time to see if they have been achieved. The minor part said that specific metrics are not in use in their project work. Some objectives can be measured quantitatively, for example number of devices delivered. It was suggested that the benefits of the project should be viewed in the long term after the project is completed. It was considered amongst the interviewees that the most important metrics are budget, schedule, aims, benefits, and success.

Some respondents suggested that there should be more instructions for measuring the project in the organization and because of the uniqueness of the projects, different kinds of projects should be taken into consideration while creating the metrics. Most of the respondents stated that the selection of metrics could be beneficial, but the metrics should not be obliged to use, because it takes more time to measure. PM2 says, “It brings extra work if there are obliged metrics”. Metrics should bring the benefits, so that they are worth using. PM4 stated, “Project manager is under evaluation, but the project manager is not measuring anything”.

Most of the respondents suggested that artificial intelligence (AI) should be developed for measuring the projects. When asked what AI could measure, there were plenty of suggestions. AI could create automated reports and data from Valtikka, it could create graphs and remind about the tasks and critical points. There could be integration between the programs and AI could bring working hours automatically to Valtikka, where they must be reported. AI could assist in doing atmosphere surveys and polls. Phone interviews could be taken care of by AI or at least they could be analyzed by AI. AI could also compare similar kinds of projects with each other and based on that, it could create initial project plans about schedule, budget, quality, and metrics. AI could estimate the number of resources and create task lists.

6.3 Success

Following codes emerged from the data related to the theme success:

Table 8. Codes emerging from the theme success.

commitment	communication	resources	scope	objectives
schedule	budget	customer satis-faction	results	mutual under-standing

Mostly it was considered that committed specialists are the critical success factors in the project. Specialists should be aware of the schedule, budget, and how much time can be used for the tasks. PM2 stated, “Committed specialists and customer are the most important elements”. PM3 said, “Scope must be understood fully by everyone, and everyone must have mutual understanding, of what the project is producing”.

Also following matters were considered as critical success factors:

- good communication
- good atmosphere and resources
- realistic schedule and budget
- clear scope and objectives
- co-operation
- motivation
- well managed solution plan

It was considered that the project is successful when the objectives have been reached on schedule and within budget. PM6 stated, “Project is successful when objectives have been reached”. Most stated also that good results in the customer satisfaction survey state that the project was successful. PM2 said, “Sign of a successful project is satisfied customer”. The atmosphere survey also talks about the success of the project. It was stated though that not everyone replies to the survey and therefore it is worth considering if the results are reliable. Some stated that it is a lot easier to give bad feedback than good feedback. PM4 said, “If you get bad service, you give feedback more likely than from the good service. It was also considered that the project is successful

if change management was successful. PM5 said, “Project can be successful if change management was done right”. Committed specialists and their motivation bring success.

It is important that all the stakeholders understand what the objectives of the project are. It was said that usually there is no negative feedback from the stakeholders, but if there is, that means something has not gone right in the project. Customers might sometimes be against the organization and therefore give negative feedback. Sometimes the cooperating partner such as the deliverer cannot deliver the agreed items and therefore the organization might get negative feedback even though the organization can not affect to the delivery problem.

PM1 stated, “Results should not stay only within the project group, but they should be reported further because the results of the projects might have an impact on everyone’s work in the organization”. That means good communication is a key and should not be forgotten.

7 Development plan

The researcher's suggestion for the selection of metrics for the organization is introduced and justified in this chapter. There is also an introduction of important and essential quality-related elements, which emerged from the interview data. These elements affect the implementation of successful projects and therefore development suggestions are also introduced for these elements affecting the quality.

7.1 Metrics for the organization

Well-planned metrics could help to improve quality, shorten the duration of the project, and increase customer satisfaction. Pries & Quickley (2012) state that it is vital to select and decide the metrics already in the beginning of the project together with the project group or stakeholders. According to Project Management Institute (2021, 97), metrics must be meaningful, achievable, and relevant and they should be linked to either the business case, baselines, or requirements. It is advisable to use metrics, which help to achieve objectives or to improve performance.

The results of the research were introduced and reviewed in Teams meeting with the group of project specialists responsible for developing the projects in the target organization. Based on the results and literature review, the researcher identified a few metrics, which were suggested for the target organization. Chosen metrics support the project management to measure the quality of the projects during the implementation and in the post-evaluation stage. It was stated in the meeting that the focus on developing the metrics begins after the project management office is established. Suggestion for metrics is described in the following table:

Table 9. Suggestion for metrics.

What is measured:	**Category of metric:**	**When it is measured:**
Agreed requirements vs accomplished requirements	Scope metric	During the project and after completing the project
Planned objectives vs actual objectives	Capability metric	During the project and after completing the project
Planned benefits vs actual benefits	Business value metric	During the project and after completing the project. In post-evaluation phase six months after the project is finished.
Planned resource utilization vs actual resource utilization	Resource metric	During the project and after completing the project
Planned cost of resources vs actual cost of resources	Resource metric	During the project and after completing the project
Business success	Success metric	Post-evaluation phase: 1-2 years after the project is completed.
Tools and techniques	Improvement metric	Any time

According to the interviews the schedule and budget, which are the existing metrics in the organization, do not necessarily measure quality. That is why it is important to have metrics, which measure the quality. Objectives were considered important regarding the quality throughout the interviews. Researcher suggests that quality can be measured for example with metric, which compares planned objectives to actual objectives. It can be categorized as a capability metric. This is monitored in certain milestones during the project implementation and after the project

whether the objectives have been met. Another metric related to quality is agreed requirements vs accomplished requirements. Requirements are set at the beginning of the project, and it would be advisable to monitor the requirements at the agreed point to see if the requirements have been fulfilled.

Benefits were seen as important among the interviewees. Therefore, planned benefits delivery compared to actual benefits delivery can be measured. According to Project Management Institute (2021, 102), this measurement belongs to the business value metrics. During the implementation of the project, benefits should be compared to the business case and therefore it can be concluded if the benefits are reachable. If benefits cannot be reached, it should be considered if the project is worth continuing or if is it better to terminate the project. It must be remembered that the benefits are not fulfilled always immediately after the project. To be able to measure this metric, there should be routine monitoring for example six months after the project is completed. Benefits might be reached much later after the project has been finished.

Because the sustainability of the projects was seen as important in the interviews, it is worth viewing the success criteria. According to Atkinson (1999, 337-342), these criteria happen in the post-delivery phase, including metric as business success, which can be measured one to two years after the project is finished. This metric presents the benefits as well and it is worth it for project managers to look for long-term benefits in the projects.

Interviewees had an experience that the project management tool Valtikka is too laborious to use and overlapping work is many times done both to Valtikka and Excel for example. Tools and techniques are measured by improvement metric (Rad, 2005, 289), which measures time and effort used for project management tools. Extra work leads to increasing costs when additional time is used to manage the projects with laborious or overlapping tools and techniques.

Obtaining the resources was a challenging matter amongst the interviewees. Specialists lack time and it is difficult to estimate the needed working hours. Therefore, planned resource utilization compared to actual resource utilization can be measured. According to Project Management Institute (2021, 101), this metric compares the actual usage of resources to the planned usage of resources whereby planned usage can be subtracted from actual usage.

Another resource-related metric is planned resource cost compared to actual resource cost. It compares the actual cost or resources to the planned cost. When subtracting the estimated cost from the actual cost, the cost variance can be calculated (Project Management Institute, 2021,

101). Resources overall were challenging matters, costs of resources included. Therefore, resource metrics are essential for the organization. According to Project Management Institute (2021, 101), resource measurements are linked to costs, because variances in resources can lead to cost variances.

One quality-related matter can be the changes in the project. Changes in the project can be anything about schedule, budget, goals, or requirements. Changes indicate that there might have been a challenge with the scope and therefore changes can affect resources and therefore possibly another projects. Changes have an impact on agreed requirements and customer satisfaction. Changes can be positive or negative or even neutral and they do not define if the project has been successful or not. The researcher's opinion is that changes cannot be measured with metrics because a number of changes does not indicate success or failure. When evaluating the quality of the project, it is worth viewing the changes after the project is completed and why the changes occurred.

It is also worth considering what is the difference between metrics and report. Differentiation between metric and topic arose while discussing the results in the organization. Some results will be reported further but are not measured or compared. Budget and schedule are considered as metrics in the target organization, and surveys and polls are considered more as reports.

7.2 Important elements affecting the project success

The researcher observed important and essential quality-related elements that emerged from the interview data. The researcher suggests that in addition to budget and schedule, these elements should be well established to be able to implement the successful project in the future:

- enough committed resources and available resources
- fluent project management tools
- mutual objectives and scope with stakeholders
- well established measurements
- post-evaluation – sustainability - benefits
- clear instructions collected centrally
- good co-operation and communication
- assistance with artificial intelligence by AI automating reports, comparisons, and graphs

Above mentioned are essential elements that should be emphasized and developed further in project management in the target organization. When discussing the results in the organization, these elements were also familiar to the project specialists. Communication and co-operation were experienced as good amongst the respondents, also mutual objectives are usually understood well. These must be still emphasized in project implication because they are very essential elements for a successful project. Artificial intelligence needs some deeper research, and it could be developed later to assist in projects to reach successful project. Nieto-Rodriguez and Viana Vargas (2023) state that if artificial intelligence and technological innovations could be applied to project management, the success ratio of projects could improve by 25 %.

Target organization should develop their resource matters remarkably. Resource requests should be responded to timely, and resources should be available for the project managers. Researcher suggests that if resources lack time and they are not available, it is worth considering if more skilled labor is needed in the organization. Implementation of the projects would be more fluent for project managers if the resources were well available. Also, Wu (2020, 8) questions the success of the project in the means of resources. If the resources are not enough, lack of resources leads to the project team's exhaustion and the project is not successful in that aspect. Tayntor (2010, 103-105) also states that it is important that the team members have time and commitment to the project.

The project management tool Valtikka needs to be developed to be less laborious to avoid overlapping work with many tools. Valtikka is an obligatory tool though, where project managers must report about the projects. Specialists do not have access to Valtikka, so it would be worth considering if they can be granted access so they can also follow up on the project implementation. Therefore, overlapping work is not needed to create for example task lists to shared files in some other location. Instructions for project management could be collected in one shared workspace which all the project managers have access. That way it is avoided that the instructions must be searched from many different files. Townsley (2023), states that technology is one significant contributor to the success rate of projects and Wu (2020, 7, 10) suggests that success is improved by working efficiently and effectively while applying the right management tools and techniques.

For the post-evaluation stage, the researcher suggests examining the benefits in the long term. Sustainability is essential and it also relates to benefits. It is ideal that the output of the project will continue in operational work and therefore it is sustainable. Sustainability depends on the nature of the project. Also, Nieto-Rodriguez (2021, 32.) states that when the project is completed,

the deliverables and outcomes are often moved to the operational side of the organization. That is where the anticipated benefits must be successfully sustained and achieved.

According to Atkinson (1999, 341) writers such as Turner (1993), Morris and Hough (1987), Wateridge (1998), deWit (1988), McCoy (1987), Pinto and Slevin (1988), Saarinen (1990) and Ballantine (1996) includes the Iron Triangle (cost, time, quality) as a success criterion to measure the project management process. Iron Triangle does not notify the benefits, therefore based on the literature review and results, the researcher of this thesis suggests The Square Route as the success criteria for the organization. In addition to the elements in the Iron Triangle, benefits for the organization and stakeholders are included in the Square Route. Also, Nieto-Rodriguez (2021, 9), emphasizes benefits and for the successful implementation of the project, he has created the project canvas including benefits as one domain. Project canvas was introduced in Chapter 2.

8 Conclusions

The objective of the project metrics is to provide accurate information that can be used to improve the performance of projects. Well-established metrics system supports the project managers' decision-making by providing the foundation and rationale for decisions. The most important advantage of the metric system is that it makes explicit those matters, which are implicit in the decision-making process. (Rad & Levin, 2006, 3.)

The main objective of this thesis was to identify suitable metrics for measuring the successful projects in the target organization. Also, the aim was to recognize the elements that affect to implementation of the successful project. The research question of this thesis was "What are the suitable metrics to measure a successful project?". Sub-research questions were "What kind of project can be defined as a successful project?", "what are the elements of implementing a successful project?" and "How it is measured that quality is obtained."

A case study was chosen as a research strategy because the purpose was to gain an understanding in detail of the quality-related matters, metrics, and success factors in projects. Data for the research was collected qualitatively by semi-structured interviews because this data collection method enables one to ask more detailed questions about the topic.

In addition to the literature review, interviews provided enough data for the research and development of the metrics and important elements for the implementation of a successful project. Results introduced the important aspects to take into consideration when regarding the quality and success of the projects. Results also gave insight from the measurements and metrics in the project as well. Measurements were not remarkably used amongst project managers, but the interviews still offered knowledge for the development plan.

The development plan was created for the target organization according to the collected data from the interviews and literature. Based on these, a selection of metrics was developed. Collected data from the interviews and literature created the basis for the selection. The development plan also suggested improvements regarding the important elements affecting the successful implementation of the project. These elements affect the quality of the project as well.

8.1 Discussion

The researcher's opinion is that measuring the project is not an unambiguous matter. Projects vary in their content and all the projects are different and unique. The uniqueness of the projects emerged also from the interview data as well as from the literature. Therefore, all the metrics do not apply to every project similarly. Selecting the right set of metrics should be considered for only one unique project at a time. Because projects are different, it is challenging to measure and analyze them in the same way in each project. Comparison of the measurements can also be challenging due to the unique nature of the projects.

Significant and essential elements affecting the implementation of a successful project were recognized in this research. That was one of the aims of this study. The identified elements need to be improved to implement more successful projects. These elements were introduced to the organization's project specialists who are responsible for developing the project management practices. Elements were relevant and realistic to take into consideration when considering the development of the project management practices.

The researcher's opinion is that the most important elements to develop are resources, the availability of the resources and, the utilization of resources at the right time. Availability of the resources was the major challenge according to the interview results. As Wu (2020, 8) states project is not successful if there are lack of resources and the project team feels exhausted. Rad et al (2005, 94-95) suggest that resources are critical success factors in a project. As resources are a critical success factor, it is essential to improve the availability of resources. Good availability of resources decreases the frustration of project managers and makes the implementation of the project more fluent and successful.

Another remarkable area for improvement is the evaluation of the benefits. Benefits were also seen as important in the interview data, but the organization is not evaluating the benefits at the moment after the completion of the project. Benefits delivered during the implementation, delivered benefits and the value of the benefits can be compared to the business case (Project Management Institute, 2021, 102). It is also important to create the post-evaluation phase whereby benefits are evaluated six months after the project has been completed (Project Management Institute (2021, 102). According to Atkinson (1999, 337-342), Shenhar (1997) suggested that project managers should look for long-term benefits.

The Square Route success criteria has benefits as one area in addition to the constraints of the Iron Triangle, which are quality, budget, and schedule (Atkinson, 1999, 341). Target organization concentrates now on the constraints of the Iron Triangle, but the researcher would suggest the usage of the Square Route success criteria as it also reviews the benefits to the organization as well as the stakeholders. Benefits are important. As Tayntor (2010, 88-90) states, projects are initiated because of benefits. Also, Morris (2013, 189) suggests that projects are done, because of benefits, and Nieto-Rodriguez (2021, 87) states that even a benefit plan is essential to create at the beginning of the project.

The objective of the thesis was also to find suitable metrics for the target organization to measure projects so that the projects would be more successful. As it was stated above, the important elements affecting the implementation of a successful project were identified first. Based on these elements and the literature review, a selection of metrics was created. The researcher's opinion is that most importantly the organization should develop the metrics related to the resources. Resources should be well available to progress the project fluently without delays. Therefore, availability and utilization of the resources are the most important areas to improve regarding the metrics also. According to Project Management Institute (2021, 101), planned resource utilization compared to actual resource utilization, as well as planned resource costs to actual resource costs could be measuring the resources.

This study focused on three main themes, which were quality, metrics, and success. Theme interviews could be conducted also with some other themes and therefore the emphasis of the answers could be on other matters depending on the themes. Metrics were created subjectively by a researcher based on the interview data and the literature review. Possibly even more metrics could be created from the data and therefore this research provides a good basis for the development of the metrics.

The target organization is establishing the project management office currently. Measurements will also be under development after PMO is established. The target organization will benefit from the well-established metrics system to implement more successful projects. This thesis provides important aspects about the quality and metrics for the commissioner to support the project development. This research supports the measurement development, by suggesting the selection of metrics and providing information about the elements affecting the implementation of a successful project to gain excellent customer satisfaction. The organization's strategy emphasizes a satisfied customer. The topic and results of this research support the strategy as well, because with well-measured projects, the desired outcome is a satisfied customer. Selected metrics could

be used also in another organization. Because projects are unique, metrics must be selected for each project so therefore selected metrics could be applicable in any organization depending on the project.

Business-based and financial metrics were not examined thoroughly in this research, because this research emphasizes more on qualitative metrics and not on quantitative metrics. Future studies could address deeper quantitative research for the financial metrics. Further research could be conducted also regarding artificial intelligence. Artificial intelligence is a new opportunity to develop automated measurements and create metrics for project management. Artificial intelligence will decrease the manual work in the organization's projects in the future, so therefore further research is needed to examine the effects of artificial intelligence in project management.

The researcher deepened her knowledge remarkably about project management matters during the thesis process. The researcher had experience completing one project as a project manager so comparing the starting point of the thesis to the final point, knowledge of the subject has developed considerably. New aspects especially regarding the measurement and metrics in project management have widened knowledge and expertise.

One of the major challenges of this thesis was the schedule and time needed for the research. The time available for the research work was limited and caused a challenge for the thesis process. There were also changes in the personnel in the target organization during the thesis process and that caused also delays in this research.

8.2 Validity and reliability of the research

Yin (2011, 11) stated that the research will unavoidably adopt the views of the researcher as the researcher is the one filtering and interpreting the collected information. That affects the validity of the research. Hiltunen (2009) states that validity is good when the target group of the research is right, and the interview questions are correct. Validity can be also estimated whether the research methods are correct, and the right phenomenon is researched. The validity of the thesis was ensured by planning the interview themes carefully so that they reflect the theory and research objectives. Before the interviews were conducted, the content of the interview questions was verified by the group manager in the project management section. The research problem and question were answered so it can be concluded that the results are valid.

Saturation was reached by an in-depth understanding of the phenomenon. According to Merriam & Grenier (2019, 27), saturation means that the same things are emerging from the interviews repeatedly and no new information arises when collecting the data. The researcher's opinion is that six interviews provided enough similar data to fulfill the criterion of saturation. Credibility was assured with a suitable number of interviews to collect enough data for the research. Credibility was increased because the results of the research and the literature review were in alignment.

If research findings can be replicated, it is reliable research. Reliability means that if the study was repeated, the same results would be achieved (Merriam & Grenier, 2019,27). Hiltunen (2009) states that reliability expresses how repeatedly and reliably the research method measures the phenomenon. Results fulfill the criterion of reliability because the same results would be able to be produced under the same conditions around the same time. Data was carefully coded and analyzed. The reliability is tied to the current moment because any changes in the operating environment could bring different results in the research.

According to the ethical principles, participants should participate in the research only voluntarily. Participants must receive information about the research, how the personal data is processed, and how the research is conducted. Personal data used for the research must include only the necessary data for the research purposes and data should be removed when it is no longer necessary for the research. Respondents' privacy must be respected. (Finnish National Board on Research Integrity TENK, 2021) All the invited interviewees participated in the interviews. They were told what the purpose of the interview was, and it was clarified that their answers were handled anonymously. Interview data was processed carefully. Transcribed and recorded interviews were deleted permanently after the data was analyzed. Personal data was not published in the research. Project managers' cited opinions were expressed as PM1-PM6 in the results, therefore none of the respondents can be identified. All the data and interviews were processed ethically.

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Table of the Themes

Main theme: Quality		
Sub-theme / code:	**Description:**	**Quotations/Statements:**
- Objectives - Needs - Benefits - Programs / tools - Schedule - Resources - Definition of quality - Templates - Communication plan - Frustration	- Importance of objectives - Recognizing the customers' needs - Reviewing the benefits throughout the project - Fluency of the programs and tools in project management -Essential metric in measuring the projects - Availability of the resources and exceeding the schedule due to lack of resources - Insufficient, limited or lack of resources (time) - Interpretation of the term quality - Project management tool / instructions - Identifying the stakeholders - Feelings of project managers	-…I want to understand the stakeholder's needs and how we can respond to their needs... -…we must have understanding what the objective is for long-term… -…all the tasks are listed to Excel, which works better than Valtikka… -...benefits need long-term monitoring… -…I got the resources but not from the unit, which is responsible of resources… -…expertise of the specialists is good… …I think budget and quality do not measure quality… -…project got delayed because of project manager, but no questioning if there were enough resources… -…we are thinking about the benefits carefully at the beginning…

Main theme: Metrics		
Sub-theme / code:	**Description:**	**Quotations/Statements:**
- Qualitative metrics - Quantitative metrics - Surveys - Benefits - Post-evaluation - Objectives - Uniqueness - Instructions - Reports - Automation - Comparisons - Plans	- Establishment of qualitative metrics in the future - Metrics in use by the target organization (quantitative) - Measuring the project during implementation - Benefit is one of the metrics, long-term monitoring - Monitoring the benefits and success in post-evaluation - Unique nature of projects affecting to the measurements -More instructions for measurement - Automated reports from the project management tool - Opportunity for automated reports, graphs and polls in the future by using artificial intelligence - Opportunity to utilize artificial intelligence in comparing the projects - Creation of project plans about schedule, budget, quality and metrics by artificial intelligence	-…it would be better if quality is monitored more carefully… -… I use polls and atmosphere surveys… -…it would be nice if there are more templates and examples… -…it would be interesting to see new metrics… -… planned tasks vs actual tasks are metrics for me… - …most important metrics is schedule for me… - …I'm wondering if all the metrics are useful… -...I think with AI we get results that we don't even realize now… - …artificial intelligence is good opportunity… -…I think AI could create plans and tasks and reports…

Main them: Success		
Sub-theme / code:	**Description:**	**Quotations/Statements:**
- Commitment - Communication - Resources - Scope - Objectives - Schedule - Budget - Customer satisfaction - Results - Mutual understanding	- Project group's and customer's commitment to the project -Good communication within the project group -Resources are one of the most important critical success factor - Clear scope understood by the project group - Clear objectives understood by the project group, objectives realistic to achieve - Project completed in schedule, specialists aware of schedule - Project completed within budget - Customer satisfaction is sign of a success in project - Reporting the results further in the organization - Communication within the project group, awareness of the tasks and proceeding	-…committed specialists and atmosphere is very important… -...communication is important throughout the project… -...if working is not fluent and people are not committed, it doesn't work… -…we must know the scope and where to focus on and what is realistic… -…objectives must be realistic, and everyone involved must understand them… -…project proceeds on schedule and within the budget and budget is around the estimated -…customer satisfaction measurement supports the fact that everything went nicely… -…people have been satisfied with the output… -…everyone involved have the same understanding already at the beginning and throughout the project…

Process of generating codes:

Codes:

1. Objectives
2. Needs
3. Benefits
4. Program/Tools
5. Schedules
6. Challenge with resources
7. Definition of quality
8. Templates
9. Communication plan
10. Frustration
11. Qualitative metrics
12. Quantitative metrics
13. Surveys
14. Post-evaluation
15. Uniqueness
16. Instructions
17. Reports
18. Automation
19. Comparisons
20. Plans
21. Commitment
22. Communication
23. Resources
24. Scope
25. Budget
26. Customer satisfaction
27. Results
28. Mutual understanding

Codes categorization:
Quality:

1. Objectives
2. Needs
3. Benefits
4. Programs/Tools
5. Schedules
6. Challenge with resources
7. Definition of quality
8. Templates
9. Communication plan
10. Frustration

Metrics:

1. Qualitative metrics
2. Quantitative metrics
3. Surveys

4. Benefits
5. Post-evaluation
6. Objectives
7. Uniqueness
8. Instructions
9. Reports
10. Automation
11. Comparisons
12. Plans

Success:

1. Commitment
2. Communication
3. Resources
4. Scope
5. Objectives
6. Schedule
7. Budget
8. Customer Satisfaction
9. Results
10. Mutual understanding

HAASTATTELUKYSYMYKSET:

YLEISTÄ:

- kuinka kauan olet työskennellyt projektipäällikkönä Valtorissa?
    - onko sinulla kokemusta projektipäällikön tehtävistä ennen Valtoria?

LAATU:

- teetkö laatusuunnitelman projektin suunnitteluvaiheessa?
    - projektinjohtamismallin mukaisesti projektisuunnitelmapohjaan (suunnittelu, seuraaminen, testaus)?
    - teetkö laajempaa tai yksityiskohtaisempaa laatusuunnitelmaa kuin mitä projektisuunnitelmapohjassa on kysytty?
        - miksi, miksi ei?
- teetkö sidosryhmäanalyysin?
    - kuinka tarkasti selvität laatuvaatimuksia ja hyötytavoitteita sidosryhmien kanssa?
- millaisen tehtäväsuunnitelman teet?
- millaisena koet resurssien suunnittelun?
    - onko resursseja saatavilla hyvin?
    - toteutuuko resurssit suunnitelmien mukaisesti?
- seurataanko mielestäsi projektien laatua tarpeeksi organisaatiotasolla? (toimitustäsmällisyys, budjetti)
        - jos ei, niin millä tavalla laatua pitäisi seurata tarkemmin?

MITTARIT:

- Käytätkö laadun varmistamisessa mittareita projektin toteuttamisen aikana? (mittarit, mittaus, arviointi)
    - jos käytät mittareita:
        - millaisia mittareita?
        - teetkö suunnitelman mittareista projektin suunnitteluvaiheessa?
        - osallistuuko projektiryhmä mittareiden laatimiseen?
        - missä vaiheessa projektia käytät mittareita / mittaat? onko tietyt tarkistuspisteet?
        - mitkä ovat mielestäsi tärkeimmät ja oleellisimmat mittarit, jotta projektin laatu saadaan varmistettua?

    - jos et käytä mittareita?
        - miksi et käytä?
        - koetko, että mittareista ei ole hyötyä?

- Pitäisikö Valtorin projektin johtamismallissa olla enemmän ohjeistusta mittaukseen?
    - pitäisikö valittavana olla valmiita mittarivaihtoehtoja?
        - jos ei, niin miksi ei?

        - minkälaista ohjeistusta kaipaisit?
- Voisiko tulevaisuudessa tekoäly hoitaa projektin mittausta?
    - voisiko tekoäly suorittaa mittausta projektin aikana ja / tai projektin jälkeen?
    - millaisia mittauksia voisi mielestäsi antaa tekoälyn hoidettavaksi?

PROJEKTIN ONNISTUMINEN:

- mitkä ovat mielestäsi projektin (kriittiset) menestystekijät projektin toteuttamisen aikana?
- mistä tunnistat onnistuneen projektin?
    - mitä mieltä olet eri sidosryhmien näkemyksestä projektin onnistumisessa?