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How project team characteristics and project management practices affect perceived project
management effectiveness
A case study within a large healthcare supplier company

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Master Thesis report

How project team characteristics and project management practices affect perceived project management effectiveness: A case study within a large healthcare supplier company

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Executive summary

Introduction and problem description

Mediq aims for a balanced matrix structure or an innovative organization for project management, but it is currently more resembling a diversified organization. Business as usual is prioritized, causing unfinished projects due to high workloads. Urgent and important problems are being managed first, while less urgent but still important projects are given less attention. Cross-functional projects take more time and need the overseeing manager or director's prioritization. Mediq defines project success as being on time, within budget, and of good quality. The progress and success of projects are hindered by various factors, including problems specific to Mediq. Out of 55 planned projects for 2022, only 33 were expected to be completed fully within the year, and three were expected to end the year incomplete. Mediq aims for continuous improvement and values a "One Mediq" mindset where employees understand the importance of their work for the company. The company is currently adapting to the Mediq Project Approach (MPA) as a project management method and wants to know which project team characteristics, combined with the MPA method, improve perceived project management effectiveness. With this information in mind, both a qualitative and quantitative study were performed looking into how project team characteristics and project management practices affect employees' perceived project management effectiveness.

Three problem statements were formulated with corresponding research questions. Firstly, Mediq currently does not have insight in how the MPA project management method is perceived by different project team members, regarding the project management effectiveness. The corresponding research question is "How do different project team members perceive the project management method?" Secondly, Mediq currently does not have insight in how different characteristics of the project team affect the perceived project management effectiveness. The corresponding research question is "What is the impact of different project team characteristics on the perceived project management effectiveness?" Thirdly, Mediq wants to know which project team characteristics are associated with perceived project management effectiveness when considering the applied project management practices. The corresponding research question is "What are the most important project team characteristics that predict perceived project management effectiveness when considering the project management practices?"

Research was conducted through interviews, a survey, and data analyses to provide recommendations for improving project management effectiveness. The research had four objectives, including gaining insight into the use of the MPA method, determining whether it's associated with

perceived project management effectiveness, identifying which project team characteristics affect this effectiveness, and providing recommendations for selecting effective project teams.

Methodology

Considering the situation of Mediq as a case study limits the project team aspects to a specific selection from the literature. A qualitative study (study 1) containing six interviews was performed to get an understanding about the potential relationships between the theorised constructs and to confirm their relevance for the case company.

For study 2, the quantitative study, an online survey was set up using Qualtrics, to further explore and study the situation at the case company. This survey is developed to collect the necessary data for investigating the relationships between the different project team characteristics and perceived project management effectiveness (see Figure A).

Results

Study 1, the qualitative study, confirmed the relevance of all hypothesised project team characteristics. Mediq is facing challenges with project management, specifically in acquiring resources, managing project team size, and lack of clarity on program goals, which hinders project management effectiveness. Standardized storage of project information on SharePoint can prevent contradictory or missing information. Defining project goals and scope, having the right people in the right roles, and managing time pressure are also important factors. Furthermore, task interdependence is inherent in project teams, and creating an overview and action list can help manage the workflow as well as the perception of time pressure. Functional and demographic diversity can positively impact projects but can also create challenges. The MPA aims to provide structure and uniformity to project management within Mediq, with the scope statement seen as the most important document. However, the MPA templates are used selectively, depending on the project's needs.

Next, hypotheses on the interrelationships were tested in study 2, the quantitative study. In study 2 regression analyses revealed that both goal clarity and role clarity relate positively to perceived project management effectiveness (PPME). Task interdependence and perceived time pressure show quadratic rather than linear relationships with PPME. The other hypothesized relationships turned out to be non-significant in the used dataset. However, further exploration of the relationship between MPA and PPME showed a positive relationship of MPA onto PPME for the group of people with age > 43 and for the group with weekly project hours < 20.

Implications, Recommendations and Future Research

At the onset of the research project, the PMO requested advice on what project team characteristics could positively or negatively affect project management practices and perceived project management effectiveness. After reviewing the research objectives, the team identified goal clarity, role clarity, task interdependency, and time pressure as the most important project team characteristics for improving perceived project management effectiveness at Mediq. These characteristics can be taken into account by the PMO and project managers by ensuring that all stakeholders understand the project's goals and each contributor's role, creating a detailed project plan to manage task interdependencies and perceived time pressure. Project managers can go beyond the functional description of employees for selecting a project team with the ability to reach project management effectiveness by following three main guidelines. Change Management within Mediq involves embedding the project management approach into the company culture and strategy. However, the quantitative study revealed that not every project team within Mediq is aware of or uses the MPA method. Also, the MPA may not be directly related to project management effectiveness. Therefore, it may be necessary to combine the MPA with other existing methods, such as Agile or LEAN, for multi-disciplinary projects, depending on the project manager's preference.

Figure A

Conceptual model
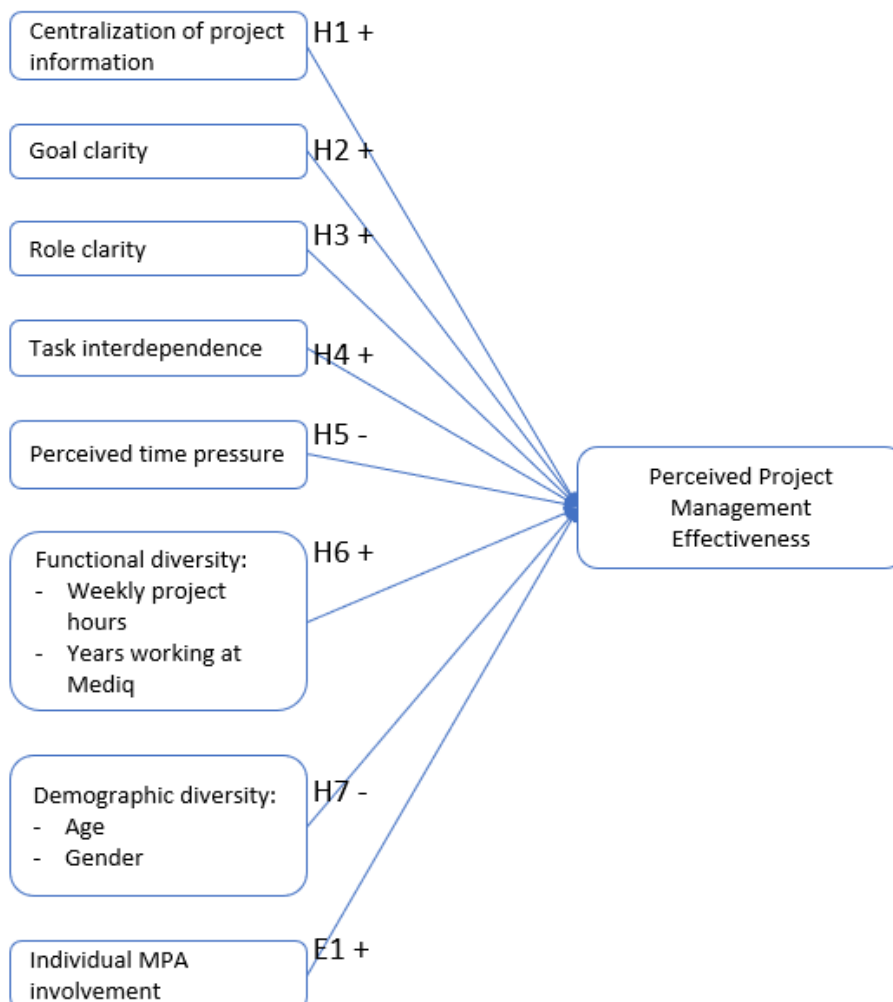
Preface

Dear reader,

In front of you lies my Master Thesis conducted at Mediq located in De Meern. This project finalizes my master studies in Innovation Management at Eindhoven University of Technology. During this rather long period I learned a lot about project management and gained insights into how topics from scientific literature can be applied within a company.

There are a number of people that I want to thank for their support during this period. I would like to start with thanking my TU/e-supervisor, Philippe van de Calseyde, who provided guidance, advice and feedback. My gratitude also goes to Jasper Severs and Stefanie Stoffelsen who gave me the opportunity to perform my graduation project at Mediq. Thanks for your enthusiasm! Also, I would like to thank the other members of the Mediq Business Transformation team that have provided me with a lot of information. Finally, I want to thank friends and family for their support. Special thanks to my partner Michiel, who always helps me through stressful moments, and cheers me up when needed.

I hope you will enjoy reading this report.

Tamar Timmer

Leerdam April 25, 2023

Contents

List of figures

List of tables

1. Introduction

The healthcare system is facing large challenges. Even though the quality of care has improved significantly over the past decades, the complexity and scale of healthcare have also grown exponentially. According to Mediq, this is due to rising multi-morbidity, longer life expectancies, and increasing expectations of personalised and convenient services. In this introduction, first the empirical context of this research will be provided. Next the problem context will be elaborated. After this the research questions and scope will be discussed, and the research objectives will be provided. The introduction ends with an outline of this report.

1.1 Empirical context

1.1.1 Organisation and Business context

Mediq is an international healthcare supplier company with leading market positions in thirteen countries, committed to improve healthcare outcomes and the affordability of care. Mediq stays committed to put their patients first and always strives to make a difference, as care sits at the heart of their business. To realise solutions that take healthcare further and meet their patient's needs, Mediq as a healthcare supplier company partners up with care institutions and healthcare professionals (Mediq, 2022b).

The Mediq head office is located just outside Utrecht, the Netherlands, and the company has over 2,500 employees. The company works with healthcare facilities, hospitals, nurses, and GPs to ensure that the best possible care can be provided. Furthermore, people with chronic conditions are provided with the daily support and care they need to successfully self-manage. Mediq's core competencies create a market leader position in different areas of homecare and medical supplies in which they can add value for their customers. These competencies are also found in Mediq's three core values: valuing a caring heart, customer drive and champion spirit. Mediq serves healthcare professionals and patients with innovative solutions, medical devices, and healthcare products. (Mediq, 2022a)

1.1.2 Current situation: The development of project management at Mediq

Mediq has long-standing partnerships that enable the company's growth. The company started with managing multiple pharmacies, followed by taking over several different healthcare supplier companies. Growth takes time, systems need to be adjusted, methods re-developed, and ways of working have to be adjusted. The merging of other companies into the daily business of Mediq has often focused on the functional departments. Due to these merges, the company is challenged in standardisation of the daily business, also spoken of as the company being "One Mediq". Another consequence of the company's growth is a larger quantity of projects that need to be managed,

resulting in a need for a project management method and process to decide which projects are started and which are continued.

As stated by Bentley (2001), project management has been done for centuries, it is common sense. A documented project management process aids in tackling problems that arise and preventing common mistakes. Therefore, in order to manage projects in a way that is repeatable and teachable, a structured project management method should be applied. An example of such a method is the PRINCE2 method, which is based on the experience of project managers (Bentley, 2001). PRINCE2 can be applied to different sized and diverse types of projects. It covers project management concerns such as initiation, controlling projects, quality, risks, change and project closure. A second example of a project management method is Stage-Gate. Stage-Gate is a process to move projects from idea to launch (Cooper, 2008). It consists of a series of stages, where the project team obtains information, analyses, and undertakes work, followed by gates, where decisions are made to either continue to invest in the project or to stop the project. IPMA, which stands for International Project Management Association, offers support in project management. This association trains project managers in four different levels and teaches them to be aware of their competencies in order to enable them to decide whether they are able to successfully manage a project (Vukomanovic et al., 2016).

In earlier years, Mediq applied the PRINCE2 project management method, focussing on the management, the control, and the organisation of a project. When the company endured a reorganisation, this method was let go, leaving the company without a specified project management method. In 2021 the decision was made to start a project management office (PMO) within the business transformation department and to develop the Mediq Project Approach (MPA). This development started by analysing how projects were undertaken without a set approach. This analysis was started by setting up interviews with the management team (MT) and appointed project management coordinators. After this analysis, an expert was asked to apply their IPMA project management expertise combined with best practices from other companies. The developed method was focused towards being user friendly, fitting for Mediq as a company, the experience level of existing project managers and what basic language seemed to be needed for the best understanding of the method by its target users. In this development, a testing group was set-up with people from different departments to discuss and make iterations on the concept of the MPA. A timeline visualisation of this development process can be found in Figure 1. After several iterations and further development of the materials and processes, the first communal training for employees at Mediq was created. In this stage of the development, the question arose who to include into the to-be-trained group, which eventually consisted of MT members, project managers and project sponsors.

Furthermore, the Executive Vice President (EVP) was asked to affirm and empower the importance of the MPA for the company. Not just the PMO department is going to use this method, the whole company needs to do so. This step was taken to create the feeling of commitment and support for the method among employees.

At the time this report is written the PMO consists of several employees with different functions. The aim of the team is to keep track of all projects that have been completed, are currently in development or running, and are expected to be started in the upcoming years. The team currently uses a structure with different overviewing levels. The head of the department is the transformation director, advocating for and keeping a high-level overview over the project management of Mediq, as well as the structuring of different company processes. The highest-level overview within PMO is kept by the portfolio management, supported by the PMO support employee. The projects are divided into programs by either functional department or by market type. The program managers keep oversight over the projects within their program, they report to the portfolio management. The third level of overview is that of the project managers, they keep oversight over their own project(s) and report to the program managers. A visualisation of these levels can be seen in Figure 2.

The Mediq Project Approach or MPA is structured as being a Stage-Gate process, visualised in Figure 3. When an idea for a new project arises, a scope statement for this idea is developed by the initiator and submitted to the PMO to become a pre-project. This scope statement is reviewed by the portfolio management, after which the project idea is allocated to a program. The steering committee of this program, led by the program manager, then reviews the scope statement and determines whether a similar project has already been undertaken or if the project idea is new enough to develop a project plan. They then decide whether the project idea will be continued to develop a project plan and, if needed, assign a project manager to the project idea. At this stage, the likely size of the project is also determined, which prescribes which documentation is expected for the project. A distinction is made between a light, medium and heavy approach, based on the expected impact onto various parts of the company processes. After this, it is determined in collaboration with the MT when the resources for the project will be available. When decided, the project idea is moved to being in preparation, now the project manager finds a project sponsor and develops the project plan together with this sponsor. In this project plan the expected scope is further detailed, a first version of the project planning is created, a supplementary project method is decided on (if needed), and the needed resources in terms of both employees and finances are estimated. The finished project plan is submitted to the steering committee that then decides for the project to either move on from preparation to delivery, to adjust the project plan, to put the project on hold for the time being or to stop the project altogether. When

in delivery, the project manager provides bi-weekly status reports on the project that are discussed by the steering committee, these intermediate reports serve to monitor the project progress. After such a report is presented, the steering committee can decide to continue, stop, or put a project on hold. When the delivery of the project is finished, either successful or unsuccessful, the steering committee decides the project moves on to closure, after which the project manager develops a closure document that contains learnings of the project that may be used for future company activities. When the steering committee approves the closure document, the project is completed.

Figure 1

The development of project management at Mediq timeline

Projects 2020	PMO 2020	PMO 2020	PMO 2021
• No specified approach	• Start Project Management Office (PMO) • Start testing group project management	• Project management expert (IPMA) • What can Mediq handle in terms of project management?	• Basic process employed though management team (MT), corporate governance and obligation for new projects to sign up at PMO. • User friendliness, simplicity, easy templates.

PMO 2021	PMO 2021	PMO 2022	PMO 2023+
• Mediq Project Approach (MPA) training developed with testing group. • MT members involved into training process • Who need to be trained for using the MPA?	• Halfway 2021 MPA version 1.0 launched	• Training • Feedback and iteration • May 2022 MPA version 2.0 launched	• Training • Feedback and iteration • January 2023 MPA version 3.0 planned

Figure 2

Project management levels at Mediq
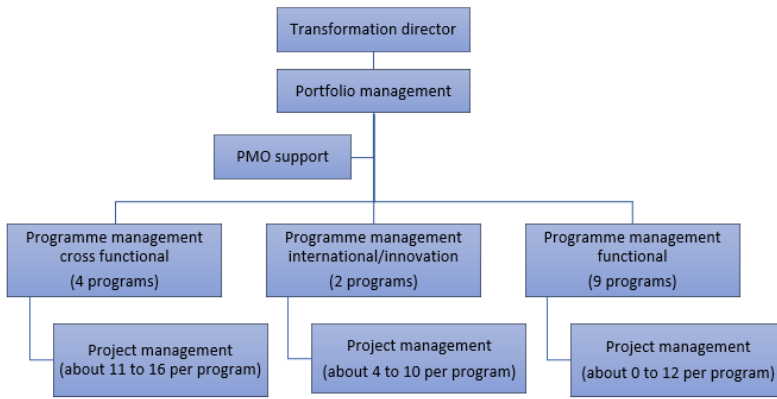
Figure 3

Mediq Project Approach
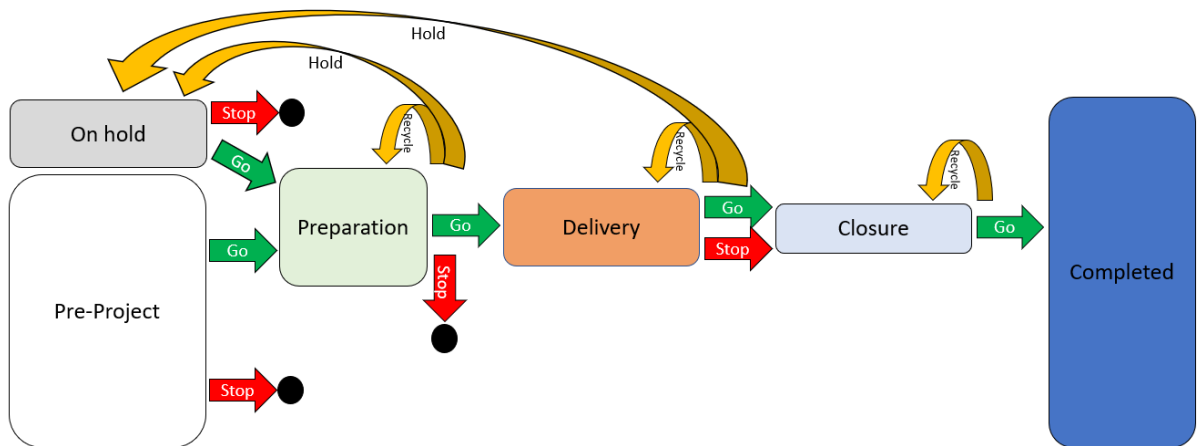
1.2 Problem context

1.2.1 Problem description

When it comes to project management, the organisational structure of Mediq is aimed to be a balanced matrix structure (Kuprenas, 2003), where the functional managers in general have more power than the project managers, or an innovative organisation (Mintzberg, 1989). However currently it comes closer to being a diversified organisation (Mintzberg, 1989). The business as usual is often prioritised. According to the HR educational manager, within Mediq the workload is being experienced as high and leads to projects remaining unfinished. Employees in general have a hard time saying no, find it difficult to keep up with deadlines, and projects often take longer than planned. Looking at Covey's time management matrix, within Mediq a large number of urgent and important problems are being managed. Crises, emergencies, pressing problems and deadline driven issues are being managed first and less to no time is spent on urgent but still important projects and problems are being spent less to no time on. Working on a project together with people from different departments often takes more time than working only with people from one's own department. The departments need time to figure out how to collaborate in order to reach better results, while also determining the usage of project management practices.

It is experienced by members of the PMO that cross functional projects take relatively more time than functional projects. The perception exists that for cross functional projects the priority needs to be highlighted by the overseeing manager and/or director for the project to be executed within its time window. Within Mediq the definition of projects being successful focuses on the Iron triangle, where project success is specified as projects being on time, within budget, and of good quality (see, e.g., Kendra & Taplin, 2004; Ika, 2009). As a general quantification of a time-based view on project success, it is seen that within Mediq out of 55 projects that were planned to be completed in 2022 only 33 are - at the start of the fourth quarter - expected to make it to fully being completed within this year. Also, three projects were expected to end the year in the closure stage, not completed yet (Sourced from Mediq PMO numbers of 2022). The progress and success of projects could rely on many different aspects, two of which are found to be specifically problematic within Mediq.

First, going from no specified project management approach at all towards the MPA appears to be challenging for the project managers and other employees, even though the MPA is designed to be a light-weight method for both project and portfolio management that focuses towards being user friendly and fitting for Mediq as a company. Additionally, the foundation of the MPA is not so much defined by theory and only mildly based on literature and research. Many hours have been spent discussing and thinking about how the employees of Mediq can be taken into the basics of this project

management approach. Specifically, considering how to enforce a Stage-Gate process that projects need to go through and how to build a community that engages the employees of different departments. The MPA Stage-Gate process seems to be meant to sustain the usage of the MPA and requests from program managers to keep a hold of their projects. However, there is no research that confirms this. After the development of the MPA, the PMO is looking for information about the usage of the method by the project teams, to determine whether the employees of Mediq are interested in the MPA, how they perceive it and how well their knowledge of the MPA is.

Second, the focus of employees lies on a departmental level rather than a company level. According to the HR educational manager, the MPA does not have priority on the agenda of many employees. Currently every department appears to have their own ways of working, leading to employees having a dominantly functional perspective. This department driven focus makes it difficult for employees to see the effects of their work on a company level, which might have led to a higher turnover of employees. At the current time, the safeguarding of specific knowledge in the organisation seems to be insufficient, while the turnover of employees has become higher in the past years. New employees often do not know whom to approach with specific questions and do not know the importance of their work relative to that of other employees and departments. They do not clearly know their role relative to the company as a whole, which might have an effect on their execution of projects. The effects of employees in the projects of Mediq might be seen as Project Team Characteristics, which will be further detailed in section 2.2 of the current report.

1.2.2 Problem definition

As more projects arise in the daily business of the growing company, the importance of a structured project management and portfolio approach increases. However, professionalising the approach as project management practices takes time. Project phases fitting the capabilities of the people within the organisation need to be agreed on, a specified approach needs to be determined, and this approach needs to be integrated into the organisational climate. All of these aspects are, within Mediq, managed by the Project Management Office in collaboration with other departments, such as Human Resources, with the ultimate goal to effectively run projects. As the MPA has only been developed recently, no potential effects have currently been tested among the employees of the organisation. Leading to the first problem statement:

Problem statement 1: Mediq currently does not have insight in how the MPA project management method is perceived by different project team members, regarding the project management effectiveness.

A lot of thought has been put into what the MPA should look like and how it should be deployed. The development of the MPA largely came down to the intuition and vision of the early PMO department and testing group, the approach was tailored to the employees of the company and what seemed to be most needed at the time. However, currently the MPA is only mildly being used as it is designed to be. Few project managers completely deliver the asked documentation, and several projects are being started without proper consideration of the consequences in terms of business processes and resources. There is a lack of information regarding why the MPA is not being used as intended and on employees' perception of the MPA. Furthermore, within Mediq the usage of project management methods appears to be a constantly evolving process. Therefore, the following problem statement is suggested:

Problem statement 2: Mediq currently does not have insight in how different characteristics of the project team affect the perceived project management effectiveness.

Employees do not clearly know their role within a project and what goal a specific project has for the business as a whole. These are two distinct characteristics that could affect the project team. In addition to this, it is not clear within Mediq what different characteristics apply to their project teams and what positive or negative effect these could have. Project team members currently are selected for their knowledge and familiarity with often no specific consideration of other potential characteristics. Considering the recently introduced MPA, and the potential effects of the project team characteristics on these project management practices, the unclarity of the project team characteristics is likely to negatively impact the project management practices and perceived project management effectiveness, leading to the third problem statement:

Problem statement 3: Mediq wants to know which project team characteristics are associated with perceived project management effectiveness when considering the applied project management practices.

1.3 Research questions and scope

The PMO of Mediq wants to gain insight into ways to improve the project management development and project management effectiveness within the company. Here the project management development ties into the project management practices and the proper usage of a project management method. They are convinced that a research project focusing on the project team characteristics and project management practices could lead to valuable insights and outcomes for the company. Therefore, the PMO asks to be advised on what project team characteristics might affect the project management practices and is looking for insights into the effects on the perceived project

management effectiveness. To tackle these challenges three research questions provide guidance to create different hypotheses in the theoretical background. These hypotheses are tested in the studies reported in this thesis. Also, the research questions aim to guide in developing recommendations regarding the problem statements. The following research questions are formulated:

- o **Research question 1:** How do different project team members perceive the project management method?
- o **Research question 2:** What is the impact of different project team characteristics on the perceived project management effectiveness?
- o **Research question 3:** What are the most important project team characteristics that predict perceived project management effectiveness when considering the project management practices?

Project management within a large company can be looked at from various levels, depending on the aspects to be researched. On a high up level, the effects of the business culture might be looked at as well as the organisational understanding of multi discipline project management. Project management might also be researched on the level of functional departments. However, for the current research the focus lies with project management on the level of the project teams. Therefore, the scope of the current research lies with aspects focusing on project team members, project managers and the projects' overall performance. Since the thesis project is a time-sensitive research project, a momentary assessment of the different aspects will be performed.

1.4 Research objectives

1.4.1 Company research objectives

The management of Mediq aims for continuous improvement of the company and its projects and values the development of the so-called "One Mediq" mindset, where each employee knows the importance of their work for the company as a whole. When considering company transformation, Change Management is an important topic. This, among other things, includes embedding the project management approach into the company culture and strategy. Mediq is currently adjusting to the relatively new MPA project management method. More specifically for the current study, Mediq wants to know which project team characteristics combined with the usage of the MPA project management method are associated with perceived project management effectiveness. To gain these insights research will be performed within Mediq, where interviews will be held and where the data of several running and completed projects as well as survey data from project team members will be used to provide recommendations regarding which project team characteristics are of importance to improve perceived project management effectiveness. The first company objective of this research project is to

gain insight into how the MPA project management method is used by different project teams and their respective members. The second research objective is to gain insight into whether the use of the MPA project management method is associated with perceived project management effectiveness. The third research objective is to determine which project team characteristics are associated with perceived project management effectiveness within Mediq. The fourth and ultimate company research objective is to provide the project managers with recommendations that go beyond the functional description of employees (such as being a trained accountant) for selecting a project team with the ability to reach project management effectiveness.

1.4.2 Scientific research objectives

Many studies have been performed in the field of project management. Past research focused on, among other things, teams in virtual settings (see, e.g., Beise et al., 2010; Krumm et al., 2016), organisational culture (see, e.g., Morrison et al., 2008; Yazici, 2009), and standardisation in organisations (Mintzberg, 1989). Furthermore, studies can be found relating project management practices and project success (see, e.g., Rolstadas et al., 2014; Kendra & Taplin, 2004; Badewi, 2016; Besner & Hobbs, 2013), as well as studies relating different project team characteristics and the project management practices (see, e.g., Scott-Young & Samson, 2007; Radhakrishnan et al., 2021). In spite of these findings, Scott-Young and Samson (2007) suggest that existing project management research gives little direction on how project costs, schedules and operability are influenced by project team factors. Also, previous research regularly looked into manufacturing (see, e.g., Badewi, 2016) and information technology (see, e.g., Kendra & Taplin, 2004). A study researching relationships between project team characteristics and perceived project management effectiveness among project team members does not seem to have been undertaken previously. Also, project management studies in the healthcare industry seem to be very rare. Therefore, the scientific objective of this research project is to extend the existing literature by studying these relationships as a case study within this industry.

1.5 Report outline

This thesis report started with an introduction, describing the empirical context and problem context. Next, the research questions, scope, and objectives were provided. In the following chapter, the theoretical background will be explicated, defining the key topics and outlining the hypotheses. At the end of this chapter, the conceptual framework is visualised. Next, for study 1 the qualitative methodology is described, and the qualitative results are provided. These are followed by study 2 with the quantitative methodology and quantitative results. The report finishes by providing a discussion of the results, the practical and theoretical implications, and the limitations of the study.

2. Theoretical background

Projects can be impacted by different factors, as is also demonstrated by literature (see, e.g., Meyer & Torres, 2019; Kendra & Taplin, 2004; Beise et al., 2010). In the scope of the current research, several aspects have been identified through observation and discussion at the PMO team that are expected to be relevant for the case of Mediq. The following sections provide an overview of the relevant theoretical- and empirical literature concerning the main topics of interest: 2.1 project management effectiveness, and 2.2 project team characteristics. Based on this literature several hypotheses are formulated, and a conceptual model is built in section 2.4. In addition to this, section 2.3 provides elaboration on the exploratory topic of individual MPA involvement, that will also be included in this study.

2.1 Project Management Effectiveness

2.1.1 Project management approach and methods

As mentioned earlier, a documented project management process aids in tackling problems that arise and preventing common mistakes. In order to manage projects in a way that is repeatable and teachable, a structured project management method should be applied (Bentley, 2001).

Kendra and Taplin (2004) specify project success as being on time, within budget, and of good quality. As previously mentioned, this definition is also called the Iron triangle (Ika, 2009). Project success can be analysed by looking at the project management approach (Rolstadas et al., 2014). The research of Rolstadas et al. (2014) shows that project success is dependent on the selected project management approach, in connection with the challenges posed by the project. They define two different approaches in project management, being a prescriptive approach and an adaptive approach, identified through studying three different case projects. The prescriptive approach focuses on formal qualities of the project organisation, whereas the adaptive approach focuses on team commitment and the process of developing and improving a project organisation and culture. Rolstadas et al. (2014) suggest that the project management approach is considered and selected by project teams at project initiation, and to decide according to the selected approach on the success factors relevant to focus on. In the current case study situation, two specific project management approaches are being investigated: Agile and Stage-Gate.

Agile project management is based on an iterative cycle. It is defined by Wysocki (2014) as a non-linear, iterative, or adaptive project management approach. They describe agile project management methods as being change-driven rather than plan-driven as agile project management cannot succeed without change. Agile project management is designed to embrace and accept change and to quickly adapt to changing priorities. Furthermore, by doing a project in iterations, Agile projects

uncover the complete project requirements and thus reduce uncertainty (Fernandez & Fernandez, 2008).

Along with other more traditional project management methods, such as PRINCE2 and IPMA, Stage-Gate uses a set of well-defined phases that are performed sequentially. As described by Singhto and Denwattana (2016), in these traditional approaches each phase should be concluded before the following phase in the sequence is started. As described by Cooper (2008), Stage-Gate projects are moved from idea to launch following a process that consists out of a series of stages, where the project team obtains information, performs analyses, and undertakes work, followed by gates, where decisions are made to either continue to invest in the project or to stop the project. The Stage-Gate method can be tailored to different sized projects using more stages and gates or less stages and gates. Furthermore, the gate decisions can be tailored to the company by setting specific requirements for the decision makers at each gate. Traditional Stage-Gate can be experienced by the project team to be a rather strict process. However, Stage-Gate can also be used as an agile project management method by applying an Agile–Stage-Gate Hybrid model. Cooper (2016) explains that blending Agile and Stage-Gate methods can provide flexibility, speed, and improved communication in new-product development.

2.1.2 Project management practices

The project management method is operationalized into project management practices. Following Kendra and Taplin (2004) and Beise et al. (2010), project management practices can be defined as formalised practices and processes used to successfully run a project. Beise et al. (2010) elaborate on project management practices as being formalised practices that tend to focus on dimensions of project management such as measuring costs, setting goals, and developing schedules. These formalised practices are explained to be "hard" dimensions, rather than "soft" dimensions like involving people, team leadership, relational development, and politics. Project management practices are the processes supporting the goals for reaching project success. These practices can be linked to IT project success, and include project documentation, planning, controls, scheduling, scope management, and risk management (Beise et al., 2010).

Looking at the research of Badewi (2016), project management practices are found to positively influence project management success in a structural equation model using survey data of two hundred project and programme managers involved in information technology projects. Furthermore, project management practices were previously found to have a marginally significant positive relationship with project success (Besner & Hobbs, 2013). Besner and Hobbs (2006) studied the perceptions of project practitioners on the relative value and potential to contribute to project

success of different project management practices. To do so they performed a large-scale survey of 753 project team members, project managers, program managers and other project practitioners. They identified specific tools for improving project performance and found that the greatest potential lies with tools related to organisational learning and memory.

Kendra and Taplin (2004) studied the adoption of Project Management (PM) practices in an Information Technology (IT) division of a large manufacturing company. They start their research by performing a literature review on project management practices (processes) in the IT industry, identifying numerous project management success factors that contribute to project success. The identified success factors were categorised into four dimensions in a 2x2 model (Table 1), reflecting "social" and "technical" design elements on a micro and a macro level. In their study, Kendra and Taplin (2004) developed a project management values framework that aligns organisational cultural values with project management values in an information technology organisation. According to this framework the alignment of the cultural values in the organisation with project management values enabled the company to successfully adopt project management as a new work method for improved project success.

Table 1

Project management design elements by organisation level

Element type	Micro	Macro
Social	Project manager skills and competencies	Organisational structures at the project level
Technical	Performance measurement systems	Supporting management practices

2.1.3 Perceived project management effectiveness

Hyväri (2006) aimed to contribute to a better understanding of project management practices by providing empirical evidence on project management effectiveness. In this study, project management effectiveness focuses on four themes, being the characteristics of an effective project manager, leadership ability, technical competency, and organisational structures. The research used both survey data and interview data. Hyväri (2006) explains that when business organisations need to rapidly respond to market changes, a traditional functional organisational structure is not the best structure for forming project teams. Furthermore, the study suggests that project management tools are widely used and that in the leadership behaviour of project managers planning, networking, and informing are the most significant managerial practices. It might be argued that these effectiveness

aspects within a company largely rely on perception of different employees, therefore project management effectiveness can also be seen as perceived project management effectiveness.

Milosevic et al. (2001) studied how project effectiveness is impacted by standardised project management. Standardised project management (SPM) in their research refers to a process of standardised practices for managing projects, where standardisation is the (degree of) absence of variation in implementing project management practices. Therefore, the more varied these practices are, the less standardised they are. Several SPM components have been identified by Milosevic et al. (2001), such as methods, leadership, technology, and organisation. Also, they suggest that SPM efforts aid in improving the achievement of project goals. The study uses a questionnaire, collecting data over several months from project participants. Furthermore, interviews were performed that yielded insights into project management practices to substantiate the findings. Milosevic et al. (2001) focus on project effectiveness being schedule-driven, cost-driven and/or quality driven, which can be related to the iron triangle of projects being on time, within budget and of good quality (see, e.g., Kendra & Taplin, 2004; Ika, 2009). The article of Milosevic et al. (2001) ends with four main takeaways. First, standardise your PM structure, systems, and culture if you desire schedule-driven project effectiveness. Second, a solid systemic standardisation of project management can aid in the pursuit of cost-driven project effectiveness. Third, when it comes to project effectiveness and quality orientation, invest in systemic and cultural standardisation. And fourth, finalising the article's takeaways, PM standardisation can vary significantly. These conclusions are summarised in Table 2, showing how certain types of project management standardisation support certain types of project effectiveness.

Table 2

Higher standardisation of project structure may lead to higher schedule-driven project effectiveness

		May lead to higher…		
		Schedule-driven project effectiveness	Cost-driven project effectiveness	Quality-driven project effectiveness
Higher standardisation of…	Project structure	V		
	Project systems	V	V	V
	Project culture	V		V

Morrison and Brown (2004) performed literature research on the construct of project management effectiveness. They started by looking at the broader topic of project success, then looked into organisational effectiveness, and finally defined a conceptual framework of project

management effectiveness from a theoretical basis. In this study, project management effectiveness focuses on project planning and execution activities and the assessment of project management objectives compliance. The effectiveness construct of Morrison and Brown (2004) is associated with the capability and process of managing projects. Following their description, project management effectiveness is intended to evaluate the organisation's capacity to consistently complete projects within the parameters of time, budget, and client requirements. Regarding the project management effectiveness construct, they make five key statements. Firstly, project management is heavily focused on achieving specified project objectives. Second, firms use project management to get long-term strategic advantages. Third, it is heavily reliant on systematic processes and a consistent resource base. Fourth, it operates in a mutually dependent connection with the rest of the organisation. Finally, project management needs to address stakeholder considerations such as customer requirements as well as management concerns and expectations.

2.1.4 Centralization of Project Information

When using any project management approach, a certain level of maturity is desired. Cooke-Davies and Arzymanow (2003) studied the maturity of project management in, among others, the Pharma industry, using qualitative methods. They developed a pilot version of a measurement instrument for project management practices containing nine aspects. This pilot version was developed using qualitative methods, tested and later improved by adding an additional aspect. Using this improved version of the instrument, it was found that the pharma industry has room for improvement on the maturity of project management. Of the aspects Cooke-Davies and Arzymanow (2003) researched, particularly the method and systems, and the centralization of project information for each project may be seen as relevant regarding the perceived effectiveness of the project management practices at Mediq. Therefore, the following hypothesis is suggested:

Hypothesis 1: Centralization of project information positively relates to perceived project management effectiveness.

2.2 Project team characteristics

A project team is expected to have several different aspects that determine the performance of the team. Mathieu et al. (2008) have reviewed team research between 1997 and 2007. They adopt the following definition of teams:

Collectives who exist to perform organizationally relevant tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are

embedded in an organisational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity. (pp. 411)

Mathieu et al. (2008) describe a team effectiveness framework with specific inputs to team effectiveness, being individual team member characteristics, team-level factors, and organisational and contextual factors. The input-process-outcome framework described by Mathieu et al. (2008) describes these factors as antecedents that enable and constrain team members' interactions. These antecedents lead to results of team activities such as team performance. A specifically noteworthy finding mentioned by Mathieu et al. (2008) is the potential of a mediator explaining why certain inputs affect team effectiveness and viability. An example of such a mediator is the state of the team climate, which is dynamic in nature. Climate can be seen as referring to the set of expectations, norms, and attitudes that individuals perceive to operate in the specific social context (Mathieu et al., 2008).

Scott-Young and Samson (2007) state that a key business objective for many domains is efficient project execution. They constructed and tested a model of organisational context, project leadership, project team processes, and project team design, affecting project outcome factors. They found that different combinations of project team factors drive project operability, schedule, and cost. Their paper ends with the advice for project managers to clearly prioritise and focus the project goals and adopt appropriate project team practice bundles facilitating these goals. Following these results, the perceived project management effectiveness construct may be connected to several project team characteristics. Furthermore, Newberry (2017) explored the characteristics and best practices of successful project teams, specifically within the defence industry. Newberry (2017) used a qualitative and exploratory case study approach to answer his research questions. The case study population entailed project managers experienced in leading high-performing teams within the defence industry. A questionnaire with open-ended questions was answered by participants and willing participants were included in semi-guided interviews. This study resulted in the conclusion about the most significant team characteristics being openness to constant performance measurement and having collaboration between team-members. Also, the most common best practice was found to be developing positive relationships through social interaction and communication. Furthermore, the need for leaders to ensure awareness of project information by team-members, team-member's capability in performing their assigned tasks, and them being equipped with the needed resources to complete the projects were emphasised.

Literature discusses many different aspects of work teams. As project teams are found in a work setting, all these aspects could potentially be applied to this topic. Considering the case study of

Mediq, specific project team characteristics are expected to be of more relevance based on in-company discussion and therefore are further elaborated on.

2.2.1 Goal Clarity

When going into project team characteristics, goal clarity is thought of as an important factor. Considering the study of Edmondson (1999), goal clarity can be defined as having a clear compelling project team goal that aids in increasing team effectiveness. Hoegl and Parboteeah (2005) used goal setting as a construct in their study regarding team goal commitment. They propose that on the team-level, goal commitment is particularly critical in highly innovative projects, suggesting that goal setting can be seen as a relevant aspect in project teams. Further supporting the relevance of goal clarity in project management, developing clearly described project objectives, requirements, and scope are to be treated as fundamental aspects of project management (Xia et al., 2016). To clarify, the goal or objective lies at the foundation of a project, followed by the requirements, and eventually followed by the scope delineation. Even though several authors mention that poor scope definition has a negative impact on project performance (e.g., Song & AbouRizk, 2005; Fageha & Aibinu, 2013), a causal relationship between project scope and project performance does not seem to have been established yet. Looking further into goal clarity, Edmondson (1999) studied psychological safety and learning behaviour in work teams using a combination of qualitative and quantitative methods. In her research, she reviewed many different aspects, of which mainly the goal clarity of the team is considered relevant in the current study. The purpose of asking about the presence of a clear goal in the study of Edmondson was to provide supplementary feedback to the teams and to obtain descriptions of team design from informants. In the study of Edmondson (1999) goal clarity was not included in the team learning model, however in a different research context this construct might still be relevant in a team setting. Combining these findings with the perceived project management effectiveness leads to the following hypothesis:

Hypothesis 2: Goal clarity positively relates to perceived project management effectiveness.

2.2.2 Role clarity

According to Feistritzer and Jones (2014), role clarity is an important element in overall team effectiveness. Role clarity can be seen as an individual team member having clear information associated with a particular role in the team and having a clear understanding of his or her task (Bray & Brawley, 2002). Within a project team, each team member should have a clear understanding of their role as well as how that role interacts with those of other team members to be able to reach team success. According to Lynn and Kalay (2015), literature on the direct impact of role clarity on team performance is sparce. Unfortunately, they have also not been able to confirm a significant

relationship between role clarity and team performance. However, as mentioned in the paper by Lynn and Kalay (2015), Rogers (2009) suggests the necessity of reminding team members of their role and the team goals at different times during the existence of a team. The relevance of role clarity in project management is suggested by Henderson et al. (2016). In their study global project team members are studied, which are employees working together, either online or offline, with people from different geographical locations within the same company. They found that having clear roles in a project team is critical to global project team members and helps build trust among project team members. This information leads to the following hypothesis:

Hypothesis 3: Role clarity positively relates to perceived project management effectiveness.

2.2.3 Task interdependence

As a third team aspect, task interdependence, refers to the perception of an individual team member of the extent to which they believe to depend on other team members for carrying out the task at hand (Van der Vegt & Janssen, 2002). Similarly, in the same study goal interdependence refers to the perception of an individual team member of the extent to which they believe that their goals can only be achieved when the goals of other team members are also met. Van der Vegt and Janssen (2002) found that task interdependence was positively and strongly related to innovative behaviour for individuals who perceived high levels of goal interdependence in heterogeneous teams. Also, they suggest that when more interaction is required to complete a task, team members have more opportunity to either promote or hinder each other's performance in terms of goal attainment. Van der Vegt and Janssen (2002) define innovative behaviour as following the process of generation, promotion and realization of new ideas within an organizational setting. Following this definition innovative behaviour can in the current study be seen as similar to project management, as this also focuses on following such a process. Considering various aspects of the project team as well as project management, task interdependence in the current study and in the case of Mediq is seen as an important aspect when looking at perceived project management effectiveness. Looking back at the framework of Mathieu et al. (2008) task interdependence is seen as an individual team member characteristic. Combining these findings with perceived project management effectiveness leads to the following hypothesis:

Hypothesis 4: Task interdependence positively relates to perceived project management effectiveness.

2.2.4 Time pressure

Another project team aspect that is determined to be in the scope of the current study is perceived time pressure. According to Janicik and Bartel (2003), discussions about time and temporal issues come forward when planning project tasks. Furthermore, Gevers et al. (2001) suggest that many project teams have difficulties meeting deadlines. In their study perceived time pressure is being used as a team-level aspect. The data for the study was collected by longitudinally administering a questionnaire to 93 students working in project teams. They propose a difference between low and high potency groups (low or high group effectiveness), where in low potency groups the performance is negatively affected by high levels of time pressure from the beginning of the project. Whereas in high potency groups time pressure does not affect the team performance until more towards the end of the project, when it even is implied that time pressure positively affects the team performance. Low potency groups are likely to procrastinate and give priority to more urgent or pleasurable tasks outside of the project, which can also be seen in the case study company of the current research. Combining these findings with the perceived project management effectiveness leads to the following hypothesis:

> **Hypothesis 5:** Perceived time pressure negatively relates to perceived project management effectiveness.

2.2.5 Diversity

Radhakrishnan et al. (2021) identifies two project team characteristics, being project team autonomy and project team diversity. They look into the impact of these characteristics on agile project management practices and project success in agile projects. They found that both project team characteristics have significant positive relationships with project agility. Diversity as a team aspect has been mentioned by many different authors, as seen in the systematic reviews of Homberg and Bui (2013) and of Patricio and Franco (2022). Faems and Subramanian (2012) differentiate this into functional diversity and demographic diversity. Functional diversity focuses on the variety in knowledge areas and educational background of employees, whereas demographic diversity entails the variety in gender, age and nationality. These two distinct types of diversity can be seen as individual level project team aspects when looking at the framework of Mathieu et al. (2008). Horwitz and Horwitz (2007) found task-related diversity to positively impact team performance. Here task-related diversity would be part of the functional diversity rather than the demographic diversity. Demographic diversity was studied by Bell et al. (2010), who found small negative relationships with team performance for race and sex variety diversity, and no relation to team performance for age diversity. Combining these findings with perceived project management effectiveness leads to the two following hypotheses:

Hypothesis 6: Functional diversity positively relates to perceived project management effectiveness.

Hypothesis 7: Demographic diversity negatively relates to perceived project management effectiveness.

To enable the analysis of data for these hypotheses in a later stage of the research, a split is made for several of the aspects that are included in functional and demographic diversity. This leads to the hypotheses being formulated as follows:

Hypothesis 6a: Functional diversity in terms of weekly project hours positively relates to perceived project management effectiveness.

Hypothesis 6b: Functional diversity in terms of years working at Mediq positively relates to perceived project management effectiveness.

Hypothesis 7a: Demographic diversity in terms of gender negatively relates to perceived project management effectiveness.

Hypothesis 7b: Demographic diversity in terms of age negatively relates to perceived project management effectiveness.

2.3 Exploratory research

During the problem exploration, two unstructured interviews were performed. These interviews provided input for the problem description and definition. Additionally, the interviewees mentioned several topics that might be included as exploratory research. One of these repeatedly came forward, in the next paragraph this specific topic will be elaborated on.

A topic that came from the problem description interviews will be called individual MPA involvement, which might be seen as a project management aspect. This topic entails several different items focusing on individual employees, being Individual MPA interest, Individual MPA perception, Individual MPA knowledge and Individual usage of MPA training and coaching. These four aspects are selected from the unstructured interviews with the HR Educational manager and PMO portfolio management. Looking at the framework of Mathieu et al. (2008) these MPA aspects are a combination of organisational factors, individual team member characteristics and team-level factors, as they are specific for the organisation but also consider the individual in the project team. By means of exploratory research, the topic of individual MPA involvement will be operationalized as a construct. Following the unstructured interviews and considering perceived project management effectiveness the following is expected:

Expectation 1: Individual MPA involvement positively relates to perceived project management effectiveness.

2.4 Conceptual model

The description of the current situation and the findings from literature raise many questions that need to be verified and further studied within the company. To create a visualisation of the scope of the current study, Figure 4 is created, which shows the topics that were previously found to be relevant in literature and translated into hypotheses on how several project team characteristics could be related to perceived project management effectiveness. Expectation 1 has also been included in the conceptual model.

Figure 4

Conceptual model
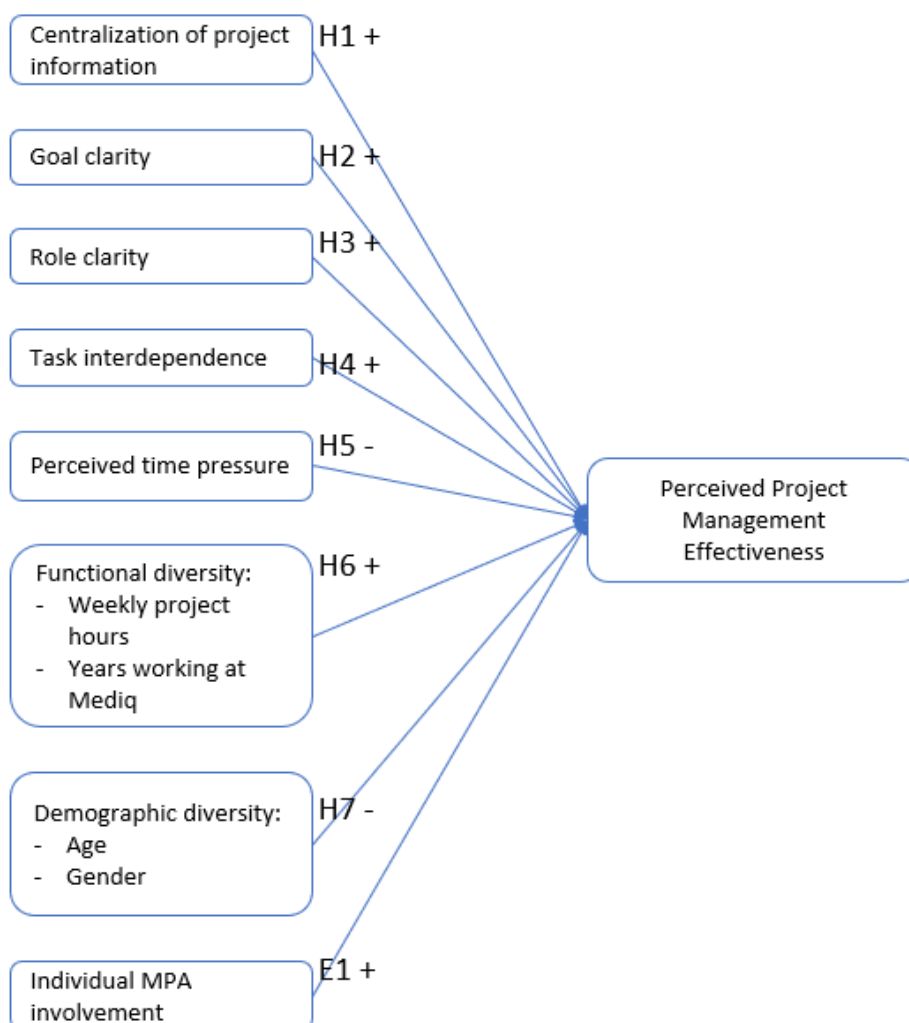
3. Study 1 - Qualitative methodology

The research results are produced using literature reviews, analysing interviews, and data analyses. The next step in this process is study 1, the qualitative study. The situation of Mediq as a case study limits the focused-on project team aspects to a specific selection from the vast amount of project team aspects that can be found in the literature. The goal of the qualitative study was to get an understanding about the potential relationships between the theorised constructs and to confirm their relevance for the case company.

3.1 Interview design

The information was gathered by conducting semi-structured interviews with several members of the project management office, project managers and project team members at Mediq. This type of interview allows the researcher to ask specific questions regarding the hypothesised constructs as well as in-depth questions in response to the interviewee's answers to clarify their view.

3.2 Participants

A total of six employees was selected for the interviews based on their position within Mediq. These pre-selected people were the BNL Transformation director (who also is the PMO manager), the portfolio manager, three project managers and one project team member. These employees were, at the time of the interviews, all involved in different ways with the project management within Mediq and have two or more months of experience with this. The selected employees all have Dutch as their native language, which is why the interviews were performed and transcribed in Dutch.

3.3 Procedure

The interviewees were informed ahead of time about the content of the interview via email. The interviews lasted approximately 30 to 45 minutes, depending on the length of the employee's answers to the interview questions. The used interview questions entail the topics from the previously stated hypotheses, the interview structure can be found (in Dutch) in Appendix A. At the start of each interview, the purpose of the interviews was explained, and the interviewee was asked for consent to record the interview. Furthermore, confidentiality was guaranteed, explaining that the identity of the employee will remain anonymous. Each interview ended with a thanks for participation, asking whether the interviewee has any remaining questions or comments, and asking whether they would like to receive the final results of the study.

3.4 Data analysis

To analyse the interviews, the transcripts were reviewed for readability and coded to identify recurring themes using a qualitative analysis software tool called QDA Miner Lite. The codes were

created using deductive processing, which is based on pre-existing key concepts, and emergent processing, which is based on concepts evolving from the data (Stuckey, 2015). Based on the deductive processing, the initial coding list includes the concepts discussed in Section 2. Other concepts emerging from the interviews were added to the list of codes when expected to be relevant, which follows from the emergent processing.

4. Study 1 - Qualitative results

In this chapter, the results of study 1, the qualitative study using the six performed interviews, are discussed. The goal of study 1 was to get an understanding about the potential relationships of the exploratory construct and to confirm the relevance of all theorised constructs for the case company. The sections are structured by topic and corresponding codes, discussing the relevance of each of the pre-determined constructs. A more detailed overview of the answers of the interviewees for each of the topics is included in Appendix C. In study 1 it was found that the constructs that were pre-selected during the problem exploration and using scientific literature were incomplete for the studied case, therefore role clarity was added as a construct.

The identity of the interviewees is kept anonymous, therefore no further information about their demographics and background is provided. At the time of the interviews, these people all worked with or at the Transformation department at Mediq.

Each of the topics contains several codes, an overview of these codes, their description, and how often they occur in the transcripts is provided in Appendix B, Table 3. Here it can be seen that particularly goal clarity and use of the Mediq project approach (MPA) were recurring topics in all interviews. Furthermore, role clarity arose as an additional potentially relevant topic. Since role clarity was not included in the first version of the theoretical background and conceptual model, it was retroactively added after performing the qualitative interviews.

4.1 Perceived project management effectiveness

In chapter 2.1, the construct of perceived project management effectiveness was discussed based on scientific literature. In five of the performed interviews this topic came forward, which suggests that perceived project management effectiveness is a relevant topic to further research in study 2, the quantitative study. The fourth interviewee did not specifically talk about this topic. The code used to identify this topic in the interview transcripts was PPME (Perceived Project Management Effectiveness), described as the perception of having or not having project management effectiveness.

According to the interviewees, Mediq faces challenges with project management, particularly in acquiring resources and managing the size of project teams. In the interviews, limited availability of

resources and unclear program goals were identified as key issues that can impede project management effectiveness. Several interviewees highlighted the lack of clarity regarding why certain problems are taken up as projects, which can lead to less effective portfolio management. One suggestion was to solve daily business problems within the daily business rather than turning them into projects. Additionally, project steering could be improved by selecting steering board members with appropriate expertise. Finally, a key to effective project management is to clearly define the "why" and "what's in it for me" for all stakeholders involved.

4.2 Centralization of project information

In chapter 2.1, the construct centralization of project information was discussed based on scientific literature. In five of the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The fifth interviewee did not specifically talk about this topic The codes used to identify this topic in the interview transcripts were:

- Digital information, described in the coding as information being centralized in a digital manner.
- Efficiency, described as information being centralized and contributing to project management efficiency.
- Undocumented information, described as information not being documented.

Using a standard location, like a SharePoint page, to store project information can improve project management by preventing contradictory or missing information. A standardized approach for sharing information is typically agreed upon at the start of a project. Centralizing information saves time, and Mediq's system makes it easy to find information. However, documentation can be incomplete, making people with specific knowledge more valuable. SharePoint pages are commonly used, and project managers create structured folders. Weekly huddles with set workdays are also used to track progress and set goals.

4.3 Goal clarity

In chapter 2.2, the construct of goal clarity was discussed based on scientific literature, this included the difference between a project goal and scope. In all of the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The codes used to identify this topic in the interview transcripts were:

- Scope/Scoping, described in the coding as the role of scoping in goal clarity.
- Goal changing, described as whether goals are changed during the project.

- Reaching goals, described as how goals are being reached.

- Goal definition, described as how goals are being defined.

- Having clear goals, described as whether goals are clear to the project team members.

The importance of clearly defining project goals and scope in project management is discussed with insights from five interviewees. All the interviewees agree on the importance of clearly defining project goals and scope, as it helps with decision-making, preparation, preventing task overlap, and achieving project success. The third interviewee suggests that project goals become more detailed as the project progresses, with main goals staying the same. The difficulty of defining the scope was also mentioned, emphasizing the need for project managers to ensure all stakeholders are aware of the goals and milestones before starting a project. The fourth interviewee notes that a well-defined scope helps team members understand their responsibilities and prevents task overlap.

4.4 Role clarity

In chapter 2.2, the construct of role clarity was discussed based on scientific literature. In all the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The codes used to identify this topic in the interview transcripts were:

- Division of roles, described in the coding as how roles are being divided among different people.
- Decision making, described as taking on the role of making a decision.
- Role description, described in the coding as how roles are described.
- Sponsors, described as the role of the project sponsor.
- Role searching/finding, described as people looking for their role within a specific area.

In the interviews clear role descriptions and division of responsibilities are seen as crucial for effective project management. Interviewees suggest that project sponsors may struggle with their role and responsibilities, and that having a sponsor at a level below management could help divide responsibilities better. Altering project management to fit the team at hand is also highlighted as important. Project managers often take on an advisory role in making important decisions and need to work closely with the project sponsor to reach project goals and overcome impediments.

4.5 Task interdependence

In chapter 2.2, the construct of task interdependence was discussed based on scientific literature. In all the performed interviews this topic came forward, which suggests that this construct can be a

relevant topic to further research in study 2, the quantitative study. The codes used to identify this topic in the interview transcripts were:

- Team dependency, described in the coding as the dependency on other team members for completing tasks.
- Method dependency, described as the effect of the project management method onto the task interdependence.
- Independency, described as team members working independently.

As can be read from the interviews, task interdependence is inherent in a project team as different departments and individuals are needed to complete a project. Multi-disciplinary teams inherently work together, but some tasks can be done alone. Creating an overview and action list can aid project team members in knowing what needs to be done and by whom, which can create calmness or peace in the workflow. Dependencies are made transparent in project management and agreement is reached about deadlines and input availability. In the interviews, it came forward that gathering information is often the most important factor in project dependency. Furthermore, while a specific project management method can create a high-level overview of the project, ultimately tasks are not dependent on the method used. Choosing specific elements of a project management method can enhance project team effectiveness. For example, using aspects of Agile methodology can force people to work together and find each other.

4.6 Perceived time pressure

In chapter 2.2, the construct of perceived time pressure was discussed based on scientific literature. In all the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The codes used to identify this topic in the interview transcripts were:

- Prioritization, described in the coding as project activities being prioritized or not prioritized.
- Work pressure, described as employees experiencing work pressure.
- Temporal pressure, described as employees experiencing temporal pressure.

From the interviews it was found that time pressure is a common experience. The cause of the pressure varies, including a combination of daily operational tasks and project work, project deadlines that are pressured by other activities, and a desire to fix many problems at once. Overall, the experience of pressure within Mediq is influenced by various factors, but a structured project planning approach can help mitigate some of the pressure. The use of a concrete project planning and clear task

ownership can help alleviate some of the pressure. Additionally, planning for more time than necessary can provide a margin for unexpected setbacks and reduce time pressure.

4.7 Functional diversity

In chapter 2.2, the construct of functional diversity was discussed based on scientific literature. In four of the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The code used to identify this topic in the interview transcripts was functional diversity, described as a project team being diverse on the level of functional aspects.

The first two interviewees did not discuss functional diversity, but the third interviewee believes that having people from different departments on a project team can have a positive impact on project results. However, a functionally diverse team may have challenges due to differences in work style. The sixth interviewee suggests that having a functionally diverse team can positively influence group dynamics and project success, but in Mediq, the same people often get appointed to work on different projects. The fourth interviewee notes that it can be difficult to identify the right people for a project. The fifth interviewee explains that working with a functionally diverse team is challenging due to logistic challenges and differences in knowledge and experiences, and the main challenge is creating a team where people understand each other.

4.8 Demographic diversity

In chapter 2.2, the construct of demographic diversity was discussed based on scientific literature. In three of the performed interviews this topic came forward, which suggests that this construct can be a relevant topic to further research in study 2, the quantitative study. The code used to identify this topic in the interview transcripts was demographic diversity, described as a project team being diverse on the level of demographic aspects.

The first, second, and fourth interviewees didn't discuss demographic diversity, but the third interviewee believes that having a project team with people from different ages and cultural backgrounds leads to more success. Furthermore, age and education can affect work preferences, which can cause differences in working styles and provide a more diverse view that may improve the success of the project team. The fifth interviewee agrees that age, IQ, and EQ levels can impact teamwork and that teams with more senior members may require less guidance. However, Mediq often only has one employee available with the necessary knowledge. The sixth interviewee confirms that teams with diverse ages and cultures are beneficial in creating different views and creative solutions.

4.9 MPA involvement

In chapter 3.1, the construct of MPA involvement was discussed as an exploratory topic specific to Mediq as a case company. In the six performed interviews this topic came forward, suggesting that this might be a relevant topic to further research in study 2, the quantitative study. The different codes used in the interview transcripts to identify this topic were:

- Templates, described as the usage of (MPA) templates for project management.
- MPA usefulness, described as whether the person experiences the MPA as useful.
- MPA goals, described as what according to the interviewee the goals of the MPA entail.
- Training, described as whether the person participated in any MPA training.
- MPA embeddedness, described as whether the MPA is embedded in the business.

In the semi-structured interviews a shared opinion is found that the MPA aims to provide structure and uniformity to project management within Mediq, with a focus on completing projects efficiently and effectively. The MPA's usefulness is dependent on the type of project being undertaken (i.e. light or heavy), and project managers feel encouraged to select relevant templates while maintaining the provision of company-wide information using the reporting structure. The scope statement is seen as the most important document; however, templates are used selectively depending on the project's needs. The MPA is seen as particularly helpful for employees that lead projects in the role of the project manager without being extensively trained to do so. However, there is a need for more widespread adoption of the MPA within Mediq. Considering these results from the qualitative interviews, a further exploration of the topic in the quantitative study is potentially relevant.

4.10 Other topics

In addition to the previously discussed topics, some other topics came forward. Three of the interviewees talked about processes related to project management. Therefore, a short overview of what was mentioned about this topic will now be provided. The following codes were used in the interview transcripts referring to processes:

- BPF, which stands for Business Process Framework.
- Project process, described in the coding as the process behind managing a project.
- Process responsibility, described as the responsibility for different business processes.
- Process knowledge, described as knowledge about business processes.

As found in the interviews, processes often play an important role within projects and are related to different departments. Optimizing a process requires a broad view, looking at different possibly related aspects. The Business Process Framework at Mediq is under development and aims to have

business processes available in an accessible tool. As processes are a topic that is rather different from projects and project management, this information will not be further researched in the quantitative study. However, process management can be a relevant topic for future studies within Mediq.

4.11 Summary of the qualitative results

Considering the results from the qualitative interviews, the different topics that were previously found in the literature review and formulated into hypotheses are still deemed relevant to look into during study 2, the quantitative study. Mediq is facing challenges with project management, specifically in acquiring resources, managing project team size, and a lack of clarity on project goals, which hinders project management effectiveness. Standardized storage of project information on SharePoint can prevent contradictory or missing information. Defining project goals and scope, having the right people in the right roles, and managing time pressure are also important factors. It is essential to clearly define the "why" and "what's in it for me" for all stakeholders involved. Task interdependence is inherent in project teams, and creating an overview and action list can help in managing the workflow. Functional and demographic diversity can positively impact projects but can also create challenges. The MPA aims to provide structure and uniformity to project management within Mediq, with the scope statement seen as the most important document. However, the MPA templates are used selectively, depending on the project's needs.

5. Study 2 - Quantitative Methodology

The next step in the research process is study 2, the quantitative study. The goal of the quantitative study is to test the hypothesised relationships of the theorised constructs and to confirm or reject these hypotheses using data from case company.

5.1 Quantitative sampling and data collection

An online survey was set up using the Qualtrics survey tool, to further explore and study the situation at the case company. This survey was developed to investigate the project team characteristics and perceived project management effectiveness. Its main goal was to collect data for a data analysis regarding the effects of the different theorised project team characteristics on perceived project management effectiveness, including the suggested exploratory construct of MPA Involvement.

The population for the survey within the case company Mediq was estimated to contain about 20 employees that act as project managers and about 60 people that are working as or have worked as project team members. Furthermore, about 50 projects are or have been running at Mediq in 2022. Participants were initially approached by email. This email can be found in Appendix D (in Dutch) and

contains a brief explanation of who is doing the research, what the thesis is about and its goal. It emphasises the anonymity of the respondents and contains a link to the questionnaire.

The survey consists of Likert-scale questions and had a cross sectional design coupled with a convenience sampling strategy. The questions correspond to different topics and are organised into constructs accordingly. The questions were divided over eight pages where within each page randomization was applied so every participant received the questions in a different order, with the exception of the questions on demographic and functional diversity to prevent confusion about these questions. At the top of each questionnaire page, it was made clear that the questions in the survey ask for the participants' own experience with projects at Mediq. To be able to perform the randomization of questions in Qualtrics, five groups were created for the questions belonging to the different constructs.

On the first page of the survey, questions regarding demographic diversity were asked. The first group of questions, on the second questionnaire page, contained questions on the constructs centralization of project information and individual MPA involvement. At the top of this page, a short explanation of the MPA was provided in addition to the previously mentioned text, as shown in Appendix F. The second group, on the third questionnaire page, contained questions on the constructs task interdependence and perceived time pressure. The third group, on the fourth questionnaire page, contained questions on the constructs goal clarity and role clarity. The fourth and fifth group, on the fifth and sixth questionnaire pages, contained questions on perceived project management effectiveness. On the seventh page, questions regarding functional diversity were asked. On the eighth page of the survey, participants were asked to leave their e-mail address when they would like to receive the results of the study. Here it was made clear that anonymity would be compromised when doing so and the option was provided to send an e-mail asking for the results outside of the survey instead of filling in this question. After completing the survey, participants were thanked for filling in the questionnaire and a reward in the form of a free download for a computer background was provided.

The survey took about ten minutes to be completed and was tested with some of the previously interviewed employees to ensure there were no unclarities. The questionnaire was kept online for seven weeks, from the sixteenth of December until the third of February, during which several reminders were sent to stimulate the response rate. The potential participants received a total of three e-mails, containing the initial e-mail and two reminders. Furthermore, a message was posted onto the company social media site called Yammer, as a third reminder for the potential participants. In addition to these online reminders, several potential participants were also approached in person in the

company office and asked whether they and their co-workers had already filled in the survey. These efforts were made to gather the largest sample possible. This is needed because the sample size, together with the effect size and significance level, greatly influences the level of statistical power that can be reached. The statistical power can also be described as the likelihood of a significance test to find an effect when there is one.

5.2 Quantitative (survey) measures

The survey consisted of one single part with closed questions with predetermined answering options and scales, for each of the survey questions the participant could indicate how much they disagreed or agreed with the statement choosing from 5 different options. The Likert scale that applies to several of the questions, ranges from one, *strongly disagree*, to five, *strongly agree*. A higher score therefore indicates a higher agreement on the statement. To create a construct from the corresponding questions the mean of the respondent scores was calculated and the Cronbach's alpha value for the construct was computed to determine the internal consistency.

5.2.1 Theorised constructs

The first construct that was asked about in the survey is that of perceived project management effectiveness (PPME). As studied by Morrison and Brown (2004) this construct could contain 78 different items divided over a total of 13 topics. In their study these items were tested with an expert panel to determine their backing and support for each of these items. Morrison and Brown (2004) have divided the thirteen topics into four categories, being the organisational input dimension, the project management process dimension, the short-term results dimension, and the strategic impact dimension. The article suggests considering items to be removed based on the specific focus of a study, or the measurability of an item in a practical setting. The case study of Mediq focuses specifically on the perception of the project team members regarding effectiveness of the project management practices. Looking at the discussed literature on project management effectiveness and the results from the qualitative interviews, particularly the usage of project management tools (Hyväri, 2006), behaviour of project managers (Hyväri, 2006), achieving specified project objectives (Morrison & Brown, 2004), employing systematic processes (Morrison & Brown, 2004), and standardisation of project management (Milosevic et al., 2001) are deemed within the scope of the current study.

Now, going back to the study of Morrison and Brown (2004), not all of their topics are part of the scope of the current research. Therefore, a selection of the topics and items to be used in the survey construct was made. The topics selected from the study of Morrison and Brown (2004) for the construct of perceived project management effectiveness were: operational outcomes, rational project decision-making, appropriate methodology, organisation and authority, and access to

resources. Operationalizing these topics into survey items leads to a total of 16 items. An example of an item is "The organization has a standardised and effective system for managing projects", which belongs to the topic of appropriate methodology. Since the survey has only participants that work at Mediq this item is formulated as follows: "Mediq has a standardised and effective system for managing projects." All items for this construct that are used for the Mediq participants can be found in Appendix F. The survey questions for the selected items used a five-point Likert scale as described above. After the necessary recoding, a higher score for the construct indicates a higher perceived project management effectiveness.

Another construct is centralization of project information. This construct was measured using a combined scale of Cooke-Davies and Arzymanow (2003) and Morrison and Brown (2004), containing two items. The first item comes from Cooke-Davies and Arzymanow (2003) and is formulated as follows "All project plans, functional plans and project deliverables are centralised under the control of the project." The second item comes from Morrison and Brown (2004) under the topic of communication and is formulated as follows: "Project information systems provide helpful and accurate project information." The items are rewritten for the Mediq participants, the used formulation can be found in Appendix F. The survey questions for these items made use of a five-point Likert scale as described above. For this construct a higher score indicates a higher level of centralization of project information.

Goal clarity was measured using a combined scale of Edmondson (1999) and Hoegl and Parbotheeah (2006). This scale contains three items. The first item is "There are clear and comprehensible goals for this project." The second item is as follows "Project goals change substantially during the project". The third item is "Project goals are changed often". Here the second and third item needed to be reverse coded. These three questions are rewritten for the Mediq participants, the specific formulation can be found in Appendix F. The survey questions for these items used a five-point Likert scale as described above. After the necessary recoding, a higher score here indicates a higher goal clarity.

Role clarity was measured using the scale of Henderson et al. (2016). At the start of this topic, participants were asked to think about their job in relation to their primary project team. The first item in this scale is "I feel certain about how much authority I have." The second item is "There are clear, planned goals and objectives for my job." The third item is "I know that I have divided my time properly." The fourth item is "I know what my responsibilities are." The fifth item is "I know exactly what is expected of me." The sixth and final item is "Explanation is clear of what has to be done." These six questions are slightly rewritten for the Mediq participants, the specific formulation can be found in Appendix F. The survey questions for these items used a five-point Likert scale ranging from (1) strongly

disagree to (5) strongly agree. After the necessary recoding, a higher score here indicates a higher role clarity.

Task interdependence was measured using the scale of Van der Vegt and Janssen (2003). This scale contains three items to include into the construct. The first item is "The tasks I perform in this project can be performed fairly independently of other team members", this item will need to be reverse coded. The second item is "The tasks I perform in this project require frequent coordination with the efforts of other team members." The third and final item here is "Performance on the tasks I perform in this project is dependent on receiving accurate information from other team members." These three questions are somewhat rewritten for the Mediq participants, the specific formulation can be found in Appendix F. The survey questions for these items used a five-point Likert scale as described above. After the necessary recoding, a higher score here indicates a higher task interdependence.

Time pressure within the project team is used as the fourth construct and was measured using the scale of Gevers et al. (2001). This four-item scale is developed focussing on project groups. The questions of this scale are somewhat rewritten for the Mediq participants mainly adding the words "…as a project team…", the specific formulation can be found in Appendix F. Furthermore, all items are preceded by the words "In my opinion/experience…" The first item of this scale is "We have too much work to do for the time available." The second item is "We have to work extra hard to finish the work on time." The third item of this scale is "We have to hurry to finish tasks on time." The fourth and final item of the scale is "We experience time pressure." As is the case with several of the other constructs, the survey questions for these items used a five-point Likert scale as described above. For this construct a higher score indicates higher time pressure.

The topic of team diversity might be seen as less straightforward than several of the other constructs. Based on Faems and Subramanian (2012), the topic can be divided into two constructs, being functional diversity and demographic diversity. Functional diversity contains four items, having several predetermined answering options. It contains items on education qualification, time working at Mediq, hours spent on projects each week, functional background, and projects the employee participated in. Demographic diversity contains three items, with predetermined answering options. It contains items on age, gender, and nationality. In Appendix F the used formulation of the functional and demographic diversity items can be found.

5.2.2 Exploratory construct

Individual MPA involvement is an exploratory and self-developed construct. The scale contains four positively stated items with the aim to investigate the individual effort of applying the Mediq

Project Approach. The first statement here is "I am interested in using the Mediq Project Approach", the second statement is "I think the Mediq Project Approach is useful for managing projects within Mediq", the third statement is as follows "I know what the Mediq Project Approach asks me to do within a project", the fourth and final statement is "I make or made use of the available training and coaching for the Mediq Project Approach". In the survey these items were answered using a five-point Likert scale as described above. A higher score here indicates higher involvement in using the MPA.

5.3 Quantitative data analysis

For the data screening and analysis, SPSS version 26 was used (IBM SPSS Statistics, 2019). The survey data was screened for missingness and outliers before analysis. After this screening, the mean and standard deviation was calculated for each construct and the constructs were checked for internal consistency by testing whether all items included into a construct measure the same variable. This was done by computing the Cronbach's alpha value for each construct. In literature Cronbach's alpha values of 0.9 or higher indicate excellent internal consistency and values between 0.8 and 0.89 are considered to be a sign of good internal consistency. Values between 0.7 and 0.79 are acceptable. (George & Mallery, 2004) Values below 0.5 are unacceptable. Furthermore, bivariate correlations were computed where applicable.

In the regression analyses that followed the initial data screening and tests, the data was checked for the assumptions of linear regression; being independence of the error term, normality, linearity, and homoscedasticity (Hair et al., 2014). For each of the linear regression analyses the following assumptions need to hold:

1. Independent observations; Which is already confirmed in the dataset.
2. Normality: the errors must follow a normal distribution in population;
3. Linearity: the relation between each predictor and the dependent variable is linear;
4. Homoscedasticity: the errors must have constant variance over all levels of the predicted value.

According to the Central Limit Theorem, a normal distribution is assumed to be followed with a sample size larger than or equal to 30; this assumption was met with the number of respondents that was acquired, being 49 usable replies. The linearity and homoscedasticity assumptions are best evaluated from a residual plot. This is a scatterplot with predicted values in the x-axis and residuals on the y-axis. Both variables have been standardized in this study but this doesn't affect the shape of the pattern of dots.

All hypotheses (H1-H7) and the expectation (E1) were initially tested using linear regression. The formula that applied for these analyses can be found in Appendix E. When using SPSS to perform

these analyses the tables with the linear regression results are shown first, after which the remaining charts to test the assumptions of linear regression are added. In addition to the initial linear regression tests, the constructs that did not show to have a linear relationship were tested using a quadratic regression test, also known as a curvilinear relationship. In the discussion section of this report specific attention is given to the constructs for which this curvilinear relationship was found to be relevant.

6. Study 2 - Quantitative results

The quantitative results start off with a general description of the gathered data. This is then followed by the demographics of the respondents. Next the construct reliability is tested, and the descriptive statistics and correlations are provided. After this the hypotheses are tested using both linear and quadratic regression analyses. At the end of the quantitative results, a summary of the hypothesis tests can be found.

6.1 Quantitative data

As can be seen in Appendix G, Table 4, a total of 77 respondents opened the survey that was sent out to gather the qualitative data. Not all respondents completed the survey, several of the incomplete entries were removed. The removed data entries were less than 50% complete. After this selection the dataset consisted of 49 Mediq employees working in a project setting. The remaining data entries were checked for missingness, and mean substitution was applied where missing data entries were encountered. This approach was chosen based on the missing data being missing completely at random, the need to replace the missing data with values using imputation, and the wish to calculate replacement values from the valid data. The dataset was cleaned up further by removing unnecessary columns containing information on timing of the survey, the IP addresses and the geographical latitude of the respondent. Finally, the dataset was loaded into SPSS and a check was performed on the type of data, ordinal or nominal, for each of the available items.

6.2 Respondent demographics

Several demographics were retrieved from the dataset of 49 usable replies. The minimum age of the respondents was 25 and the maximum age was 63. The mean age was found to be 49.49, with a standard deviation of 10.683. Of the respondents 29 identified as male (59,18%) and 20 identified as female (40,82%). Of the respondents 23 completed a bachelor's degree (46,94%) and 17 completed a master's degree (34,69%). The respondents have been working at Mediq for different amounts of time. 17 people (34,69%) have been working at Mediq for less than 3 years. 11 people (22,45%) have been working at Mediq for more than 3 years and less than 5 years. 21 people (42,86%) have been working at Mediq for more than 5 years. The minimum hours spent on projects each week by the respondents was 2, the maximum hours spent was 40, with an average of 18.3 hours spent on projects each week

and a standard deviation of 10.8 hours. Of the respondents 43 people originated from western Europe (87,76%) and 6 people originated from northern Europe (12,24%). The functional background of the respondents varied greatly, as can be seen in Table 5.

Table 5

Functional background

		Frequency	Percentages of total (%)
Valid	IT	8	16,33
	Customer Contact Center	7	14,29
	Supply Chain	3	6,12
	Finance	5	10,20
	e-Business	4	8,16
	Sales	5	10,20
	Human Resources	2	4,08
	Category Management	1	2,04
	Marketing	2	4,08
	General/Other	9	18,37
	Total	46	93,88
Missing	System	3	6,12
Total		49	100,00

6.3 Construct reliability

The constructs are created using the corresponding items. Constructs are created for concepts that were assessed by means of more than one item. The construct reliability is considered a measure for the internal consistency of the constructs. Next, the hypotheses were tested. It is assumed that all items within a construct have an equal weight, this means that for each respondent a score can be calculated using the mean. As can be seen in Table 6, for all the constructs the Cronbach's alpha value is found to be higher than 0,7, with the exception of task interdependence. Task interdependence has a low value for Cronbach's alpha (<0,5), which means the results from this construct are less reliable then for the other constructs/topics.

Table 6

Cronbach's alpha values

Construct name	Including items	Cronbach's alpha	Cronbach's Alpha Based on Standardized Items
Centralization of project information (CPI)	CPI1 CPI2	0,799	0,808
Individual MPA (Mediq Project Approach) perception	MPA1 MPA2 MPA3 MPA4 MPA5	0,740	0,748
Task interdependence (TI)	TI1_r TI2 TI3	0,149	0,139
Time pressure (TP)	TP1 TP2 TP3 TP4	0,836	0,836
Goal clarity (GC)	GC1_r GC2 GC3	0,783	0,791
Role clarity (RC)	RC1 RC2 RC3 RC4 RC5 RC6	0,822	0,824
Perceived project management effectiveness (PPME)	PPME1 PPME2 PPME3 PPME4 PPME5 PPME6 PPME7 PPME8 PPME9 PPME10 PPME11 PPME12 PPME13 PPME14 PPME15 PPME16 PPME17	0,922	0.932

6.4 Descriptive statistics and correlations

In Table 7, the descriptive statistics are being reported. Here it can be seen that for each of the different constructs a normal distribution graph can be created. Also, the mean value for PPME appears to be lower than for the other constructs, and the standard deviation for CPI appears to be somewhat higher than for the other constructs. Furthermore, in Appendix H, Table 8, the correlations between all different constructs are shown with their significance value (* for $p \leq .05$; ** for $p \leq .01$; *** for $p \leq .001$). Considering the hypotheses, several correlations between the different constructs are expected to be significant. The correlation between centralization of project information (CPI) and PPME was not significant (p= 0.169), which was not expected. The correlation between goal clarity (GC) and PPME was negative and significant (p= 0.003**). The correlation between role clarity (RC) and PPME was positive and significant (p= 0.001***). The correlation between task interdependence (TI) and PPME was not significant (p= 0.079), which was not expected. The correlation between perceived time pressure (TP) and PPME was not significant (p= 0.206), which was not expected. The correlation between weekly project hours and PPME was not significant (p= 0.963), which was not expected. The correlation between years working at Mediq and PPME was not significant (p= 0.185), which was not expected. The correlation between gender and PPME was not significant (p= 0.590), which was not expected. The correlation between age and PPME was not significant (p= 0.569), which

was not expected. The correlation between individual MPA involvement (MPA) and PPME was not significant (p= 0.185), which was not expected.

Table 7

Descriptive statistics

Construct	N	Minimum	Maximum	Mean	Std. Deviation
MPA	49	1,00	5,00	3,6327	,87402
CPI	49	1,00	5,00	3,6429	1,00519
TI	49	2,67	5,00	3,7619	,60093
TP	49	1,00	5,00	3,5408	,93868
GC	49	1,00	5,00	3,4150	,98726
RC	49	1,50	4,83	3,4864	,84220
PPME	49	1,24	3,88	2,5455	,70430

6.5 Hypothesis testing

In the hypothesis testing, a standard approach was used for each of the hypotheses. First a scatterplot of the hypothesised construct in relation to perceived project management effectiveness (PPME) is made. Next a linear regression test is performed including the beta value, t value, significance level p, and the adjusted R squared for each of the project team characteristics. In Table 9 the results of the linear regression analyses on the relationship between the different project team characteristics (independent variables) and PPME (dependent variable) can be found. Each of these analyses was performed separately, for which the steps are described in section 5.3 Quantitative data analysis and elaborated in the now following paragraphs.

The applied threshold for the significance level p is 0.05, meaning that a value for the significance level p below 0.05 means the hypothesis can be accepted and that a value equal to or above 0.05 means that the hypothesis cannot be accepted. The direction and strength of the relationship with PPME for the project team characteristics is indicated by the standardized coefficient (beta) where a value closer to plus or minus 1 indicates a stronger effect and value closer to zero indicates a weaker effect. Additionally, in each of the linear regression analyses an analysis of the R, R squared, and adjusted R squared was performed. In each of these analyses' shrinkage was detected, which possibly is due to small sample size. This means there is a low estimate of predictive accuracy of the independent variables for PPME. Furthermore, following the order in which the analyses are shown in SPSS, the data was checked for the remaining assumptions of linear regression; being normality, linearity, and homoscedasticity. Finally, in the case the assumptions did not hold, or the linear regression test did not show significant results, a quadratic regression test was performed. The sample

size is not large enough to draw meaningful conclusions. However, a suggestion on the best fitting model in terms of linear or quadratic can be made with a recommendation for further exploration in a future study.

Table 9

Linear regression analyses summary with PPME as the dependent variable

Independent variable	beta	t(df)	p	R^2 adjusted
CPI	.200	t(48) = 1,397	.169	.019
GC	-.420	t(48) = -3.175	.003 **	.159
RC	.442	t(48) = 3.381	.001 ***	.179
TI	-.253	t(48) = -1.797	.079	.044
TP	-.184	t(48) = -1.282	.206	.013
Weekly project hours	-.007	t(48) = -.047	.963	-.021
Years working at Mediq	.193	t(48) = 1.345	.185	.017
Gender	.079	t(48) = .543	.590	.006
Age	.083	t(48) = .573	.569	.007
MPA	.192	t(48) = 1.345	.185	.013

Note. * for p<= .05; ** for p<= .01; *** for p<=.001

6.5.1 Centralization of project information (Hypothesis 1)

Linear regression was aimed for to predict PPME based on CPI. In the scatterplot in Figure 5, a line is seen that goes upwards diagonally. This could indicate a positive effect. Regarding the assumptions for linear regression, normality might be suggested when analysing the normal probability plot in Appendix I, Figure 6, however some skewness can be seen. From the plot of the residuals opposing the predicted values as shown in Appendix I, Figure 7, neither homoskedasticity nor linearity can be confirmed. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = 1.397, p = .169 and R^2 adjusted = .019. Therefore H1 is not confirmed, the data does not confirm a linear relationship of CPI onto PPME.

To create a more complete overview the data was tested for having a quadratic relationship using a quadratic regression test. A visualisation of the data as a plot with quadratic relationship is shown in Figure 8. As can be read from Table 10, p = .165 for the quadratic regression test, which is

not significant. Therefore, the results from the regression tests do not show what model would be most suitable.

Figure 5

Scatterplot CPI with PPME Linear for N=49
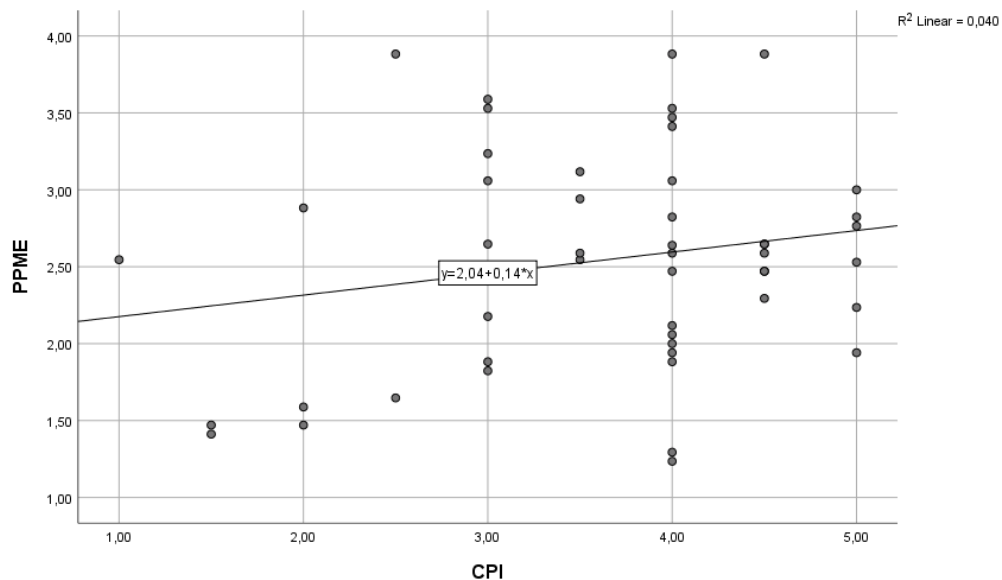
Figure 8

Scatterplot CPI with PPME quadratic for N=49
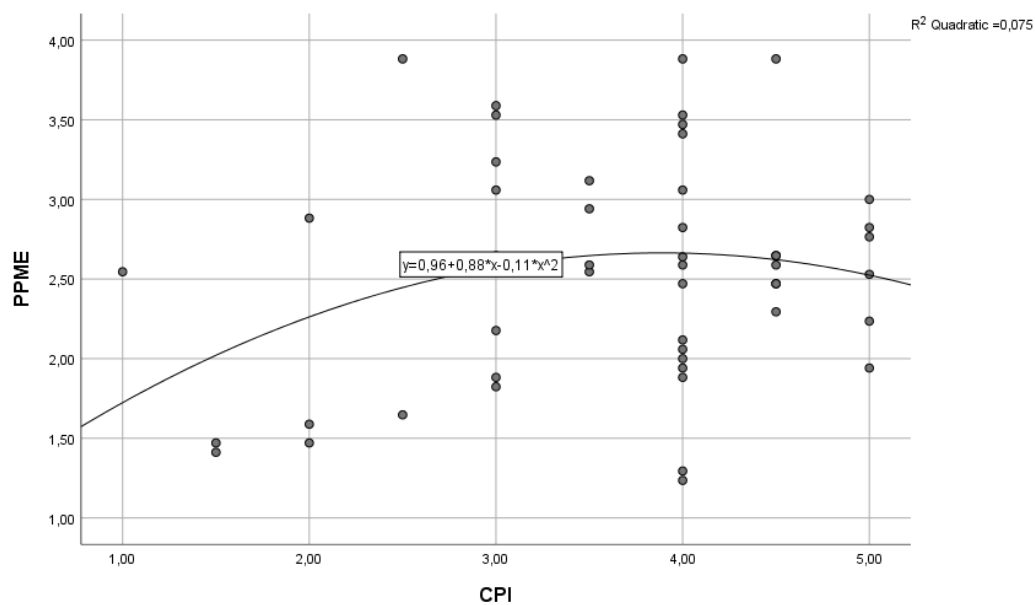
Table 10

Model Summary and Parameter Estimates for the prediction of PPME by CPI

Equation	Model Summary				
	R Square	F	df1	df2	p
Linear	0,04	1,951	1	47	0,169
Quadratic	0,075	1,877	2	46	0,165

Dependent variable: PPME
Independent variable: CPI

6.5.2 Goal clarity (Hypothesis 2)

Linear regression was aimed for to predict PPME based on GC. In the scatterplot in Figure 9, a line is seen that goes downwards diagonally. This could indicate a negative effect. Regarding the assumptions for linear regression, normality can be confirmed when analysing the normal probability plot in Appendix I, Figure 10. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 11, both homoskedasticity and linearity can be confirmed. Therefore, the results for the second hypothesis from the regression test show that a linear model would be suitable for the data. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = -3.175, p = .003 and R^2 adjusted = .159. The scale of goal clarity runs from 1 = positive to 5 = negative whereas the scale of PPME runs from 1 = negative to 5 = positive. Therefore H2 is confirmed, goal clarity in the used dataset has a positive relationship with PPME. Higher goal clarity thus leads to higher PPME.

Figure 9

Scatterplot GC with PPME linear for N=49
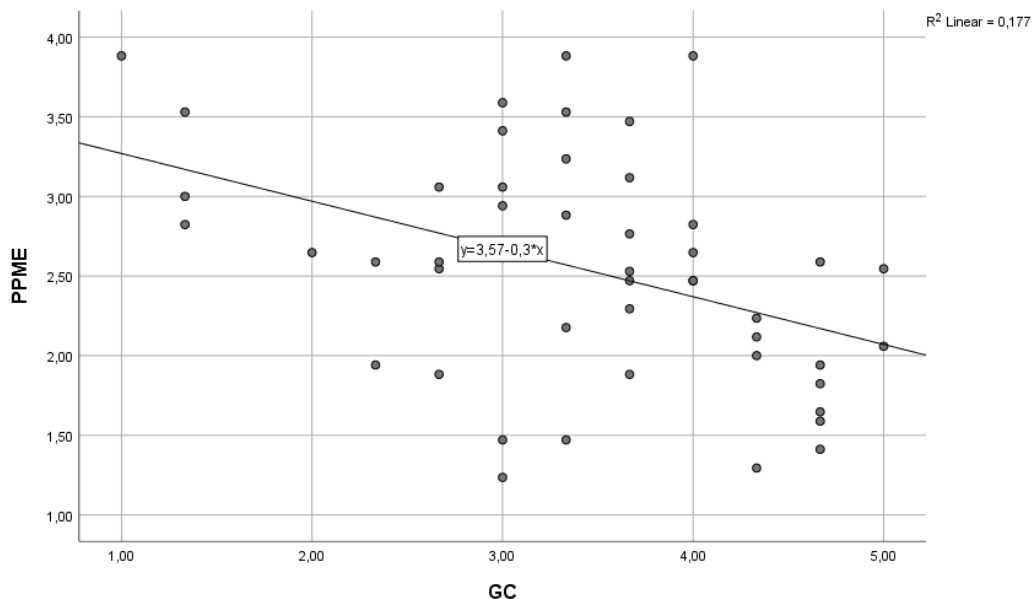
6.5.3 Role clarity (Hypothesis 3)

Linear regression was used to predict PPME based on RC. In the scatterplot in Figure 12, a line is seen that goes upwards diagonally. This could indicate a positive effect. Regarding the assumptions for linear regression normality can be confirmed when analysing the normal probability plot in Appendix I, Figure 13. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 14, both homoskedasticity and linearity can be confirmed. Therefore, the results for the second hypothesis from the regression test show that a linear model would be suitable for the data. In Table 9 the results for the linear regression test are shown, here it can be seen that $t(48) = 3.381$, $p = .001$ and R^2 adjusted $= .179$. Therefore H3 is confirmed, role clarity in the used dataset has a positive relationship with PPME. Higher role clarity thus leads to higher PPME.

Figure 12

Scatterplot RC with PPME linear for N=49

6.5.4 Task interdependence (Hypothesis 4)

Linear regression was aimed for to predict PPME based on TI. In the scatterplot in Figure 15, a line is seen that goes downwards diagonally. This could indicate a negative effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 16. From the plot of the residuals opposing the predicted values as shown in Appendix I, Figure 17, homoskedasticity is suggested, however linearity cannot be confirmed. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = -1.797, p = .079 and R^2 adjusted = 0.44. Therefore H4 is not confirmed, the data does not confirm a linear relationship of TI with PPME.

To create a more complete overview the data is tested for having a quadratic relationship using a quadratic regression test. A visualisation of the data as a plot with quadratic relationship is shown in Figure 18. As can be read from Table 11, p = .031 for the quadratic regression test, which is significant. A quadratic relationship might be suitable for the data. Higher task interdependence thus leads to lower PPME until a certain nadir is reached, after which higher task interdependence leads to higher PPME.

Figure 15

Scatterplot TI with PPME linear for N=49

R^2 Linear = 0,064

y=3,66-0,3*x

Figure 18

Scatterplot TI with PPME quadratic for N=49

R^2 Quadratic =0,140

y=10,81-4,21*x+0,52*x^2
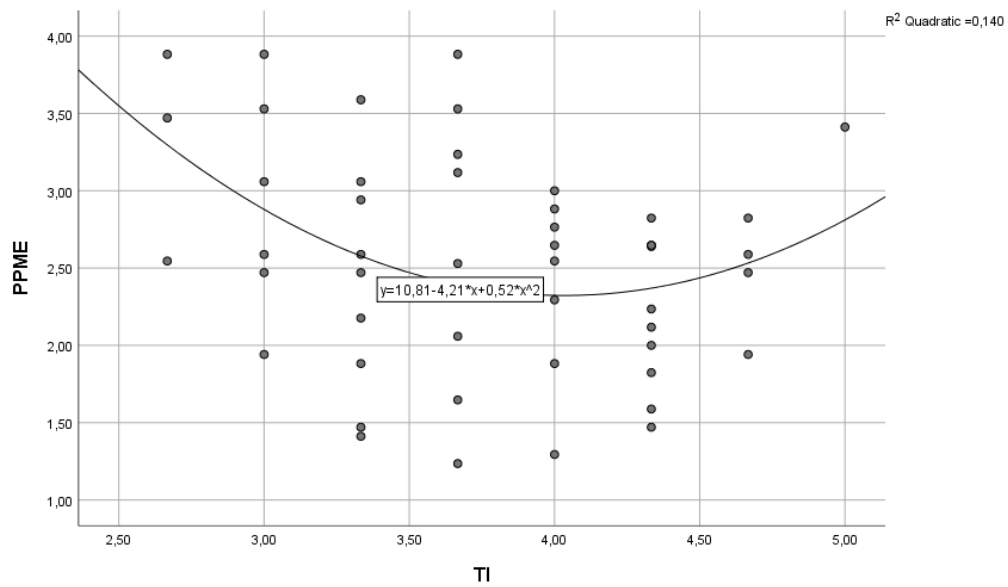
Table 11

Model Summary and Parameter Estimates for the prediction of PPME by TI

Equation	Model Summary				
	R Square	F	df1	df2	p
Linear	0,064	3,228	1	47	0,079
Quadratic	0,14	3,746	2	46	0,031

Dependent variable = PPME
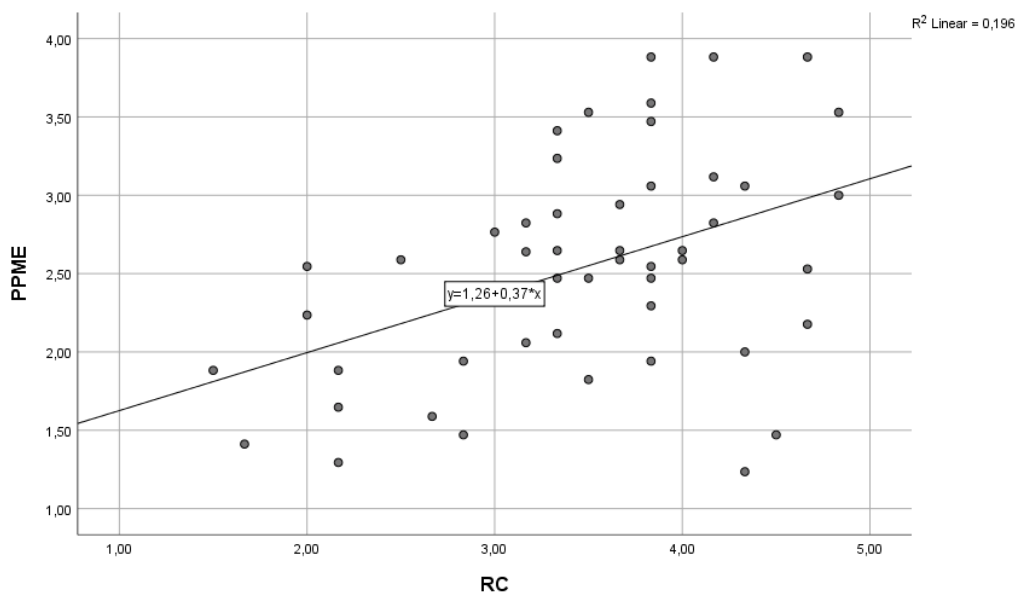**Independent variable = TI**

6.5.5 Perceived time pressure (Hypothesis 5)

Linear regression was aimed for to predict PPME based on TP. In the scatterplot in Figure 19, a line is seen that goes downwards diagonally. This could indicate a negative effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 20. From the plot of the residuals opposing the predicted values as shown in Appendix I, Figure 21, homoskedasticity is confirmed, however linearity cannot be confirmed. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = -1.282, p = .206 and R^2 adjusted = .013. Therefore H5 is not confirmed, the data does not confirm a linear relationship of TP with PPME.

To create a more complete overview the data is tested for having a quadratic relationship using a quadratic regression test. A visualisation of the data as a plot with quadratic relationship is shown in Figure 22. As can be read from Table 12, p = .019 for the quadratic regression test, which is significant. A quadratic relationship might be suitable for the data. Higher perceived time pressure thus leads to higher PPME until a certain top is reached, after which higher perceived time pressure leads to lower PPME.

Figure 19

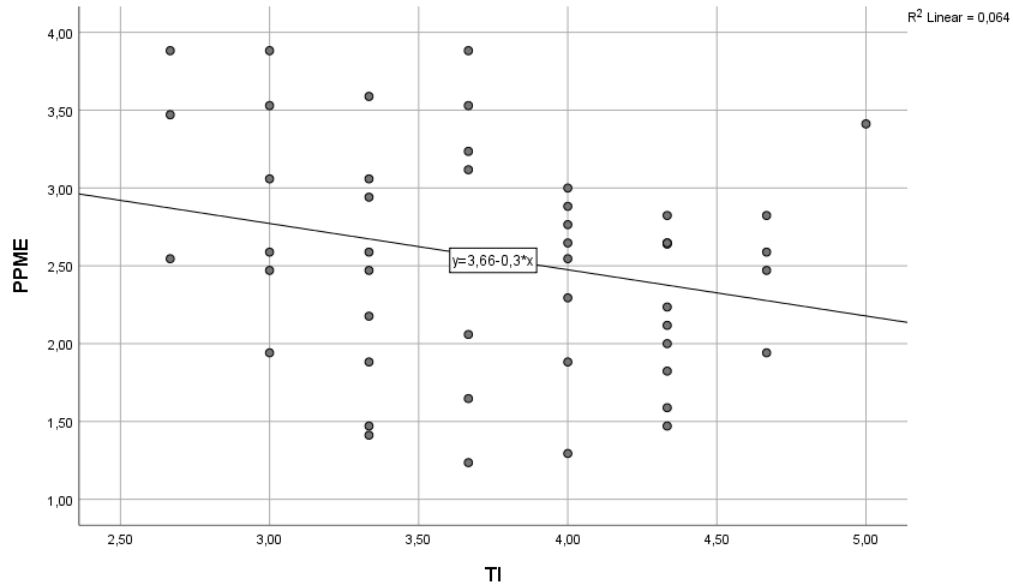*Scatterplot TP with PPME linear for N=49*
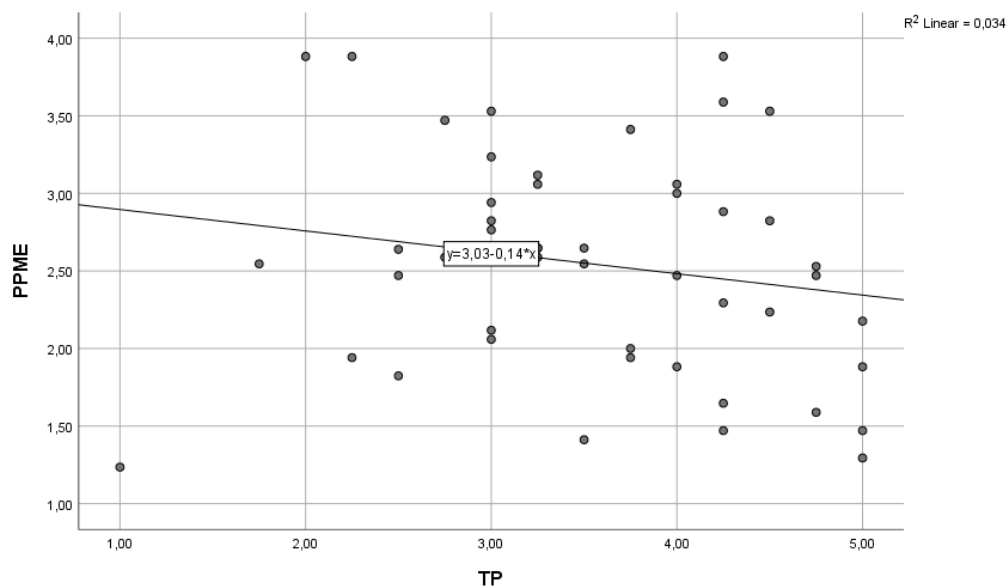
Figure 22

Scatterplot TP with PPME quadratic for N=49
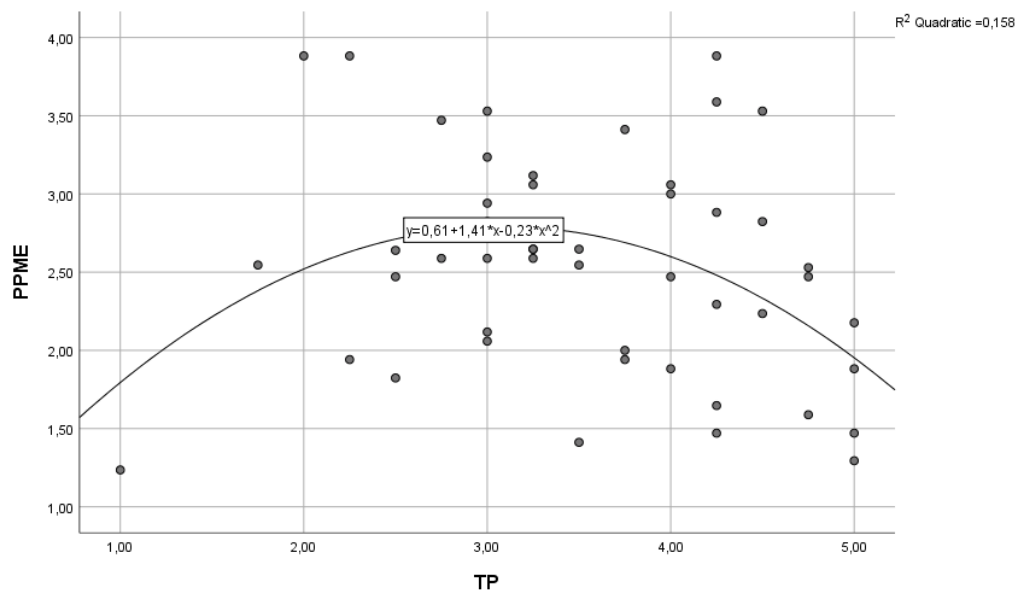
Table 12

Model Summary and Parameter Estimates for the prediction of PPME by TP

Equation	Model Summary				
	R Square	F	df1	df2	Sig.
Linear	0,034	1,643	1	47	0,206
Quadratic	0,158	4,313	2	46	0,019

Dependent variable = PPME
Independent variable = TP

6.5.6 Diversity (Hypotheses 6a, 6b, 7a and 7b)

Based on the available data for diversity, an analysis using multi-item constructs is not a possibility. Therefore, a median split approach was tried, where the groups that arose from this split needed to have at least 20 data points. Four different variables emerged, of which two for demographic diversity (gender and age) and two for functional diversity (weekly project hours and years working at Mediq). Of these four groups gender was tested as a binary variable, using the two groups indicated by the survey participants (female and male). Age and weekly project hours were tested as continuous variables. Years working at Mediq was tested as a scaled variable, using the scale applied in the survey.

Weekly project hours (Hypothesis 6a)

Linear regression was aimed for to predict PPME based on weekly project hours. In the scatterplot in Figure 23, a line is seen that goes horizontally. This indicates no effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 24. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 25, homoskedasticity is confirmed, however linearity is only suggested. Therefore, the results for hypothesis 6a from the regression test do not show a suitable model. In Table 9 the results for the linear regression test are shown, here it can be seen that $t(48) = -.047$, $p = .963$ and R^2 adjusted $= -.021$. Therefore H6a is not confirmed, no relationship of weekly project hours with PPME is detected.

Figure 23

Scatterplot weekly project hours with PPME linear for N=49

R^2 Linear = 4,736E-5

y=2,55-4,48E-4*x

PPME

On average, how many hours do you spend on projects each week?
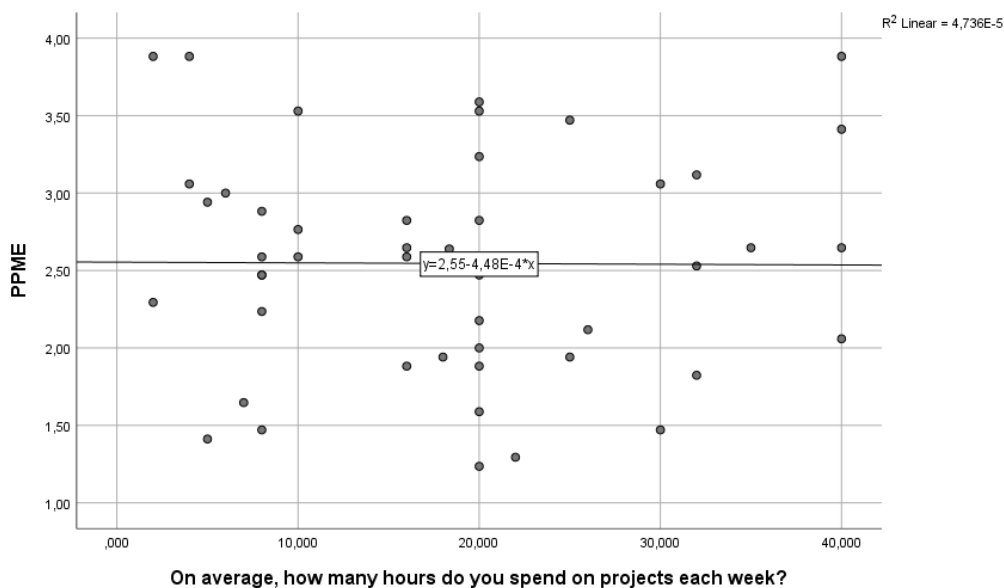
Years working at Mediq (Hypothesis 6b)

Linear regression was aimed for to predict PPME based on years working at Mediq. In the scatterplot in Figure 26, a line is seen that goes upwards diagonally. This indicates a positive effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 27. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 28, homoskedasticity is confirmed, however linearity is only suggested. Therefore the results for hypothesis 6b from the regression test do not show a suitable model. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = .345, p = .185 and R^2 adjusted = .017. Therefore H6b is not confirmed, no relationship of years working at Mediq with PPME is detected.

Figure 26

Scatterplot years working at Mediq with PPME linear for N=49
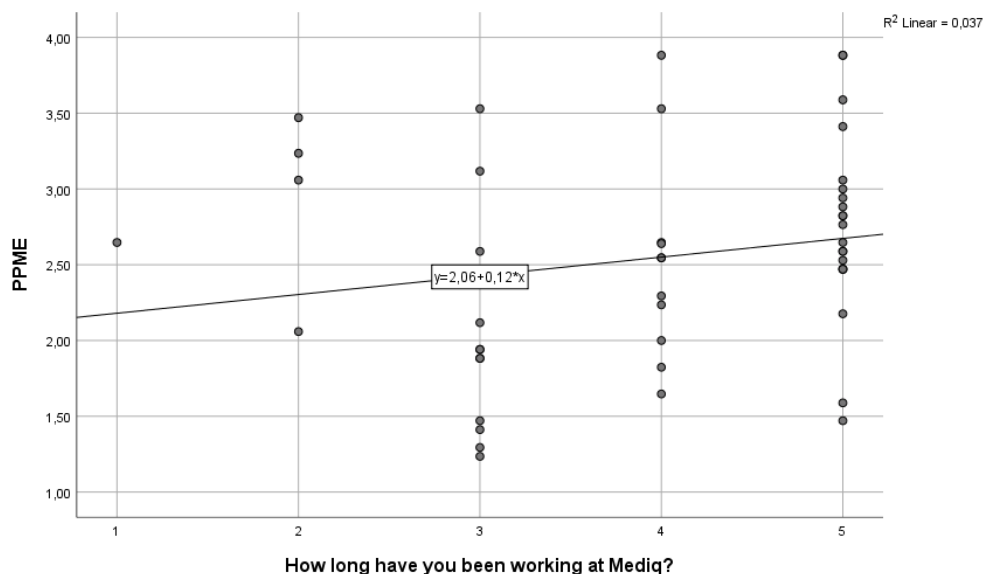
Gender (Hypothesis 7a)

Notwithstanding the (ethical) complexities of the subject of 'gender', for the analysis linear regression was aimed for to predict PPME based on gender. In the scatterplot in Figure 29, a line is seen that goes upwards diagonally. This indicates a positive effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 30. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 31, homoskedasticity and linearity are confirmed. Looking at this regression test the results for hypothesis 7a do not show a suitable model. In Table 9 the results for the linear regression test are shown, here it can be seen that t (48) = .543, p = .590 and R^2 adjusted = .006. Therefore H7a is not confirmed, no relationship of gender with PPME is detected.

Figure 29

Scatterplot gender with PPME linear for N=49

Figure 29. Scatterplot with PPME on the y-axis ranging from 1,00 to 4,00 and "What gender do you identify as?" on the x-axis ranging from 1,0 to 2,0. R^2 Linear = 0,006. Regression line labelled y=2,39+0,11*x.
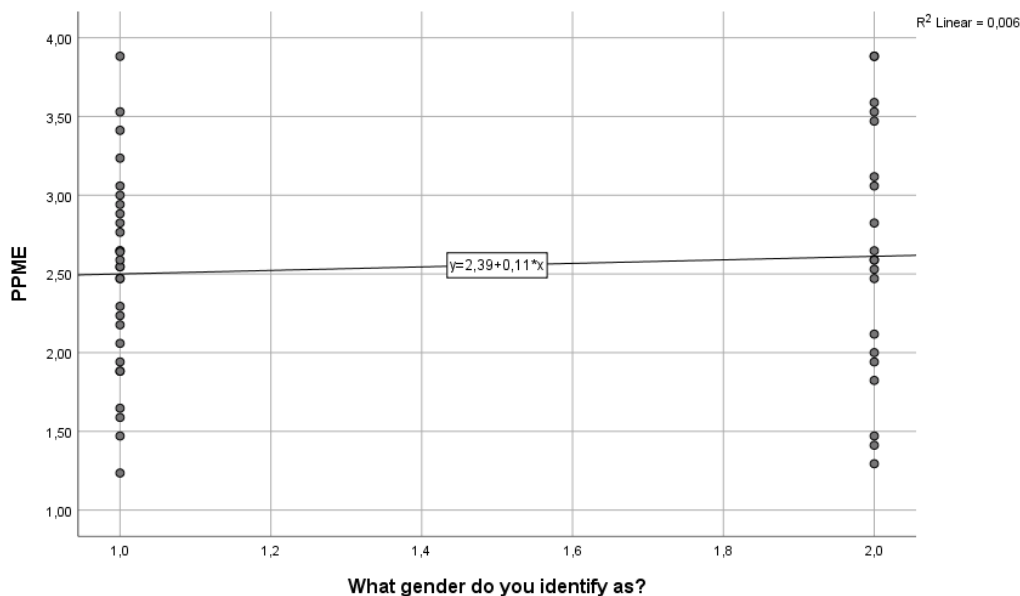
Age (Hypothesis 7b)

Linear regression was aimed for to predict PPME based on age. In the scatterplot in Figure 32, a line can be drawn that goes upwards diagonally. This indicates a positive effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 33. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 34, homoskedasticity and linearity are confirmed. In Table 9 the results for the linear regression test are shown, here it can be seen that $t(48) = .573$, $p = .569$ and R^2 adjusted = .007. Therefore H7b is not confirmed, no effect of age onto PPME is detected.

Figure 32

Scatterplot age with PPME linear for N=49
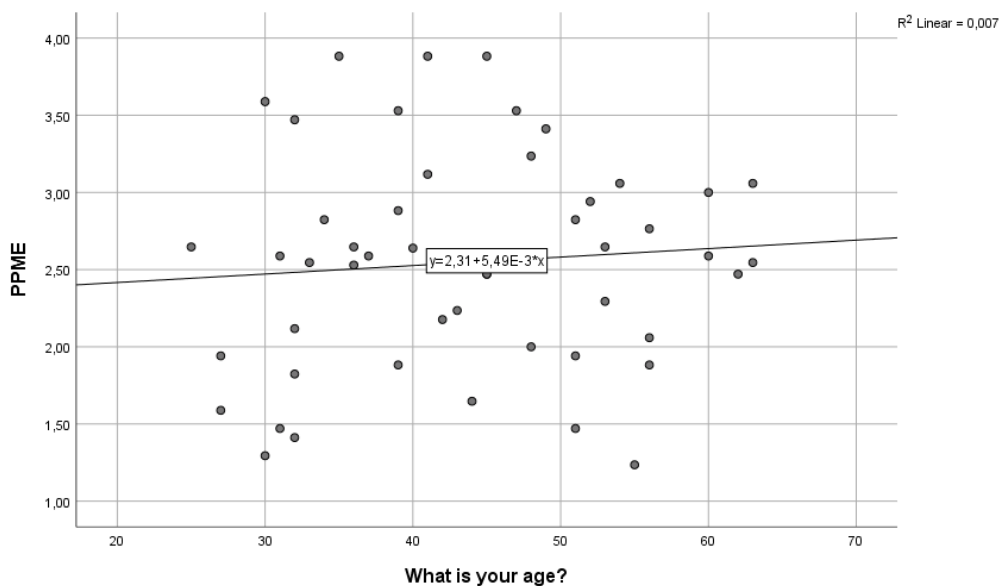
6.5.7 Individual MPA involvement (Expectation 1)

Linear regression was aimed for to predict PPME based on individual MPA involvement. In the scatterplot in Figure 35, a line is shown that goes upwards diagonally. This indicates a positive effect. Regarding the assumptions for linear regression normality might be suggested when analysing the normal probability plot in Appendix I, Figure 36. From the plot of the residuals opposing the predicted values, as shown in Appendix I, Figure 37, linearity is confirmed, however homoskedasticity cannot be confirmed. In Table 9 the results for the linear regression test are shown, here it can be seen that $t(48) = 1.345$, $p = .185$ and R^2 adjusted $= .013$. Therefore E1 is not confirmed, no relationship of MPA with PPME is detected.

Figure 35

Scatterplot MPA with PPME linear for N=49
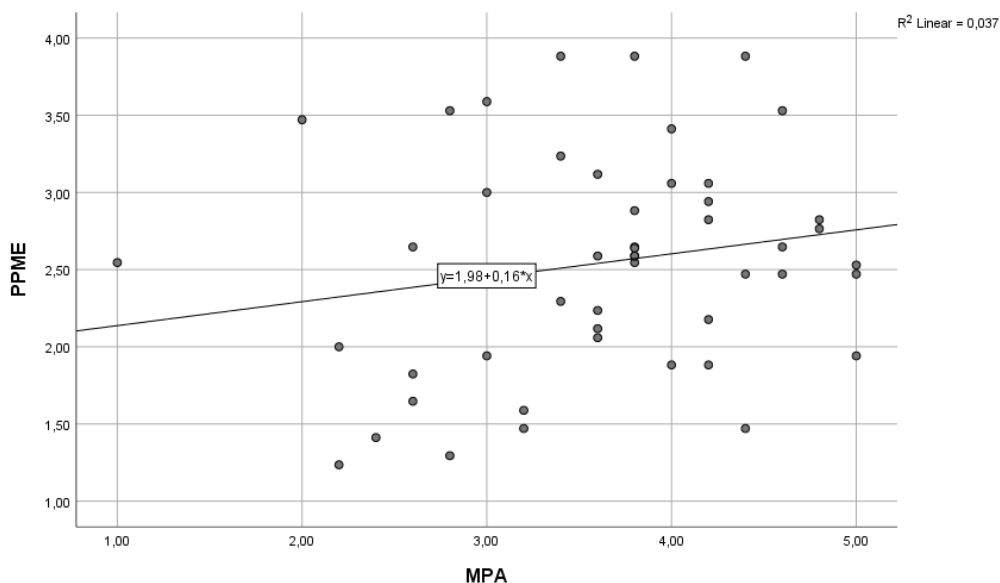
As this construct is an exploratory topic, the linear regression test for MPA x PPME is also run on some smaller parts of the dataset. Specifically for gender female and gender male, age <= 43 and age > 43, for weekly project hours < 20 and weekly project hours => 20, and for years working at Mediq <= 4 and years working at Mediq > 4. A summary of these analyses is provided in Table 13. The relationship between MPA and PPME was positively significant with t (48) = 3.315 and p = 0.003 for the group age > 43, as can be seen in Table 14, as well as with t (48) = 2,499 p = 0.020 for the group weekly project hours < 20, as can be seen in Table 15.

Table 13

Summary of Additional Linear Regression Analyses for MPA X PPME

Dependent variable = PPME; Independent variable = MPA

Group of participants	P	Positive or Negative effect?
Gender female	0.432	Unknown
Gender male	0.327	Unknown
Age <= 43	0.689	Unknown
Age > 43	0.003	Positive
Weekly project hours < 20	0.020	Positive
Weekly project hours => 20	0.963	Unknown
Years working at Mediq <= 4	0.519	Unknown
Years working at Mediq > 4	0.838	Unknown

Table 14

Linear Regression Analysis Summary for MPA X PPME for age > 43

Variable	B	95% CI	beta	t	P
PPME (Constant)	0.733	[-0.343, 1.899]		1.302	0.206
MPA (Age > 43)	0.481	[0.180, 0.782]	0.577	3.315	0.003
Note. R^2 adjusted = 0.303		CI = confidence interval for B			

Note. Normality not fully accepted due to small dataset, homoskedasticity and linearity hold.

Table 15

Linear Regression Analysis Summary for MPA X PPME for weekly project hours > 20

Variable	B	95% CI	beta	t	P
PPME (Constant)	1.284	[0.177, 2.390]		2.400	0.025
MPA (Weekly ph < 20)	0.355	[0.061, 0.650]	0.462	2.499	0.020
Note. R^2 adjusted = 0.179		CI = confidence interval for B			

Note. Normality not fully accepted due to small dataset, homoskedasticity holds, linearity suggested.

6.6 Summary of quantitative results

From the regression analyses in the quantitative results it can be seen that hypotheses 2 and 3 are confirmed. The analyses for hypotheses 4 and 5 show quadratic rather than linear effects, which means the linear hypotheses are rejected. For hypotheses 1, 6a, 6b, 7a and 7b no effects were detected with the regression analyses. For expectation 1 initially no effect was detected, however in further exploration a positive effect of MPA onto PPME was detected for the group of people with age > 43 and for the group with weekly project hours < 20. In Table 16 a summary of the quantitative results can be found, using PPME as the dependent variable.

Table 16

Summary of quantitative results. Dependent variable: Perceived Project Management Effectiveness

	Independent variable	Confirmed/ Not Confirmed	Linear or Quadratic	Significance level p	Positive or negative effect
H1 (+)	Centralization of Project Information	Not Confirmed	Linear	0,169	Unknown
H2 (+)	Goal Clarity	Confirmed	Linear	0.003	Positive
H3 (+)	Role Clarity	Confirmed	Linear	0.001	Positive
H4 (+)	Task Interdependence	Not Confirmed	Quadratic	0,031	Negative; Quadratic with a down
H5 (-)	Time Pressure	Not Confirmed	Quadratic	0,019	Positive; Quadratic with a top
H6a (+)	Functional Diversity; Weekly project hours	Not Confirmed	Quadratic	0.141	Unknown; Quadratic with a down
H6b (+)	Functional Diversity; Years working at Mediq	Not Confirmed	Quadratic	0.052	Unknown; Quadratic with a down
H7a (-)	Demographic Diversity; Gender	Not Confirmed	Linear[1]	0.590	Unknown
H7b (-)	Demographic Diversity; Age	Not Confirmed	Linear	0.569	Unknown
E1 (+)	Mediq Project Approach	Not Confirmed	Linear	0.185	Unknown

Note[1]: other possible methods for analysis of this relationship might be considered.

7. Discussion and Conclusion

In this chapter, answers to the research questions of this study are formulated based on the qualitative and quantitative results from study 1 and 2 as well as the previously studied literature. After presenting the main findings, theoretical and practical implications are discussed, and practical recommendations are formulated. This chapter concludes with an overview of this study's limitations and future research opportunities and a general conclusion.

7.1 Main findings

The first research question that was studied, accompanying the first problem statement, was: How do different project team members perceive the project management method? This question originated from the consideration that the MPA had only been developed recently, no potential effects were tested among the employees of the organisation. This question is answered based on the results of study 1. The common thread running through the qualitative interviews was the project management at Mediq, continuously considering the interviewees' perceptions and opinions about the different topics. Each of the topics is now discussed in light of the scientific literature, the qualitative interview results from study 1 and the corresponding hypothesis (or expectation).

To start with, the perceived project management effectiveness is confirmed as being an important aspect to study. Morrison and Brown (2004) define project management effectiveness as the organization's capacity to consistently complete projects within time, budget, and client requirements. This was translated into perceived project management effectiveness in the interviews. Overall, literature (see, e.g., Hyväri, 2006; Milosevic et al., 2001; Morrison & Brown, 2004) suggests that effective project management is achieved through standardized processes, consistent resource allocation, and stakeholder consideration. As found in the interviews, Mediq faces challenges with project management, particularly in acquiring resources and managing the size of project teams. Limited availability of resources and unclear program goals were identified as key issues that can impede project management effectiveness. Perceived project management effectiveness (PPME) is part of all hypotheses and used as the dependent variable in the quantitative study (study 2).

Hypothesis 1, mainly based on the study of Cooke-Davies and Arzymanow (2003), states that centralization of project information positively relates to perceived project management effectiveness. In the interviews it was found that using a standard location, like a SharePoint page, to store project information can improve project management by preventing contradictory or missing information. A standardized approach for sharing information is typically agreed upon at the start of a project. Centralizing information saves time, and Mediq's system makes it easy to find information. Therefore the first hypothesis is found to be relevant for further exploration in study 2.

Goal clarity is important for project teams and can increase team effectiveness (see e.g., Edmondson, 1999). In accordance with this, hypothesis 2 states that goal clarity positively relates to perceived project management effectiveness. The importance of clearly defining project goals and scope in project management is agreed on by five interviewees, as it helps with decision-making, project and task preparation, preventing task overlap, and achieving project success. The need for project managers to ensure that all stakeholders are aware of the goals and milestones before starting a project is also emphasised. Combining the interview results with the literature study shows that the second hypothesis is relevant for further exploration in study 2.

Hypothesis 3 states that role clarity positively relates to perceived project management effectiveness. Again, looking at the results from the interviews combined with the previously studied literature, this hypothesis is deemed relevant for further exploration in the quantitative study. Henderson et al. (2016) highlight the criticality of clear roles in project teams, which can help build trust among members. In several of the interviews, the importance of having the right people in the right roles is being stressed. Feistritzer and Jones (2014) suggest that role clarity is crucial for team effectiveness in project management. In the interviews, clear role descriptions and division of responsibilities are seen as crucial for effective project management.

Hypothesis 4 states that task interdependence positively relates to perceived project management effectiveness. As can be read from the interview results, task interdependence is inherent in a project team as different departments and individuals are needed to complete a project. Looking at the results of the performed literature study, Van der Vegt and Janssen (2002) found that individuals who perceived high levels of goal interdependence in heterogeneous teams showed a positive and strong relationship between task interdependence and innovative behaviour. Looking at these results hypothesis 4 is deemed relevant for further exploration in the quantitative study.

Perceived time pressure is considered an important aspect of project teams, as discussed by Janicik and Bartel (2003) and Gevers et al. (2001). Therefore, hypothesis 5 is proposed: Perceived time pressure negatively relates to perceived project management effectiveness. Considering the studied literature and the results of study 1, this hypothesis is deemed relevant for further exploration in the quantitative study. From the interviews, it was found that time pressure is a common experience of project team members. The cause of the pressure may vary, e.g., project deadlines that are given less attention than other activities, and a desire to fix many problems at the same time.

Faems and Subramanian (2012) differentiate diversity into functional diversity and demographic diversity, where functional diversity focuses on the variety in knowledge areas and

educational background of employees. Horwitz and Horwitz (2007) found that task-related functional diversity positively impacted team performance. Based on these findings, hypothesis 6 states that functional diversity positively relates to perceived project management effectiveness. Looking at the results from study 1 and the studied literature, the sixth hypothesis is deemed relevant for further exploration in the quantitative study. Specifically, the third interviewee believes that having people from different departments on a project team can have a positive impact on project results. The sixth interviewee suggests that having a functionally diverse team can positively influence group dynamics and project success.

Demographic diversity is a type of diversity in project teams that includes differences in gender, age, and nationality (Faems & Subramanian, 2012). Bell et al. (2010) found that race and sex diversity had small negative relationships with team performance, leading to hypothesis 7: demographic diversity negatively relates to perceived project management effectiveness. Based on the results from study 1, the seventh hypothesis is deemed relevant for further exploration in the quantitative study (study 2), when considering the results from study 1 and the previously studied literature. Specifically, the third interviewee believes that having a project team with people from different ages and cultural backgrounds leads to more project success. The sixth interviewee suggests that teams with diverse ages and cultures are beneficial in creating different views and creative solutions.

During the problem exploration two unstructured interviews were conducted, these interviews provided input for the problem description and definition. Individual MPA involvement emerged as a topic from these interviews, which refers to various aspects related to project management, such as individual interest, perception of the MPA, knowledge of the MPA, and usage of MPA training and coaching. These aspects are specific to the organization and the individual team member. The following is expected: Individual MPA involvement positively relates to perceived project management effectiveness. From the qualitative interviews a shared opinion emerges that the MPA aims to provide structure and uniformity to project management within Mediq, with a focus on completing projects efficiently and effectively. The MPA is seen as particularly helpful for non-project managers leading projects (employees that are not extensively trained as project managers, such as a finance business controller or IT solution manager). However, there is a need for more widespread adoption of the MPA within Mediq. Considering the results from study 1, a further exploration of individual MPA involvement as a topic in the quantitative study was found to be relevant.

The second research question of this study, accompanying the second problem statement, was formulated as follows: What is the impact of different project team characteristics on the perceived

project management effectiveness? This question took into account that few to no information was available regarding why the MPA is not being used as intended as well as about the employee perception of the MPA. This question is answered using the results from study 2, the quantitative study, based on data from a survey held among employees working in different project settings within Mediq. The constructs that were included in the survey were selected based on the literature review and the interview results from study 1.

The relationship between perceived project management effectiveness (PPME) and centralization of project information (CPI), as predicted in (Hypothesis 1), was analysed using both linear and quadratic regression. However, this relationship turned out to be non-significant in both analyses, and therefore Hypothesis 1 was rejected.

The relationship between perceived project management effectiveness and goal clarity (GC), as predicted in Hypothesis 2, was analysed using linear regression. A significant positive relationship was found, and therefore Hypothesis 2 was accepted.

The relationship between perceived project management effectiveness and role clarity (RC), as predicted in Hypothesis 3, was analysed using linear regression. A significant positive relationship was found, and therefore Hypothesis 3 was accepted.

As our measure of task interdependence had low reliability, the results related to this construct have to be interpreted with caution. Within the construct of task interdependence the survey participants provided largely varying answers. This may have been caused by the variety in time spent on projects by the survey participants. The relationship, as predicted in Hypothesis 4, between perceived project management effectiveness and task interdependence (TI) was first analysed using linear regression. Based on the non-significant relationship found, Hypothesis 4 was rejected. Considering the complexity of the relationship found for task interdependence with innovative behaviour by Van der Vegt and Janssen (2002), as was previously explained in section 2.2.3 Task Interdependence, a quadratic regression analysis was performed, and a significant relationship was found. Thus, task interdependence shows a negative quadratic relationship with Perceived Project Management effectiveness, meaning that higher task interdependence leads to lower PPME until a certain nadir is reached, after which higher task interdependence leads to higher PPME.

The relationship between perceived project management effectiveness and perceived time pressure (TP), as predicted in Hypothesis 5, was first analysed using linear regression. Based on the non-significant relationship found, Hypothesis 5 was rejected. Considering the complexity of the relationship found for perceived time pressure with team performance by Gevers et al. (2001), a

quadratic regression analysis was performed, and a significant positive relationship was found. Perceived time pressure showed a positive quadratic relationship with Perceived Project Management Effectiveness, meaning that higher perceived time pressure leads to higher PPME until a certain top is reached, after which higher perceived time pressure leads to lower PPME.

For the analyses regarding functional diversity a selection of the variables needed to be made because of the small total sample size. It was decided not to use the data on Project Membership and Functional Background for analyses in smaller subsamples. However, data on weekly project hours and years working at Mediq could be analysed for the total sample. To analyse the relationship between perceived project management effectiveness and weekly project hours, as predicted in Hypothesis 6a, linear regression was used. Based on the non-significant relationship found, Hypothesis 6a was rejected. To analyse the relationship between perceived project management effectiveness and years working at Mediq, as predicted in Hypothesis 6b, again linear regression was used. A non-significant relationship was found, so Hypothesis 6b was rejected too.

For demographic diversity, again, analyses were performed only for those variables that enabled using the total sample. Despite the complexity of 'gender' as an ethical topic, the data for gender and age were analysed as being respectively a binary measure and a continuum. To analyse the relationship between perceived project management effectiveness and gender, as predicted in Hypothesis 7a, a linear regression analysis was used. Based on the non-significant relationship found, Hypothesis 7a was rejected. To analyse the relationship between perceived project management effectiveness and age, as predicted in Hypothesis 7b, again linear regression was used. A non-significant relationship was found, and therefore Hypothesis 7b was rejected too.

The relationship between perceived project management effectiveness and individual MPA involvement, as predicted in Expectation 1, was analysed using linear regression. Based on the non-significant relationship found, Expectation 1 was rejected. However, to further explore this relationship a median split was applied to the data for age and for weekly project hours, even though this did create smaller datasets. Additional linear regression analyses were performed on these subsamples. These analyses showed that for the group of employees that are older than 43 years individual MPA involvement was positively related to Perceived Project Management Effectiveness. Also, for the group of employees that weekly work less than 20 hours on a project individual MPA involvement was positively related to Perceived Project Management Effectiveness.

The third research question of this study, accompanying the third problem statement, was formulated as follows: What are the most important project team characteristics that predict

perceived project management effectiveness when considering the project management practices? The third problem statement and research question were created considering that the unclarity about the project team characteristics is likely to negatively impact perceived project management effectiveness. Furthermore, the project management practices in terms of the effects of the recently introduced MPA were still unclear and potentially could also affect the perceived project management effectiveness. This research question is answered combining the literature reviews, the results from both study 1 and 2, and a discussion with the Mediq PMO and Business Transformation team.

In study 1, it came forward that hypothesis 1 (centralization of project information positively relates to perceived project management effectiveness) is relevant for research in the quantitative study, since it was mentioned that project management can be improved by using a standard location to store project information. However, in study 2 no significant relationship of CPI with PPME was found. When this result was discussed with the Mediq PMO and Business Transformation team, it was suggested that some questions might have been interpreted wrongly by the survey participants. In the survey it was explained that the questions asked about the accessibility of project documents whereas one of the questions on centralization of project information asked about the participant's experience regarding the helpfulness and accuracy of project information systems. This might have confused the participants since many different systems are being used within Mediq for storing project information rather than one system for all projects. However, another possible explanation for not detecting a significant relationship is that the construct only contains two items, which could lead to lower content, construct and criterion validity, it can be difficult to accurately address the construct using only a few items.

In study 1, it came forward that hypothesis 2 (goal clarity positively relates to perceived project management effectiveness) is relevant for research in the quantitative study. In study 2, the data analysis showed a significant relationship of goal clarity with PPME. When this result was discussed with the Mediq PMO and Business Transformation team, immediate consensus was reached on the logic of this result within a company setting. The team agreed that clearly defining goals helps with decision-making and effectively managing projects.

The third hypothesis states that role clarity positively relates to perceived project management effectiveness. This topic came forward in study 1 and was therefore added as a construct. In study 2, a significant relationship of role clarity with PPME was found. When this result was discussed with the Mediq PMO and Business Transformation team, the team agreed that having clearly defined roles helps project team members to know what is expected of them, which then leads to more successful projects.

In study 1, it came forward that the fourth hypothesis (task interdependence positively relates to perceived project management effectiveness) is relevant for research in the quantitative study. In study 2, it was seen that some of the participants experienced large task interdependence, whereas other participants experienced less. The quadratic regression analysis showed a significant relationship of task interdependence with PPME. From this analysis it can be seen that when task interdependence is either too low or too high it contributes negatively to the perceived project management effectiveness. When this was discussed in the Mediq PMO and Business Transformation team, it was suggested that mutual coordination might often be challenging for project team members, as they may have a hard time reaching mutual agreement on specific tasks. The definition of task interdependence by Van der Vegt and Janssen (2002) supports this: task interdependence is an individual's belief in depending on other team members for carrying out the task at hand.

The fifth hypothesis states that perceived time pressure negatively relates to perceived project management effectiveness. In study 1 it was found that time pressure is a common experience among employees at Mediq. The linear regression analysis in study 2 did not show a significant relationship between perceived time pressure and perceived project management effectiveness. However, the quadratic regression analysis did show a significant relationship of perceived time pressure with PPME. When this was explained in the Mediq PMO and Business Transformation team, it was confirmed that when perceived time pressure is either too low or too high it contributes less to the perceived project management effectiveness. A golden midpoint needs to be reached for the highest positive contribution.

In light of functional diversity, hypothesis 6a predicted that weekly project hours positively relates to perceived project management effectiveness. Also, hypothesis 6b predicted that years working at Mediq positively relates to PPME. Looking at the results from study 1 combined with the studied literature, both hypotheses are deemed relevant for the quantitative study. However, both hypotheses were rejected based on the results of study 2. In the discussion of these results the Mediq PMO and Business Transformation team suggested that the lack of significant results may be due to the fact that different people have different perceptions of how effective functional diversity can be. When individual perceptions differ largely, the datapoints are highly dispersed and do not show a significant relationship. This was definitely the case for the datapoints in the scatterplot of weekly project hours with PPME (Figure 23).

In light of demographic diversity hypothesis 7a predicted that gender negatively relates to perceived project management effectiveness. Also, hypothesis 7b predicted that age negatively relates to perceived project management effectiveness. Looking at the results from study 1 combined with

the studied literature, both hypotheses are deemed relevant for the quantitative study. However, both hypotheses were rejected based on the results of study 2. For both age and gender no specific response was given by the Mediq PMO and Business Transformation team. However, a point of feedback that came forward in the discussion of the results regarding demographic diversity was that the categories for the question on the region of nationality might have been too broad. These were formulated as regions of Europe, whereas most of the Mediq employees originate from Western Europe.

Based on the problem exploration, it was expected that individual MPA involvement positively relates to perceived project management effectiveness. In study 1, a shared opinion was that the MPA aims to provide structure and uniformity to project management within Mediq, with a focus on completing projects efficiently and effectively. In the initial linear regression analysis for MPA involvement in study 2 the hypothesis was not accepted. However, when performing further explorative analyses, significant positive relationships were found for people with an age higher than 43 as well as for people that on average spend less than 20 hours weekly on projects. When these results were presented to the Mediq PMO and Business Transformation team, the question arose whether people that spend less than 20 hours weekly on projects could experience the MPA as supportive. Since these people spend less than half of the time of a fulltime job working on projects at Mediq, they might not have a routine for this work, and it might be the case that they need more guidance in this type of work than people that spend more time working on projects. This interpretation explains why individual MPA involvement does show a significant positive relationship for people that spend less than 20 hours weekly on projects but not for people that spend more than 20 hours weekly on projects.

7.2 Theoretical implications

This study confirmed several earlier found relationships between project team characteristics and perceived project management effectiveness (see, e.g., Edmondson, 1999 and Henderson et al., 2016). However, there are also some important differences. The current study's results are not always aligned with previous findings, and therefore it adds to the literature in several ways:

Firstly, a study researching relationships between project team characteristics and perceived project management effectiveness among project team members does not seem to have been undertaken previously, as mentioned in section 1.4 in the scientific research objectives. In addition to this, project management studies in the healthcare industry seem to be very rare. Therefore, this research project aimed to extend the existing literature by studying these relationships as a case study within this industry.

Second, to the researcher's best knowledge, this research is the first to combine both a qualitative and a quantitative study regarding the relationships between several project team characteristics and perceived project management effectiveness in the health care industry. Both study 1 and study 2 found that several different project team characteristics were of importance when looking into the perceived project management effectiveness. Existing literature mainly focused on specific characteristics in isolation rather than a combination of several different characteristics.

In addition, in this research both a qualitative and a quantitative approach were taken for studying centralization of project information. Although the results of this study showed limited significant relationships, this approach can still be taken as a recommendation for further research. Previous studies, such as Cooke-Davies and Arzymanow (2003), have taken a solely qualitative approach towards this topic.

Furthermore, Van der Vegt and Janssen (2002) studied task interdependence in relationship to innovative behaviour. Furthermore, they studied the relationship of task interdependence with goal interdependence in heterogeneous teams. The current study looked into task interdependence in relation to perceived project management effectiveness, which to our best knowledge has not been previously studied. The qualitative study showed that task interdependence is inherent in project teams. In addition to this, the quantitative study showed a quadratic relationship between task interdependence and perceived project management effectiveness. Future research could further explore how task interdependence in project teams affects the perceived project management effectiveness.

Lastly, in this research an exploratory construct was studied, namely MPA involvement. No previous research was conducted onto this topic, as the Mediq Project Approach was developed in-company. A study including this topic as a construct therefore is unique and provides insights for potential future research on e.g., the adoption of the MPA within functional departments as well as how the change management progressed while introducing the MPA.

7.3 Practical implications and recommendations

At the start of the research project, the PMO asked for advice on what project team characteristics might affect the project management practices and looked for insights into the effects on perceived project management effectiveness. A recommendation is made for which project team characteristics are of importance to improve perceived project management effectiveness within Mediq.

When considering the project management practices at Mediq, the project team characteristics that are most strongly related to perceived project management effectiveness are goal clarity, role clarity, task interdependence and time pressure. Furthermore, for specific groups of people, i.e. people that spend less than 20 hours weekly working on projects, the MPA might also be used effectively. Goal clarity and role clarity - as project team characteristics - can be taken into account by the PMO and the project managers, making sure all stakeholders (including project team members and project sponsors) know what the goal of the project is and what the roles of each of the contributors are. In addition, a 'golden midpoint' for task interdependence might be reached by creating a detailed project planning, which also aids in managing the perceived time pressure by creating clarity for the project team members.

Following these results project managers can go beyond the functional description of employees for selecting a project team with the ability to reach project management effectiveness. They can be aided by the PMO team when preparing to start a project. Three main guidelines can be followed to enable this:

- Clearly discussing and documenting the project goals before starting the project execution.
- Clearly defining the roles and responsibilities of all stakeholders at the start of the project and reviewing these continuously during the project.
- Creating a detailed project planning at the start of each project phase to
  - clearly define task interdependencies, making sure any negative effects (i.e. slower execution of project tasks) are kept as small as possible,
  - create clarity about the expected time to be spent, to aid people in managing their time. Aiming for the best possible situation in terms of time pressure.

In addition to the project managers following these guidelines, support of the management team in managing projects is also strongly encouraged. When considering company transformation, Change Management within Mediq includes embedding the project management approach into the company culture and strategy. During both the qualitative interviews and from the personal responses about the survey, it became clear that Mediq is currently adjusting to the relatively new MPA project management method. Specifically during study 2, the quantitative study, and from the personal responses about the survey it was encountered that not every project team within Mediq is aware of and uses the MPA method. Some projects use an Agile approach, some projects a Lean approach, and some projects make their own combination of methods. Especially projects within a functional department often use their own methods rather than the company wide MPA. For multi-disciplinary projects, the usage of the MPA depends on the project manager. When this person is deployed from

the PMO team, the MPA is used as a guideline, besides which often a choice is made by the project manager to combine the method with other existing methods. This suggests that these people might not see the MPA as being directly related to project management effectiveness. They might perceive the MPA as being useful only when combined with other methods.

7.4 Limitations and future research opportunities

This study has several limitations that have to be considered. Moreover, several future research topics can be identified.

A specific limitation is that project management within a large company can be studied on various levels while only one of these levels was focused on in the current project, being that of the project teams. This means that the company wide understanding of multi discipline project management as well as the potential influence of the business culture onto the project management were overlooked. Also, potential influences from higher organizational levels onto the project teams were not taken into account. The current research focused only on project team members, while differences in perception of project management effectiveness may exist between groups of employees within a company. Therefore, a specific recommendation for future research is to specifically take the company wide perception regarding this topic into account.

Furthermore, in terms of diversity, project management on the level of the functional departments was also not specifically considered. Leading to a second recommendation for future research, to look into the perception of project management effectiveness within different functional departments. In addition to this, gender - as a diversity variable – could be seen as a scaled variable rather than a binary variable, research on different possibilities to analyse this variable is recommended.

A third limitation that can be seen is that the thesis project is time-sensitive, and a momentary assessment of the different variables was performed. A longitudinal study might be more accurate to research the perceived project management effectiveness, however within the current timeframe this was not a possibility. In addition to this, the survey was designed with the aim of a maximum duration of 10 minutes. This limited the number of items that could be included in the survey. More accurate results might have been achieved when using more survey items.

Another limitation of the research is that it proved to be difficult to collect the needed data within the set timeframe, since at the current time Mediq and many other companies struggle with a limited workforce, limiting the availability of the employees. Using a longitudinal study with a larger population would eliminate this limitation.

Furthermore, Gevers et al. (2001) suggested that many project teams have difficulties meeting deadlines. They propose a difference between high potency and low potency groups regarding how performance is affected by perceived time pressure, with a negative effect for low potency groups for the entire duration of the project. It was also found by Gevers et al. (2001) that for high potency groups, time pressure does not affect performance until (towards) the end of a project, where even a positive effect was implied. Taking a closer look at hypothesis 5 (stating that perceived time pressure has a negative effect onto perceived project management effectiveness), the current study took a more limited approach than the research of Gevers et al. (2001) did. Mitigating this limitation, an effort was made to look beyond the initial hypothesis by performing a quadratic regression analysis. In future studies this limitation can be avoided by providing a more exhaustive hypothesis when looking at perceived time pressure.

Quantitative research generally is seen as not being context sensitive when a sufficient sample size is used, it does not depend on the context or circumstances of the researcher. However, as qualitative and quantitative research are combined, and as the current study focuses on a specific case company, some context sensitivity was encountered. Also, the generalizability of the research might have been compromised by studying a specific population at the company. This limitation might be seen from the results regarding functional and demographic diversity. Several previous studies (see, e.g., Horwitz & Horwitz, 2007 and Bell et al., 2010) found effects of team diversity on team performance, however in the current study no effects of project team diversity were encountered. People within the company might not experience effects of diversity in the project teams. In future research context sensitivity of the results can be avoided by using multiple case companies, also providing more possibilities for generalization.

7.5 Conclusion

Overall, it is concluded that the study comprehensively satisfied the research objectives. The PMO requested advice on how project team characteristics affect project management practices and how different project team characteristics impact perceived project management effectiveness. The study found that goal clarity, role clarity, task interdependence, and perceived time pressure were the most important project team characteristics in predicting perceived project management effectiveness. To improve effectiveness, project managers should clearly discuss and document project goals, clearly define stakeholder roles and responsibilities, and create a detailed project plan. The study adds to previous research by examining the relationships of several project team characteristics to perceived project management effectiveness in the healthcare industry. It also combines a qualitative and quantitative study, and explores a new construct called individual MPA involvement. The study

found that not all project teams within Mediq use the MPA project management method, and some departments use their own methods. Future research could investigate the embedding of project management practices into the company culture and strategy.

References

Attarzadeh, I., & Ow, S. H. (2008). Project Management Practices: Success vs. Failure. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1628612

Badewi, A. (2016). The impact of project management (PM) and benefits management (BM) practices on project success: Towards developing a project benefits governance framework. *International Journal of Project Management*, *34*(4), 761–778. https://doi.org/10.1016/j.ijproman.2015.05.005

Ballard, G., & Howell, G. (2003). Lean project management. *Building Research &Amp; Information*, *31*(2), 119–133. https://doi.org/10.1080/09613210301997

Beise, C., Carte, T. A., Vician, C., & Chidambaram, L. (2010). A case study of project management practices in virtual settings. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *41*(4), 75–97. https://doi.org/10.1145/1899639.1899644

Bell, S. T., Villado, A. J., Lukasik, M. A., Belau, L., & Briggs, A. L. (2010). Getting Specific about Demographic Diversity Variable and Team Performance Relationships: A Meta-Analysis. *Journal of Management*, *37*(3), 709–743. https://doi.org/10.1177/0149206310365001

Bentley, C. (2001). *PRINCE2: A Practical Handbook, Second Edition (Computer Weekly Professional)* (2nd ed.). Butterworth-Heinemann. https://doi.org/10.4324/9780080497792

Besner, C., & Hobbs, B. (2006). The Perceived Value and Potential Contribution of Project Management Practices to Project Success. *Project Management Journal*, *37*(3), 37–48. https://doi.org/10.1177/875697280603700305

Besner, C., & Hobbs, B. (2013). Contextualized Project Management Practice: A Cluster Analysis of Practices and Best Practices. *Project Management Journal*, *44*(1), 17–34. https://doi.org/10.1002/pmj.21291

Bray, S. R., & Brawley, L. R. (2002). Role Efficacy, Role Clarity, and Role Performance Effectiveness. *Small Group Research*, *33*(2), 233–253. https://doi.org/10.1177/104649640203300204

Bstieler, L., & Gross, C. W. (2003). Measuring the effect of environmental uncertainty on process

activities, project team characteristics, and new product success. *Journal of Business &Amp;*

Industrial Marketing, *18*(2), 146–161. https://doi.org/10.1108/08858620310463079

Cooke-Davies, T. J., & Arzymanow, A. (2003). The maturity of project management in different

industries. *International Journal of Project Management*, *21*(6), 471–478.

https://doi.org/10.1016/s0263-7863(02)00084-4

Cooper, R. G. (2008). Perspective: The Stage-Gate® Idea-to-Launch Process. *Journal of Product*

Innovation Management, *25*(3), 213–232. https://doi.org/10.1111/j.1540-5885.2008.00296.x

Cooper, R. G. (2016). Agile–Stage-Gate Hybrids. *Research-Technology Management*, *59*(1), 21–29.

https://doi.org/10.1080/08956308.2016.1117317

Cruz, A., Tereso, A., & Alves, A. C. (2020). Traditional, Agile And Lean Project Management. *Journal of*

Modern Project Management, *8*(2), 87–95. https://doi.org/10.19255/JMPM02407

Edmondson, A. (1999). Psychological Safety and Learning Behavior in Work Teams. *Administrative*

Science Quarterly, *44*(2), 350–383. https://doi.org/10.2307/2666999

Faems, D., & Subramanian, A. M. (2012). R&D Manpower and Technological Performance: The

Impact of Demographic   and Functional Diversity. *Academy of Management Proceedings*,

2012(1), 11898. https://doi.org/10.5465/ambpp.2012.11898abstract

Fageha, M. K., & Aibinu, A. A. (2013). Managing Project Scope Definition to Improve Stakeholders'

Participation and Enhance Project Outcome. *Procedia - Social and Behavioral Sciences*, *74*,

154–164. https://doi.org/10.1016/j.sbspro.2013.03.038

Fernandez, D. J., & Fernandez, J. D. (2008). Agile Project Management —Agilism versus Traditional

Approaches. *Journal of Computer Information Systems*, *49*(2), 10–17.

https://doi.org/10.1080/08874417.2009.11646044

George, D., & Mallery, P. (2004). *SPSS for Windows Step-by-Step: A Simple Guide and Reference 12.0*

update (5th Edition) (5th ed.). Pearson.

Gevers, J. M., Van Eerde, W., & Rutte, C. G. (2001). Time pressure, potency, and progress in project groups. *European Journal of Work and Organizational Psychology*, *10*(2), 205–221. https://doi.org/10.1080/13594320143000636

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis: Pearson new international edition* (1st ed., Vol. 2). Essex: Pearson Education Limited.

Henderson, L., Stackman, R. W., & Lindekilde, R. (2016). The centrality of communication norm alignment, role clarity, and trust in global project teams. *International Journal of Project Management*, *34*(8), 1717–1730. https://doi.org/10.1016/j.ijproman.2016.09.012

Hoegl, M., & Parboteeah, K. P. (2006). Team goal commitment in innovative projects. *International Journal of Innovation Management*, *10*(03), 299–324. https://doi.org/10.1142/s136391960600151x

Homberg, F., & Bui, H. T. M. (2013). Top Management Team Diversity. *Group &Amp; Organization Management*, *38*(4), 455–479. https://doi.org/10.1177/1059601113493925

Horwitz, S. K., & Horwitz, I. B. (2007). The Effects of Team Diversity on Team Outcomes: A Meta-Analytic Review of Team Demography. *Journal of Management*, *33*(6), 987–1015. https://doi.org/10.1177/0149206307308587

Hyväri, I. (2006). Project management effectiveness in project-oriented business organizations. *International Journal of Project Management*, *24*(3), 216–225. https://doi.org/10.1016/j.ijproman.2005.09.001

IBM SPSS Statistics (Version 26). (2019). [Computer software]. IBM. https://www.ibm.com/products/spss-statistics?lnk=ushpv18ct7

Ika, L. A. (2009). Project Success as a Topic in Project Management Journals. *Project Management Journal*, *40*(4), 6–19. https://doi.org/10.1002/pmj.20137

Janicik, G. A., & Bartel, C. A. (2003). Talking about time: Effects of temporal planning and time awareness norms on group coordination and performance. *Group Dynamics: Theory, Research, and Practice*, *7*(2), 122–134. https://doi.org/10.1037/1089-2699.7.2.122

Kendra, K., & Taplin, L. J. (2004). Project Success: A Cultural Framework. *Project Management Journal*, *35*(1), 30–45. https://doi.org/10.1177/875697280403500104

Koops, L., Coman, L., Bosch-Rekveldt, M., Hertogh, M., & Bakker, H. (2015). Public Perspectives on Project Success – Influenced by National Culture? *Procedia - Social and Behavioral Sciences*, *194*, 115–124. https://doi.org/10.1016/j.sbspro.2015.06.126

Krumm, S., Kanthak, J., Hartmann, K., & Hertel, G. (2016). What does it take to be a virtual team player? The knowledge, skills, abilities, and other characteristics required in virtual teams. *Human Performance*, *29*(2), 123–142. https://doi.org/10.1080/08959285.2016.1154061

Kuprenas, J. A. (2003). Implementation and performance of a matrix organization structure. *International Journal of Project Management*, *21*(1), 51–62. https://doi.org/10.1016/s0263-7863(01)00065-5

Lynn, G. S., & Kalay, F. (2015). The Effect of Vision and Role Clarity on Team Performance. *Journal of Business, Economics and Finance*, *4*(3), 473. https://doi.org/10.17261/pressacademia.2015313067

Mathieu, J., Maynard, M. T., Rapp, T., & Gilson, L. (2008). Team Effectiveness 1997-2007: A Review of Recent Advancements and a Glimpse Into the Future. *Journal of Management*, *34*(3), 410–476. https://doi.org/10.1177/0149206308316061

Mediq. (2022a). *About-us*. Mediq Global Presence. Retrieved August 26, 2022, from https://mediq.com/about-us

Mediq. (2022b). *Approach*. Mediq Global Presence. Retrieved August 26, 2022, from https://mediq.com/approach

Meyer, C. M., & Torres, E. L. G. (2019). Success Factors for Supply Chain Management Projects: An Empirical Analysis. *IFAC-PapersOnLine*, *52*(13), 153–158. https://doi.org/10.1016/j.ifacol.2019.11.168

Milosevic, D., Inman, L., & Ozbay, A. (2001). Impact of Project Management Standardization on

    Project Effectiveness. *Engineering Management Journal*, *13*(4), 9–16.

    https://doi.org/10.1080/10429247.2001.11415133

Mintzberg, H. (1989). *Mintzberg on Management: Inside Our Strange World of Organizations*. Free

    Press.

Morrison, J. M., & Brown, C. J. (2004). Project management effectiveness as a construct: A

    conceptual study. *South African Journal of Business Management*, *35*(4), 73–94.

    https://journals.co.za/doi/epdf/10.10520/EJC22263

Morrison, J. M., Brown, C. J., & Smit, E. V. (2008). The impact of organizational culture on project

    management in matrix organizations. *South African Journal of Business Management*, *39*(4),

    27–36. https://doi.org/10.4102/sajbm.v39i4.569

Newberry, D. C. (2017). *Exploring the characteristics and best practices of successful project teams*

    within the defense industry [PhD dissertation]. Capella University.

Patrício, L., & Franco, M. (2022). A Systematic Literature Review about Team Diversity and Team

    Performance: Future Lines of Investigation. *Administrative Sciences*, *12*(1), 31.

    https://doi.org/10.3390/admsci12010031

Radhakrishnan, A., Zaveri, J., David, D., & Davis, J. S. (n.d.). The impact of project team characteristics

    and client collaboration on project agility and project success: An empirical study. *European*

    Management Journal. https://doi.org/10.1016/j.emj.2021.09.011

Riis, J. (1993). Lean project management. *International Journal of Project Management*, *11*(1), 3–4.

    https://doi.org/10.1016/0263-7863(93)90002-5

Rolstadås, A., Tommelein, I., Morten Schiefloe, P., & Ballard, G. (2014). Understanding project

    success through analysis of project management approach. *International Journal of*

    Managing Projects in Business, *7*(4), 638–660. https://doi.org/10.1108/ijmpb-09-2013-0048

Scott-Young, C., & Samson, D. (2007). Project success and project team management: Evidence from capital projects in the process industries. *Journal of Operations Management*, *26*(6), 749–766. https://doi.org/10.1016/j.jom.2007.10.006

Singhto, W., & Denwattana, N. (2016). An experience in blending the traditional and Agile methodologies to assist in a small software development project. *2016 13th International Joint Conference on Computer Science and Software Engineering (JCSSE)*. https://doi.org/10.1109/jcsse.2016.7748914

Sohi, A. J., Hertogh, M., Bosch-Rekveldt, M., & Blom, R. (2016). Does Lean & Agile Project Management Help Coping with Project Complexity? *Procedia - Social and Behavioral Sciences*, *226*, 252–259. https://doi.org/10.1016/j.sbspro.2016.06.186

Song, L., & AbouRizk, S. (2005). Quantifying Engineering Project Scope for Productivity Modeling. *Journal of the Construction Division and Management*, *131*(3), 360–367. https://doi.org/10.1061/(asce)0733-9364(2005)131:3(360

Stuckey, H. (2015). The second step in data analysis: Coding qualitative research data. *Journal of Social Health and Diabetes*, *03*(01), 007–010. https://doi.org/10.4103/2321-0656.140875

Todorović, M. L., Petrović, D., Mihić, M. M., Obradović, V. L., & Bushuyev, S. D. (2015). Project success analysis framework: A knowledge-based approach in project management. *International Journal of Project Management*, *33*(4), 772–783. https://doi.org/10.1016/j.ijproman.2014.10.009

Van Der Vegt, G. S., & Janssen, O. (2003). Joint Impact of Interdependence and Group Diversity on Innovation. *Journal of Management*, *29*(5), 729–751. https://doi.org/10.1016/s0149-2063_03_00033-3

Vukomanović, M., Young, M., & Huynink, S. (2016). IPMA ICB 4.0 — A global standard for project, programme and portfolio management competences. *International Journal of Project Management*, *34*(8), 1703–1705. https://doi.org/10.1016/j.ijproman.2016.09.011

Womack, J. P., & Jones, D. T. (1996). *Lean Thinking : Banish Waste and Create Wealth in Your Corporation* (1st ed.). Productivity Press. https://www.tandfonline.com/doi/abs/10.1057/palgrave.jors.2600967

Wysocki, R. (2014). *Effective Complex Project Management: An Adaptive Agile Framework for Delivering Business Value* (first). J. Ross Publishing.

Xia, B., Xiong, B., Skitmore, M., Wu, P., & Hu, F. (2016). Investigating the Impact of Project Definition Clarity on Project Performance: Structural Equation Modeling Study. *Journal of Management in Engineering*, *32*(1). https://doi.org/10.1061/(asce)me.1943-5479.0000386

Yazici, H. J. (2009). The Role of Project Management Maturity and Organizational Culture in Perceived Performance. *Project Management Journal*, *40*(3), 14–33. https://doi.org/10.1002/pmj.20121

Appendix A

Interview questions

1. Hoe lang werk je al in het projectmanagement en hoe ben je hierin terechtgekomen?

   a. Hoe ervaar jij het managen van projecten binnen Mediq?

   b. Is naar jouw/uw idee een project effectief te managen wanneer er mensen van verschillende afdelingen in het team meewerken? (H5)

   c. Is naar jouw/uw idee een project effectief te managen wanneer er een mensen in het team meewerken van verschillende leeftijden en culturele achtergronden? (H6)

2. Op welke manier zorg jij ervoor dat bij projecten binnen Mediq iedereen alle informatie en documentatie makkelijk kan teruglezen?

   a. In jouw ervaring, hoe verloopt een project wanneer alle relevante informatie en documenten op een centrale plaats terug zijn te vinden? (H1)

3. In jouw ervaring, ben je voor het uitvoeren van projecttaken afhankelijk van anderen?

   a. Wat voor invloed heeft een project management methode op hoe mensen afhankelijkheid van elkaar ervaren in een project? (H3)

4. Naar jouw idee, ervaren medewerkers tijdsdruk binnen projecten bij Mediq?

   a. Heeft een project management methode invloed op hoe mensen tijdsdruk ervaren in een project? Waarom wel/niet? (H4)

5. In welke mate ben je bekend met de MPA en wat er hierin wordt gevraagd van een projectmanager?

   a. Wat zijn naar jouw idee de doelstellingen van de MPA?

6. In welke mate maak jij gebruik van de MPA templates? Welke templates zijn voor jou het belangrijkste? (E2)

7. Naar jouw mening, draagt de MPA bij aan het verbeteren van het projectmanagement binnen Mediq? Waarom wel/niet? (E1)

8. In jouw ervaring, krijg je als projectmanager bij Mediq de mogelijkheid om wanneer dat nodig is beslissingen te maken of prioriteren? Waarom wel/niet?

9. In jouw ervaring, hoe verloopt een project wanneer de doelen van tevoren voor alle stakeholders duidelijk zijn? En wanneer dit niet het geval is? (Doelen voor kosten, doorlooptijd, requirements en kwaliteit) (H2)

Bedankt voor de informatie en je deelname!

Appendix B

Table 3 - Interview coding

Codes	Sum of % Codes	# Times mentioned
Centralization of information	**0,034**	**7**
Digital information	0,014	3
Efficiency	0,01	2
Undocumented information	0,01	2
Diversity	**0,062**	**8**
Demographic diversity	0,024	3
Functional diversity	0,038	5
Goal clarity	**0,259**	**22**
Goal changing	0,053	6
Goal definition	0,038	4
Having clear goals	0,038	3
Reaching goals	0,043	3
Scope/Scoping	0,087	6
MPA	**0,198**	**23**
MPA embeddedness	0,01	1
MPA goals	0,034	6
MPA usefulness	0,058	6
Templates	0,077	6
Training	0,019	4
Processes	**0,067**	**8**
BPF	0,029	1
Process knowledge	0,01	2
Process responsibility	0,014	3
Project process	0,014	2
Role clarity	**0,135**	**18**
Decision making	0,029	4
Division of roles	0,034	3
Role description	0,024	4
Role searching/finding	0,019	3
Sponsors	0,029	4
Task interdependence	**0,095**	**13**
Independency	0,014	2
Method dependency	0,038	6
Team dependency	0,043	5
Time pressure	**0,096**	**12**
Prioritization	0,043	5
Temporal pressure	0,01	2
Work pressure	0,043	5
PPME (Perceived Project Management Effectiveness)	0,053	5

Note: Codes here means that for each of the boldly shown topics the codes that are shown below these were used in the interview coding. Sum of % Codes here means that from the total of all the codes used, the shown percentage amount entailed the specific code. # Times mentioned here means that the specific code is mentioned the shown amount of times by all interviewees together.

Interviewee response details

Perceived project management effectiveness

The first interviewee mentioned that the project management within Mediq does not always run smoothly. According to this person the main challenge lies with acquiring resources and the size of the needed project team.

The second interviewee suggested that one of the main challenges for the project management effectiveness is the availability of resources, which often is limited to a few hours each week. The second interviewee also noticed that the program goals often weren't clear, which might lead to less effective portfolio management.

The third interviewee suggested that it is not always clear why a problem is taken up to become a project. This opinion was shared with the fifth interviewee. In the past year several projects came from problems in the daily business that had no dedicated problem owner. Considering the portfolio, program and project management this might lead to a perception of less effective project management.

The fifth interviewee proposed that problems found in the daily business can often be solved in the daily business, instead of instantly turning these problems into a project. The PMO of Mediq might then assign a project coach rather than a project manager, which could free up time for higher priority projects. A final suggestion made by the fifth interviewee regarding the perceived project management effectiveness turned towards the project steering, this could be performed more effectively by selecting people for the steering board with fitting expertise.

The sixth interviewee mentioned that the "Why" and the "What's in it for me" are two important aspects for effectively managing a project. Translating these to the previously discussed constructs this might direct towards the goal clarity and the perceived project management effectiveness.

Centralization of project information

The first interviewee mentioned that by using a standard location for saving project information, such as a SharePoint page, the project can be managed more effectively than when not using such location. This person explained that when no standard location is used to save information different versions of the documents can exist that can contain contradicting information or that are missing important information.

The second interviewee elaborated that when a project is started the possible ways of sharing information are discussed and a standard approach is agreed upon.

The third interviewee suggested that time can be saved when a centralized place is used for storing project information.

The fourth interviewee stated that information can be found easily within Mediq. This person experienced more difficulties in finding needed information in other companies they worked at than they do within Mediq. This interviewee also specifically mentioned the SharePoint pages. A point of improvement this person encountered was that many times needed information is not documented or only documented poorly and therefore people that have specific knowledge are more important.

The sixth interviewee mentioned, along with the first and fourth interviewees, that SharePoint pages are often used within Mediq projects. Furthermore, in their work as project manager they create strict folder structures for storing project information documents. In addition to the use of SharePoint they use weekly huddles, where weekly goals are determined and updates are provided about the current state of a project, and preferably a set day in the week that is used for working on a project.

Goal clarity

The first interviewee emphasized that defining project goals and scope at the start of the project, in the project proposal, is crucial for success. They noted that although project goals may change, the MPA provides a structure for deciding about such changes and encourages thorough consideration of them. The interviewee explains that projects used to start running without the existence of a pre-planned project plan, which led to results that were reached in the duration of the project needed to be revised often. Additionally, the interviewee suggested that a clear project goal helps in creating a detailed project plan and managing the project more easily. Finally, they highlighted the importance of the project proposal in clearly defining project goals and scope.

The second interviewee emphasizes the importance of clear project goals that are supported by stakeholders and a dedicated problem owner or client. A defined project management structure can help achieve results, but it is not essential for success. The interviewee also notes that project requirements can be adjusted, but the project goal should remain consistent and any changes in the goal should be reflected in the expected results or deliverables. Clear project goals help the project team understand what tasks to prioritize and prevent scope creep. The MPA's scope statement or project proposal templates can be used to define project goals at the start of a project.

The third interviewee highlighted the importance of defining project success to prevent premature termination or incomplete results. They also suggested that project goals become more detailed as the project progresses, while the main goals remain the same and are defined in the scope statement. The interviewee pointed out that a lack of clarity on the definition of a project within Mediq can cause confusion and recommended that project goals and scope be communicated clearly.

The fourth interviewee explained that when a project is well-scoped, all team members know what part of the project they are responsible for. This person states that when the project is well-scoped there are no overlapping tasks or project areas multiple people have to decide about. In addition, this interviewee mentions that a clearly defined scope prevents people from reporting about tasks that are not within their project area. In the end the fourth interviewee mentions that a scope might be broadened when a situation is encountered where overlap is seen with the current project tasks.

The fifth interviewee highlights that it can be challenging to define project scope and gather the necessary people to work on the project in Mediq due to unclear internal problems. The interviewee stresses the importance of clearly defining project goals, milestones, and important aspects before starting a project and obtaining signoffs from stakeholders. The project manager should write the problem statement and suggested solutions if the project scope is not clearly defined. The interviewee emphasizes that while project goals can change during the project, the main goals usually stay the same, and sub-goals change as new insights are encountered.

The sixth interviewee stresses the importance of understanding why certain tasks are assigned to team members within a project. Without clear understanding, team members may not prioritize project tasks. They also mention that Agile methodology allows for more flexibility in adjusting project goals, whereas Prince2 has less flexibility. The interviewee suggests that the main project goal should be constant and originate from higher-level strategies, while sub-goals can change. Asking questions to determine the scope and align stakeholders is important, and project management methodology should be applied flexibly.

Role clarity

The first interviewee highlighted the possibility of growing into a role based on demonstrated competence. They gave an example of transitioning from a task-based role to a project or implementation manager role. The interviewee also mentioned the importance of a sponsor's role in a project and their ability to make final decisions when needed.

The second interviewee believes that a project runs smoothly when the goals are clear, and the roles are well-defined. Spending more time together as a team can also increase effectiveness. The role

division in the MPA can help with decision-making, and the project sponsor or responsible client is important in ensuring that decisions are followed through.

The third interviewee emphasizes the project manager's role in clarifying project goals and ensuring that employees are placed in suitable roles based on their competencies. They also discuss the importance of project sponsors in prioritizing decisions but note that sponsors may struggle with their role and responsibilities. The interviewee suggests having a project sponsor at a level below the management team to divide responsibilities and stresses the importance of having the right people with the needed expertise in the right place.

The fourth interviewee only shortly notices role clarity, by saying that they feel like the middle management is also often capable of making certain decisions.

The fifth interviewee highlights the challenge of building project teams at Mediq due to employees working on projects in addition to their daily tasks. They emphasize the importance of tailoring project management to suit the team at hand, including accommodating introverted team members. This interviewee notes that project managers may receive less coaching and that project sponsors do not always take enough responsibility, leaving the project manager to advise on important decisions.

The sixth interviewee suggests that the sponsor and project manager are closely related. The project manager needs to aid the sponsor in reaching the project goals and in his or her turn the sponsor needs to help the project manager when needed to take away impediments.

Task interdependence

The first interviewee highlighted that task interdependence is essential in project teams, as each team member relies on others to move through the various phases of a project. In cross-functional projects, dependencies between departments become more apparent. The interviewee suggests that project effectiveness can be improved by actively listening to everyone in the team, creating an action list and project plan, and keeping everyone informed of their tasks and deadlines on a weekly basis.

The second interviewee mentioned that the project management can be supported by using a specific method, based on the project goal the team has a high-level overview of what should be done and who should be involved in which parts of the project. However ultimately this person suggested that the tasks are not dependent of the used method.

The third interviewee explained that in a project planning task might be detailed to a point where only one person is needed to perform the task, to have one specific owner of a task that if needed can ask information from others. This person stated that in project management dependencies are made

transparent and agreement is reached about dependencies, for example that a task has a deadline and the team checked if all needed input is available.

The fourth interviewee elaborated that in terms of dependency within a project often the most important factor is the need for information. Every person has different knowledge which creates dependency onto each other. Furthermore, this person explained that the project management method contains the way of working in a project. Using a specific method makes sure people know what to expect within the project, which could mean knowing what to expect from the different project team members.

The fifth interviewee prefers to focus on output rather than input, believing that multi-disciplinary teams inherently work together. However, larger tasks aimed at specific goals do require teamwork. They suggest using Agile methodology and work-in-progress limits to encourage collaboration among team members. In addition, they schedule specific working sessions each week with relevant groups of people to encourage collaboration and ensure necessary tasks are completed.

The sixth interviewee stated that when looking at the bigger picture people always depend on each other. This interviewee defines a project as being a temporary organization that exists because the daily business cannot pick up these tasks. They state that a project team is in a unique situation where the tasks an individual performs have to be cohesive with and fit into the bigger picture of the project. Furthermore, this person explains that they do not think one specific project management method to be best, but that whichever method is used affects how effective a project team can be. They explain that specific elements of a project management method can be chosen that fit with the organisation and project team.

Perceived time pressure

The first interviewee mentioned that project team members experience a project to run more smoothly when a project planning is provided. When a planning is provided team members know what to expect and what they need in order to move forward with the project tasks. This interviewee explains that within Mediq perceived time pressure is largely influenced by the combination of different activities employees are expected to perform. A project deadline that is agreed on can be pressured by other activities that need to be executed.

The second interviewee mentioned that the perceived time pressure within Mediq is not directly related to the projects, time pressure is also experienced by employees in their daily activities.

The third interviewee mentioned that time pressure is common in Mediq, caused by the nature of healthcare-related projects, the desire for improvement, and the urge to fix multiple problems simultaneously. A concrete project plan could help alleviate time pressure, as it would shift the pressure to meet deadlines rather than complete multiple tasks at once. The interviewee suggested that prioritizing projects and tasks at different levels within the company can also affect how time pressure is perceived. Overall, the interviewee emphasized the importance of effective project planning and prioritization to manage time pressure.

The fourth interviewee explains that it can be difficult to gather people for a meeting, often because people are busy working on different tasks at the same time. This interviewee confirms that people within Mediq experience time pressure because employees often work on different operational tasks along with project tasks. According to this person the experience of time pressure might be reduced when a project is managed using a structured planning. Furthermore, the company managers need to prioritize specific tasks to have people available to dedicate their time.

The fifth interviewee suggests that the pressure people experience within Mediq might not be time pressure. They explain that the pressure people experience may be caused by employees performing many tasks at the same time, which might be called work pressure instead of time pressure. This interviewee states that planned deadlines and deliverables pinned to a specific date and time make people feel like they are falling behind with their work. The vaguer and more abstract a project planning is, the less people feel pressure from such a planning. Furthermore, clearly divided ownership of tasks makes people feel responsible for finishing their tasks in time and might strengthen the feeling of being a team within a project.

The sixth interviewee suggests that time pressure is affected by the project planning. The project manager can choose to use a planning where more time than might be needed is assigned to the separate tasks, this allows for a margin in both time and budget of the project. Such an approach might lead to project team members experiencing less time pressure.

Functional diversity

The topic of functional diversity was not elaborated on by the first and second interviewees. The third interviewee suggested that having people from different departments work together in a project team could positively influence the project results. A team with people from different departments could have more different perspectives and more influence and power than a team with less diversity in terms of functional departments. Also, a team with people from different departments also prevents several blind spots within the teams' knowledge. This interviewee states that having a

functionally diverse team is a requirement for being able to oversee implications of a project. Additionally, a functionally diverse team might have a negative effect if focussing on the project management when each department has a different way of working than the others according to this interviewee.

The fourth interviewee explained that it is difficult to have the right people on board within a project within Mediq. It often happens that when asking about a specific topic, other names come up than those of the people that are already involved.

The fifth interviewee suggests that working with a functionally diverse team is challenging. People that do not know each other needing to work together challenges the project manager to forge the team, create a team dynamic and team spirit. Furthermore, this interviewee also elaborates on the logistic challenge of selecting the right people for the project team as well as the challenge of having these people understand each other. People from different departments come from different backgrounds with different knowledge and experiences. This person explains that one of the main challenges as a project manager is to create a team where people understand each other.

The sixth interviewee states that having a functionally diverse team greatly influences the group dynamics. In addition to this the interviewee elaborates that the group dynamics determine the results and success of the project. One might say that a group of people from different backgrounds should be able to deliver a project, the interviewee adds to this by saying that having people look beyond their own expertise leads to successes in a project. Within Mediq the project manager generally is the person who compiles a project team, the interviewee says that often the same people get appointed to work on different projects and different project teams therefore often make use of the same people.

Demographic diversity

The topic of demographic diversity was not elaborated on by the first, second and fourth interviewees. The third interviewee confirmed that having a project team with people of different ages and from different cultural backgrounds leads to more successes. This person explains that there often are differences in way of working among people of different ages. The experiences from work life and education often lead to people having preferences for specific methods and techniques.

The fifth interviewee confirms that aspects such as age, IQ level and EQ level play a role in how easily people work together. Additionally this person explains that a team with more senior level team members might need less guidance and supervision than a team with mainly junior level team members. For creating a project team it would be an ideal situation to have the possibility to choose

between a junior, medior or senior employee within one function profile, according to this interviewee. Unfortunately, within Mediq this often is not possible because there mostly is only one level employee available with the needed knowledge.

The sixth interviewee suggests that when looking to create a project team containing people with different views it would work well to have people from different ages and cultural backgrounds. They explain that older employees often are used to a certain way of working and are less open to different views and creative solutions than younger employees might be.

MPA involvement

The first interviewee explained the goals of the MPA to be a more efficient execution of projects, to have more projects that make it to a successful result within the planned time and with pre-defined goals. They state that the MPA contributes to improving the project management within Mediq in general. This person says they use the templates when needed or applicable within a project. However, the MPA has not been completely embedded within Mediq according to this person. The organisation has not lived through the approach enough to be able to test its structure.

The second interviewee explains the goal of the MPA as providing structure to the project work at Mediq. According to this person the most important document of the MPA is the scope statement, in this document it is made clear what topics belong within the project and what topics do not belong. The scope statement is used to show the conditions of the project. This interviewee describes a project to have a clear result, within a specific timeframe, using a temporary team. They suggest that the weakness of the MPA is that it does not starts with specific goals.

The third interviewee explains the goals of the MPA to be securing that projects are completed within a specific time and with the aimed impact. Using the MPA enables people within Mediq to steer projects effectively according to this interviewee. They suggest that all templates have their reason to exist, however this person does find the scope statement to be the most important template to enable the prioritisation of projects. Additionally, the third interviewee explains that the MPA provides an overview of the running projects on a high level, containing their aim and possible dependencies. According to this person, the main challenge for the MPA lies with what problems are taken on as projects within Mediq.

The fourth interviewee explains the goal of the MPA to be to create a uniform method for the projects within Mediq in order to reach high quality results. The most used template for this person is the project planning document, where an example is provided for a project planning using a GANTT chart. This interviewee confirms that a standardized project management method is useful for a

company. Such a method or approach helps people understand what is expected within a project and it makes sure people that work on multiple projects can use one single method for all their projects.

The fifth interviewee highlights the benefits of Mediq's MPA, which creates an overview of ongoing initiatives and helps project managers steer projects in a uniform way. The MPA also helps prevent too many projects from running simultaneously. However, the interviewee notes that not all templates are useful for every project, and some project managers create their own templates when needed. They suggest that the MPA should be used for smaller, less impactful projects taken on by line managers, rather than large strategic projects that require a dedicated project manager.

The sixth interviewee states that the MPA focuses on capturing project information, reporting, scoping, and resource planning. The MPA is described as a waterfall method to create structure and uniformity among projects at Mediq, but its implementation has weakened. Project managers should select relevant templates while still ensuring company-wide project information is available. The MPA is suggested as most useful for those leading projects without prior project management training, providing support and structure.

Other topics

The third interviewee suggested that optimizing a process is an intervention. When optimizing a process a broader view is needed, so not only looking at the process but also at possibly related aspects. For example are agreements in place with the suppliers and customers, before looking to improve the internal process only.

The fourth interviewee explained that the Business Process Framework within Mediq is under development and aims to have the business processes available in an accessible tool instead of hidden in the different departments. At the time of the interviews this person said to not have the knowledge about how all business processes progress, this information needs to be gathered form different people at the different functional departments to create the documentation of the processes. Within projects often processes play an important role, this interviewee suggests using the process management as a tool for the project management and to include process improvements that result from projects into the Business Process Framework.

The sixth interviewee confirms that processes often play an important role within projects, the need for different departments to work together in projects shows how the processes of these departments are related.

Appendix D

Survey e-mail

Hallo,

Fijn dat je mijn mail leest!

Mijn naam is Tamar Timmer. Ik ben werkzaam bij het projectmanagement team van Mediq naast mijn masterstudie Innovation Management aan de TU Eindhoven. In mijn master scriptie doe ik onderzoek naar de relatie tussen verschillende eigenschappen van een projectteam en de ervaren effectiviteit van het projectmanagement.

Aangezien jij betrokken bent (geweest) bij een of meerdere projecten binnen Mediq en/of de Mediq Project Aanpak training hebt gevolgd zou ik graag jouw ervaringen en mening meenemen.

Klik op de volgende link op naar de vragenlijst te gaan:

https://innotechentremarktue.qualtrics.com/jfe/form/SV_1ZjoP1rkeKBKFRs

(Note: as of 28-02-2023 no longer operational)

Het invullen van alle vragen duurt ongeveer 10 minuten en is volledig anoniem.

De vragen worden gesteld in het Engels, omdat dit de voertaal is op de TU Eindhoven.

Aan het einde van de survey ontvang je een link naar een klein bedankje.

Alvast bedankt voor je tijd en het invullen van de vragen!

Met vriendelijke groet,

Kind regards,

Tamar Timmer

Appendix E

Linear regression formula

The following general linear regression formula was applied to test the hypotheses, using β to estimate the regression intercepts and slopes and ε to describe the error term:

$$\gamma = \beta_0 + \beta_i * x_i + \varepsilon_i$$

Where:

γ is the value for Perceived project management effectiveness

x_1 is the value for Centralization of project information

x_2 is the value for Goal clarity

x_3 is the value for Role clarity

x_4 is the value for Task interdependence

x_5 is the value for Perceived time pressure

x_6 is the value for Functional diversity

x_7 is the value for Demographic diversity

x_8 is the estimated Individual MPA involvement

Appendix F

Survey details

Introduction to survey ▾ ···

Q1

Hi, I'm glad you opened this page!

My name is Tamar Timmer. I work at the project management office of Mediq besides my master Innovation Management at Eindhoven University of Technology. In my master thesis I look into the relationship between different project team characteristics and the perceived project management effectiveness.

Since this topic originated at the Mediq project management office I would like to include your experience with projects at Mediq into the research. Completing the survey will take approximately 10 minutes.

The questions are posed in English because this is the main language at our university.
Off course I don't want to spam you in any way, the data that is collected will be used only for this research and you remain completely anonymous.

As a small thank you gift you can choose a free new background for your phone or computer after submitting your answers.
Do you have any questions for me? Mail to t.l.timmer@student.tue.nl or tamar.timmer@mediq.com

Thank you in advance for your time in filling out the survey!

Demographic diversity ▾ ···

Q3

What is your age?

Q4

What gender do you identify as?

○ Male
○ Female
○ Non-binary / third gender
○ Prefer not to say

Q5

Which of the following regions holds the country of your nationality?

○ Northern Europe
○ Western Europe
○ Eastern Europe
○ Southern Europe
○ Asia
○ Africa
○ North America
○ South America
○ Australia & New Zealand

Q6

This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Centralization of project information + Individual MPA involvement

Q60

The questions in this survey ask for your own experience with or perception of projects within Mediq.
For each question you can indicate how much you disagree or agree with the statement choosing from 5 different options.

The following questions focus on the Mediq Project Approach (MPA). This is a project management method focussing on different phases of a project:
Pre-project > Preparation > Delivery > Closure > Completed.
For each project phase several MPA templates are available.

The last two questions on this page ask about the accessibility of project documents.
Examples of information systems used within Mediq are SharePoint or a Microsoft Teams group.

Q26

In my experience, all project documents are centralised under the control of the project.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q27

In my experience, project information systems provide helpful and accurate project information.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q28

I am interested in using the Mediq Project Approach.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q29

I think the Mediq Project Approach is useful for managing projects within Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q30

I know what the Mediq Project Approach asks me to do within a project.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q31

I make or made use of the available training and coaching for the Mediq Project Approach.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q32

I make or made use of the available Mediq Project Approach Templates.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Task interdependence + Time pressure

Q62

The questions in this survey ask for your own experience with or perception of projects within Mediq.
For each question you can indicate how much you disagree or agree with the statement choosing from 5 different options.

The following questions ask about your experience with working in project teams within Mediq.

Q44

The tasks I perform in a project can be performed fairly independently of other team members.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q45

The tasks I perform in a project require frequent coordination with the efforts of other team members.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q46

I depend on receiving accurate information from other project team members to perform well on the tasks I carry out in a project.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q47

In my opinion, we have too much work to do as a project team for the time available.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q48

In my experience, we have to work extra hard as a project team to finish the work on time.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q49

In my experience, most of the time we have to hurry as a project team to finish tasks on time.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q50

In my opinion, most of the time we experience time pressure as a project team .

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q63

The questions in this survey ask for your own experience with or perception of projects within Mediq.
For each question you can indicate how much you disagree or agree with the statement choosing from 5 different options.

The following questions ask about how you experience project goals and your position within a project team.
Keep in mind that project goals are the main focus of the project. The scope of a project is not included in the goal, this can be seen as a separate topic.

+ Add page break

Q34

There are clear and comprehensible goals for projects within Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q35

Project goals change substantially during projects within Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q36

Project goals are changed often for projects within Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q37

There are clear, planned goals and objectives for my job within a project team at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q38

I feel certain about how much authority I have within a project team at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q39

I know that I have divided my time properly when working within a project team at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q40

I know what my responsibilities are within projects at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q41

I know exactly what is expected of me within projects at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q42

The explanation of what has to be done is clear within projects at Mediq.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q43

This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

PPME 1

Q64

The questions in this survey ask for your own experience with or perception of projects within Mediq.
For each question you can indicate how much you disagree or agree with the statement choosing from 5 different options.

Q7

Projects within Mediq consistently meet their cost targets.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q8

Projects within Mediq consistently meet time targets.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q9

Projects within Mediq consistently meet the required quality standards.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q10

Projects within Mediq consistently meet their technical performance specifications.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q11

Project estimates and planning within Mediq are as far as possible done on factual and reliable information.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q12

Within Mediq it is customary to have formal reviews to learn from project failures and/or successes.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q13

Projects within Mediq are continually reviewed to re-evaluate their viability and potential success.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q14

Mediq has a standardised and effective system for managing projects.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q15

Mediq has the ability to estimate and plan its projects with reasonable accuracy.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

PPME 2

Q65

The questions in this survey ask for your own experience with or perception of projects within Mediq.
For each question you can indicate how much you disagree or agree with the statement choosing from 5 different options.

Q17

Within Mediq there is an adequate focus on managing project risks.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q18

Project managers within Mediq are given the necessary authority to execute their responsibilities.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q19

Within Mediq there are clearly laid down decision-making principles.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q20

Project managers within Mediq are held accountable for meeting their responsibilities.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q21

Within Mediq project teams are generally effectively structured and mobilised.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q22

Mediq is committed to providing the agreed upon resources.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q23

Project managers within Mediq are adequately empowered to access the required resources for their projects.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

Q24

Within Mediq the availability of resources are taken into account when deciding upon projects and setting priorities.

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
○	○	○	○	○

+ Add page break

Q25

This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Functional diversity

Q52

What is your highest education qualification?

○ Vocational training (MBO)

○ HBO/WO Bachelor

○ WO Master

○ PHD

○ Other (Please specify in following question)

Q53

Elaboration on education qualification:

Q54

How long have you been working at Mediq?

6 months or less	Over 6 months, up to 1 year	Over 1 year, up to 3 years	Over 3 years, up to 5 years	Over 5 years
○	○	○	○	○

Q62

On average, how many hours do you spend on projects each week?

Q55

What is your functional background?

- ○ IT
- ○ Sourcing
- ○ Customer Contact Center
- ○ Supply Chain
- ○ Finance
- ○ e-Business
- ○ Sales
- ○ Human Resources
- ○ Category Management
- ○ Marketing
- ○ General/Other

★

Q56

Which projects are or were you part of in 2022?

	Yes	No
Infuus Optimalisatie	○	○
Incomplete Authorizations	○	○
ZVZ Facturatie	○	○
ZVZ Contracten	○	○
Cycle time pumps	○	○
Mijn Mediq - Patient Portals	○	○
Mijn Mediq - DVN	○	○
Prescriber Portal - Infuus & Respiratoir	○	○
Migratie Medbis 2.0	○	○
PIM 2.0	○	○
Philips FSN	○	○
WeSense	○	○
Retouren Kaart in de bus	○	○
Customer Onboarding	○	○
MTM IG	○	○
MPS Toekomstvast	○	○
Digitize Customer Interactions: Maximize No Touch	○	○
Customer Data Readiness	○	○
Other project, please indicate below.	○	○

Q68

These projects I have participated in are not in the list above:

Q57

This question lets you record and manage how long a participant spends on this page. This question will not be displayed to the participant.

Results mail ⌄ ···

Q67

Keep in mind that when an answer is provided to the next question your anonimity for the previous questions will still be kept in the final report. However, in the dataset that will be retrieved from the survey you are no longer anonymous. Do you want to keep 100% anonimity but still are interested in the results? You can skip this question if preferred and send me an e-mail instead: tamar.timmer@mediq.com or t.l.timmer@student.tue.nl

Don't forget to click next to submit your answers and receive your thank you gift!

Q59

Would you like to receive the results of my research? Please leave your e-mail address below.

End of Survey

Your response has been recorded.

Thank you for your time in filling out this survey!

Here's a link to some free background pictures for your phone or computer:

https://www.pexels.com/search/winter%20scenes/

Appendix G

Table 4 - Quantitative data entries

Number of respondents	Stopped after page…	Page description
9	1	Introduction to survey
15	2	Demographic diversity
2	3	Centralization of project information + Individual MPA involvement
2	4	Task interdependence + Time pressure
2	5	Goal clarity + Role clarity
0	6	PPME part 1
0	7	PPME part 2
1	8	Functional diversity
0	9	Results mail
46	10	End of survey
77	Total	
49	Usable replies	

Appendix H

Correlation matrix

This table represents a correlation matrix with Pearson correlations. The significant correlations are marked in red. Naturally the correlation of a construct with itself always is significant.

Table 8

Correlation matrix

Correlations

		CPI	MPA	TI	TP	GC	RC	PPME	Age	Gender	Nationality	Education	Time working at Mediq	Project hours each week	Functional Background
CPI	Pearson Correlation	1,000	,438**	,316*	-0,150	-0,176	,300*	0,200	0,241	0,089	0,210	-0,154	0,128	0,063	-0,050
	Sig. (2-tailed)		0,002	0,027	0,304	0,225	0,036	0,169	0,096	0,541	0,147	0,306	0,381	0,668	0,740
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
MPA	Pearson Correlation	,438**	1,000	0,208	,320*	-0,208	0,240	0,192	0,223	0,084	0,259	-0,203	,379**	-0,048	-0,095
	Sig. (2-tailed)	0,002		0,151	0,025	0,152	0,096	0,185	0,123	0,567	0,073	0,176	0,007	0,744	0,529
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
TI	Pearson Correlation	,316*	0,208	1,000	0,208	0,154	-0,162	-0,253	-0,186	-0,040	0,199	0,155	0,017	,366**	-0,273
	Sig. (2-tailed)	0,027	0,151		0,151	0,289	0,266	0,079	0,201	0,786	0,170	0,303	0,910	0,010	0,066
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
TP	Pearson Correlation	-0,150	,320*	0,208	1,000	0,090	-0,144	-0,184	-0,104	0,064	0,067	0,078	0,173	-0,099	-0,040
	Sig. (2-tailed)	0,304	0,025	0,151		0,539	0,323	0,206	0,478	0,662	0,649	0,605	0,233	0,500	0,793
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
GC	Pearson Correlation	-0,176	-0,208	0,154	0,090	1,000	-,510**	-,420**	-0,251	0,228	0,116	0,046	-0,144	-0,052	-0,078
	Sig. (2-tailed)	0,225	0,152	0,289	0,539		0,000	0,003	0,082	0,115	0,427	0,761	0,323	0,721	0,606
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
RC	Pearson Correlation	,300*	0,240	-0,162	-0,144	-,510**	1,000	,442**	0,263	0,121	0,019	-0,003	,333*	0,055	0,110
	Sig. (2-tailed)	0,036	0,096	0,266	0,323	0,000		0,001	0,068	0,406	0,898	0,982	0,019	0,706	0,466
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
PPME	Pearson Correlation	0,200	0,192	-0,253	-0,184	-,420**	,442**	1,000	0,083	0,079	-0,223	0,019	0,193	-0,007	0,101
	Sig. (2-tailed)	0,169	0,185	0,079	0,206	0,003	0,001		0,569	0,590	0,124	0,900	0,185	0,963	0,502
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Age	Pearson Correlation	0,241	0,223	-0,186	-0,104	-0,251	0,263	0,083	1,000	-,470**	,312*	-0,043	0,197	-,340*	-0,019
	Sig. (2-tailed)	0,096	0,123	0,201	0,478	0,082	0,068	0,569		0,001	0,029	0,777	0,175	0,017	0,898
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Gender	Pearson Correlation	0,089	0,084	-0,040	0,064	0,228	0,121	0,079	-,470**	1,000	-0,070	0,032	-0,007	0,020	0,051
	Sig. (2-tailed)	0,541	0,567	0,786	0,662	0,115	0,406	0,590	0,001		0,634	0,832	0,962	0,894	0,737
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Nationality	Pearson Correlation	0,210	0,259	0,199	0,067	0,116	0,019	-0,223	,312*	-0,070	1,000	0,011	0,043	0,024	-0,110
	Sig. (2-tailed)	0,147	0,073	0,170	0,649	0,427	0,898	0,124	0,029	0,634		0,943	0,768	0,871	0,468
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Education	Pearson Correlation	-0,154	-0,203	0,155	0,078	0,046	-0,003	0,019	-0,043	0,032	0,011	1,000	-0,124	0,035	0,070
	Sig. (2-tailed)	0,306	0,176	0,303	0,605	0,761	0,982	0,900	0,777	0,832	0,943		0,411	0,819	0,644
	N	46	46	46	46	46	46	46	46	46	46	46	46	46	46
Time working at Mediq	Pearson Correlation	0,128	,379**	0,017	0,173	-0,144	,333*	0,193	0,197	-0,007	0,043	-0,124	1,000	-,388**	-,358*
	Sig. (2-tailed)	0,381	0,007	0,910	0,233	0,323	0,019	0,185	0,175	0,962	0,768	0,411		0,006	0,015
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Project hours each week	Pearson Correlation	0,063	-0,048	,366**	-0,099	-0,052	0,055	-0,007	-,340*	0,020	0,024	0,035	-,388**	1,000	0,023
	Sig. (2-tailed)	0,668	0,744	0,010	0,500	0,721	0,706	0,963	0,017	0,894	0,871	0,819	0,006		0,877
	N	49	49	49	49	49	49	49	49	49	49	46	49	49	46
Functional Background	Pearson Correlation	-0,050	-0,095	-0,273	-0,040	-0,078	0,110	0,101	-0,019	0,051	-0,110	0,070	-,358*	0,023	1,000
	Sig. (2-tailed)	0,740	0,529	0,066	0,793	0,606	0,466	0,502	0,898	0,737	0,468	0,644	0,015	0,877	
	N	46	46	46	46	46	46	46	46	46	46	46	46	46	46

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix I

Normal probability plots and scatterplots of residuals

Figure 6

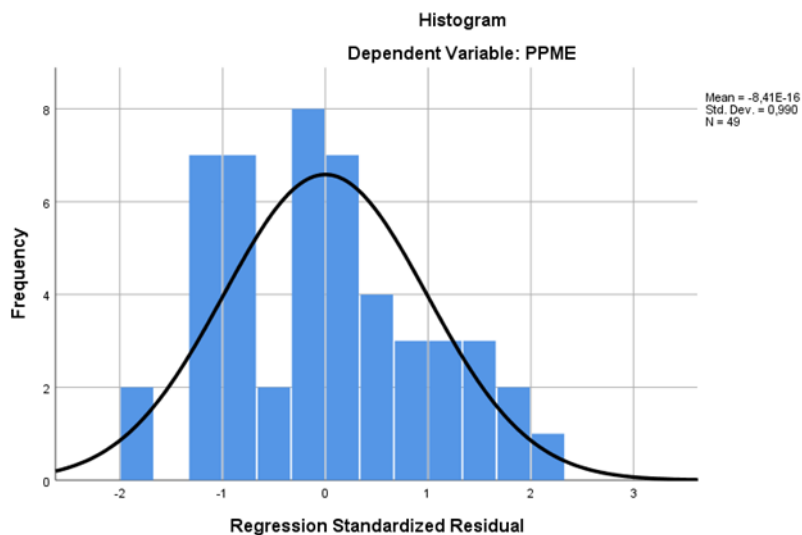*Normal probability plot for the residuals of CPI X PPME*

Figure 7

Scatterplot of the residuals opposing the predicted value for CPI X PPME
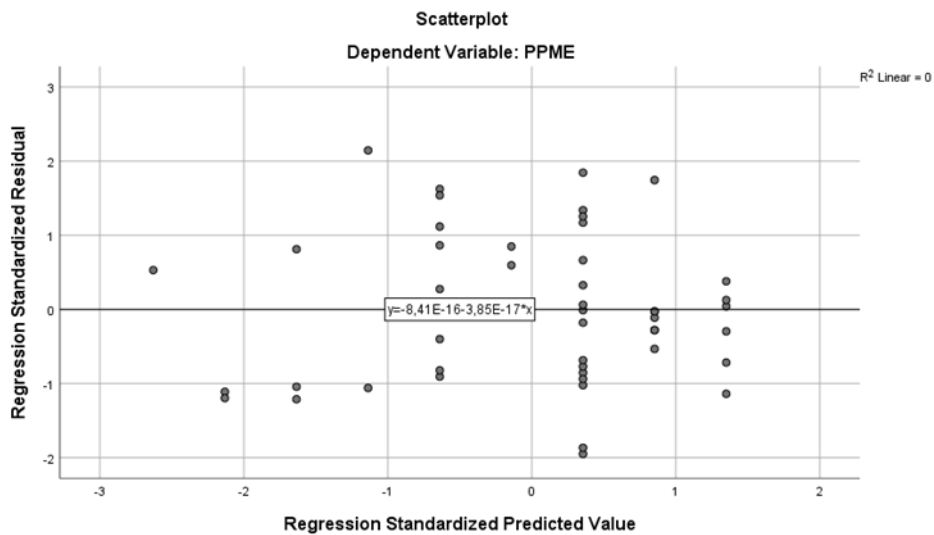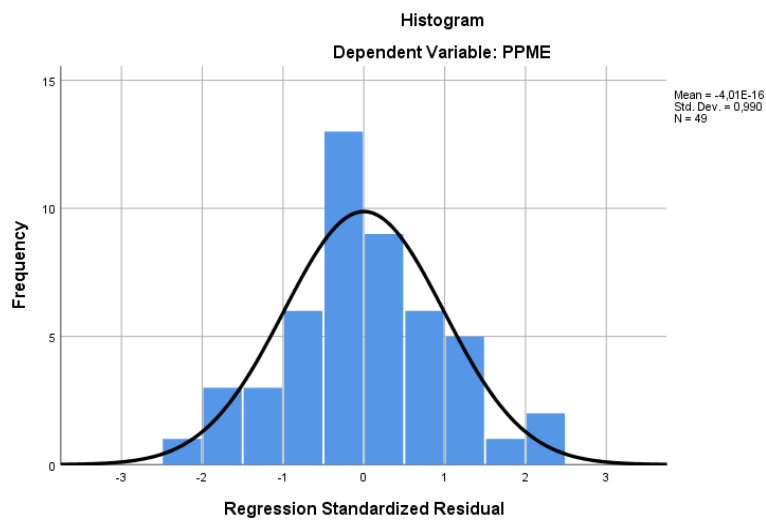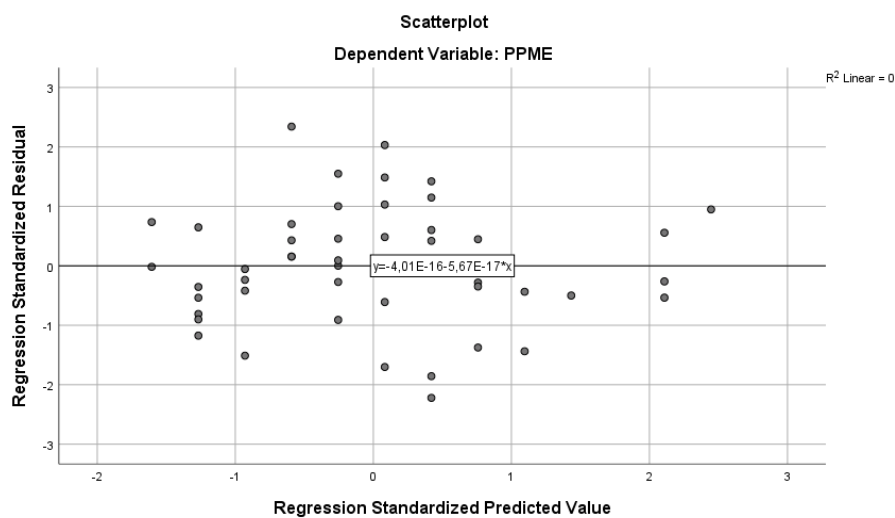
Figure 10
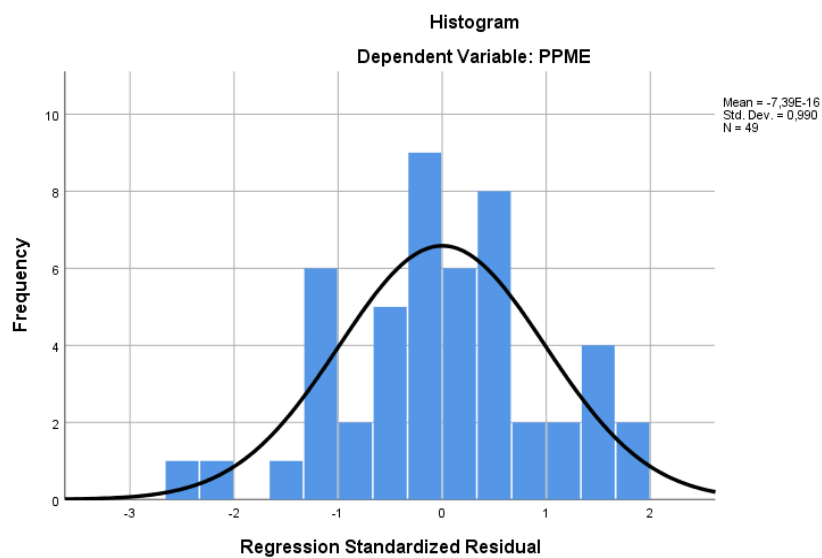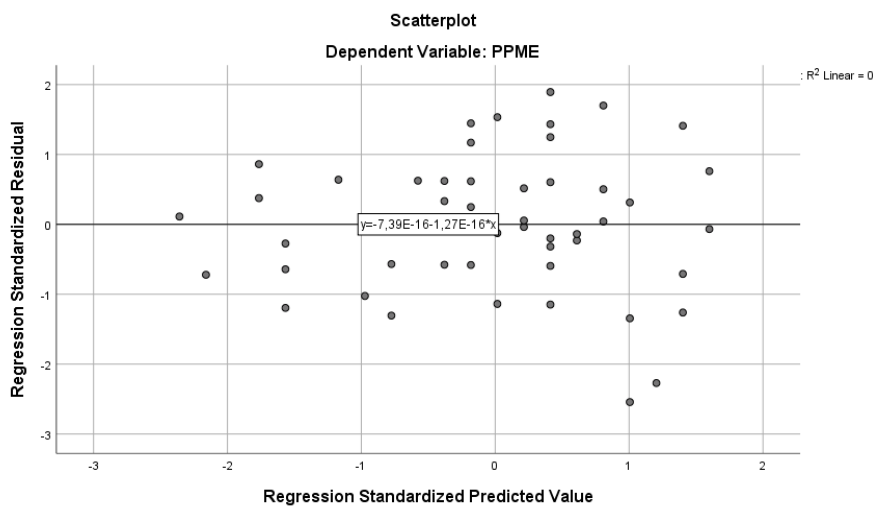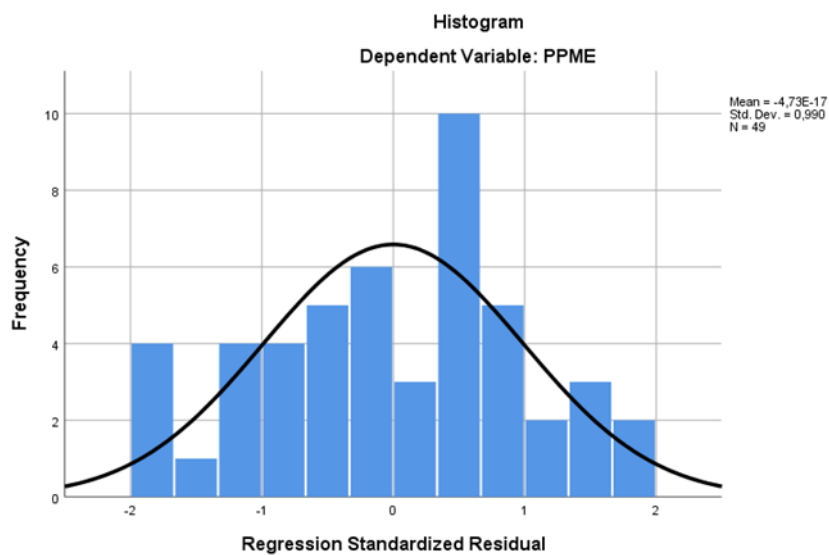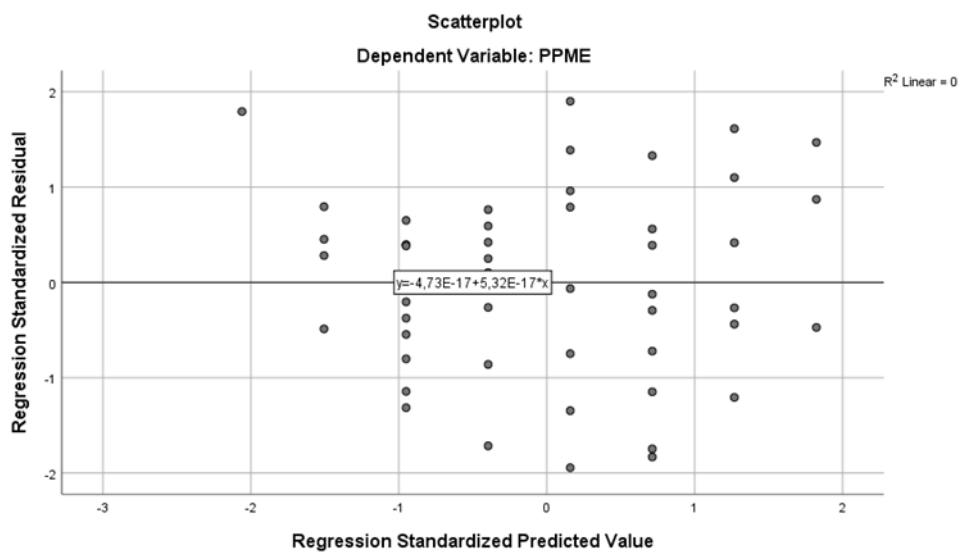
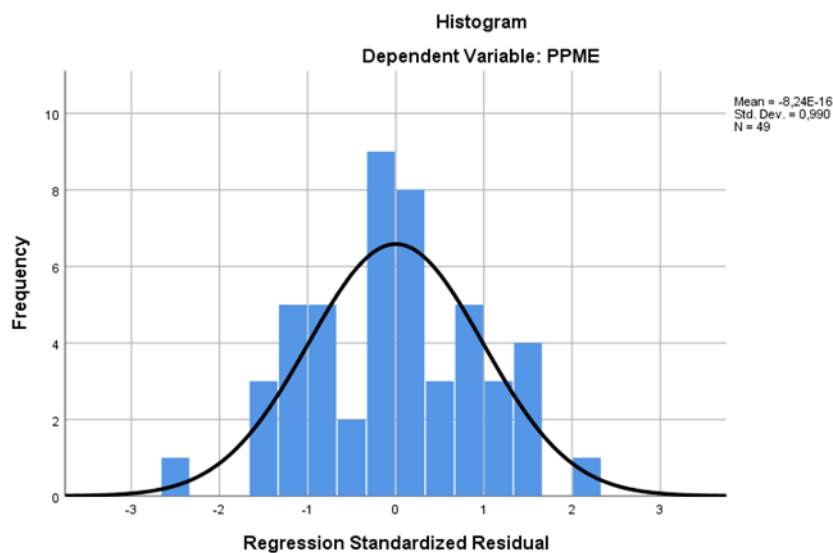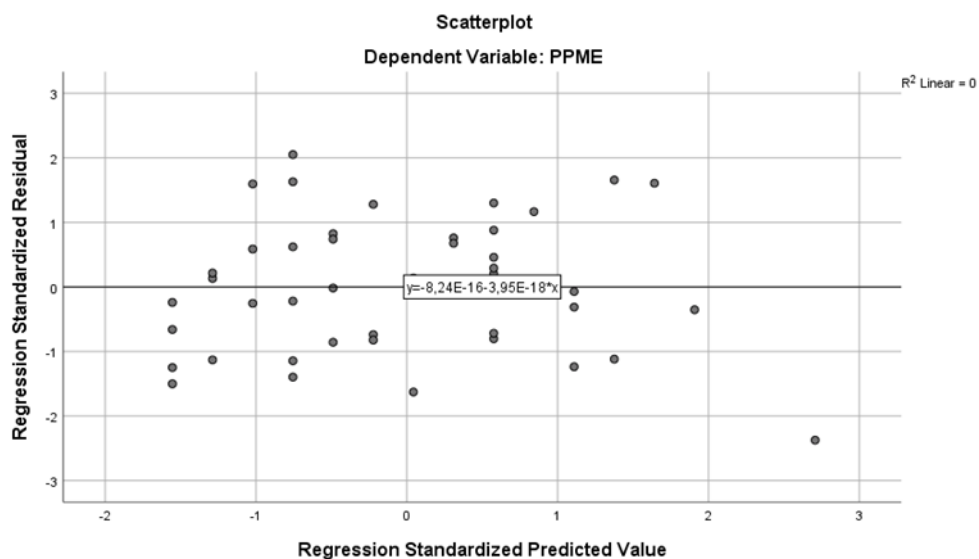*Normal probability plot for the residuals of GC X PPME*

Histogram
Dependent Variable: PPME

Mean = -4,01E-16
Std. Dev. = 0,990
N = 49

Figure 11

Scatterplot of the residuals opposing the predicted value for GC X PPME

Scatterplot
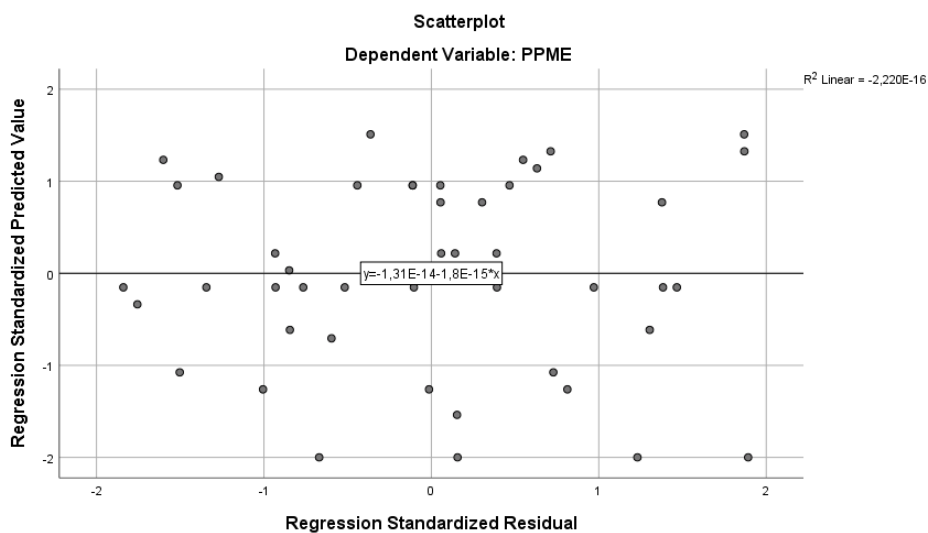Dependent Variable: PPME

R^2 Linear = 0

y=-4,01E-16-5,67E-17*x

Figure 13

Normal probability plot for the residuals of RC X PPME

Figure 14

Scatterplot of the residuals opposing the predicted value for RC X PPME

Figure 16
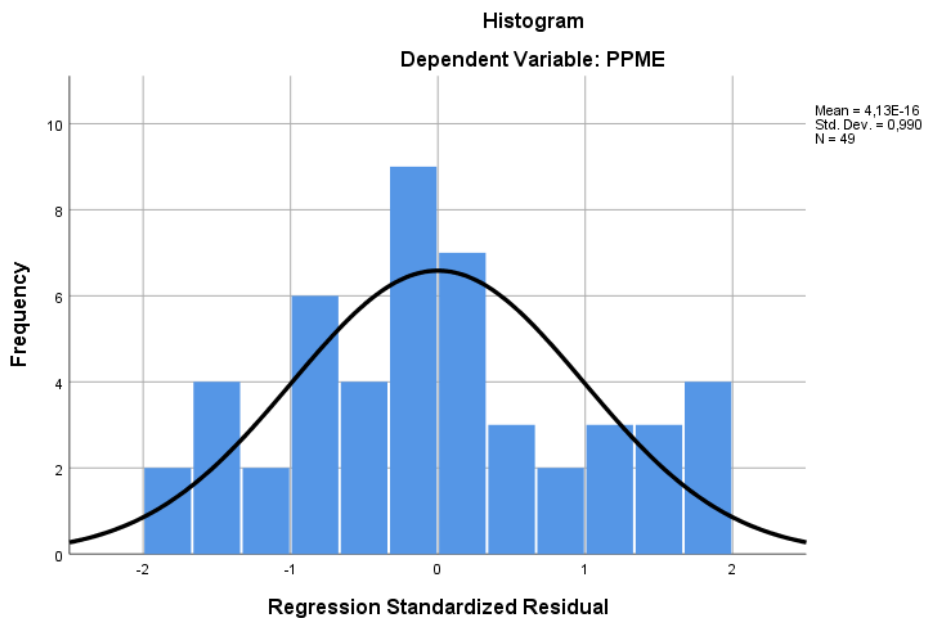
Normal probability plot for the residuals of TI X PPME

Figure 17

Scatterplot of the residuals opposing the predicted value for TI X PPME

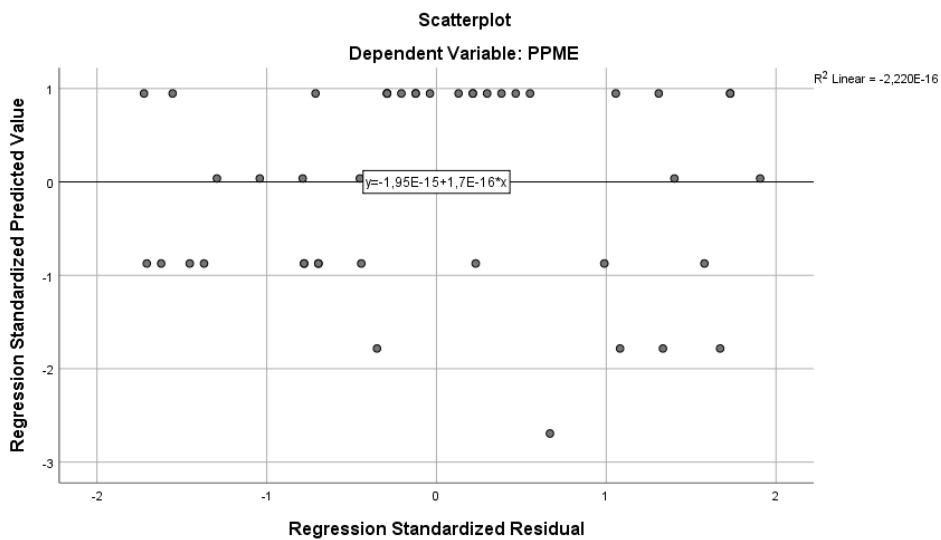**Figure 20**

Normal probability plot for the residuals of TP X PPME

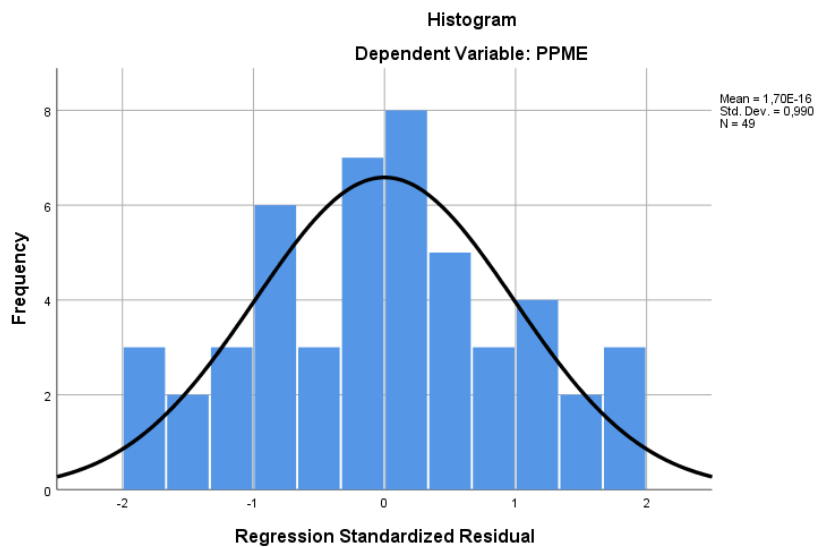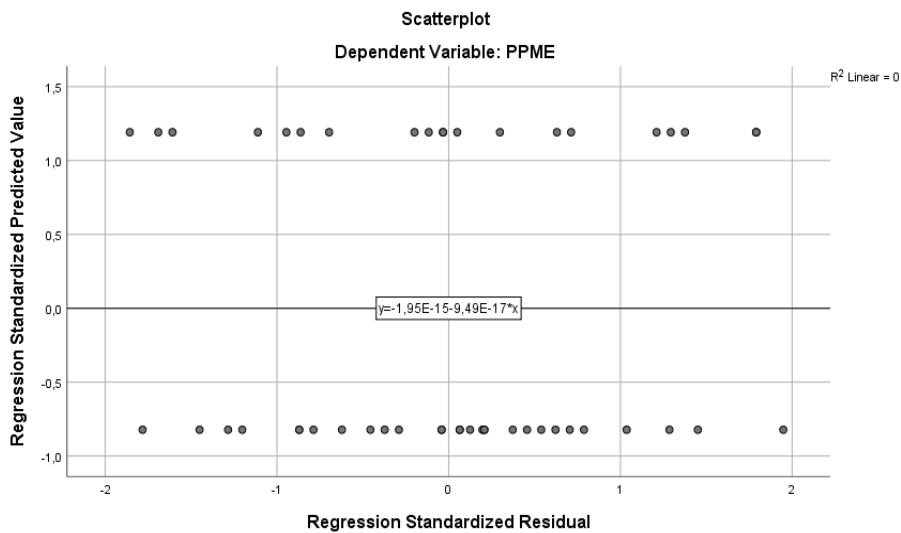**Figure 21**

Scatterplot of the residuals opposing the predicted value for TP X PPME

Figure 24

Normal probability plot for the residuals of weekly project hours X PPME

Histogram
Dependent Variable: PPME

Mean = 6,59E-17
Std. Dev. = 0,990
N = 49
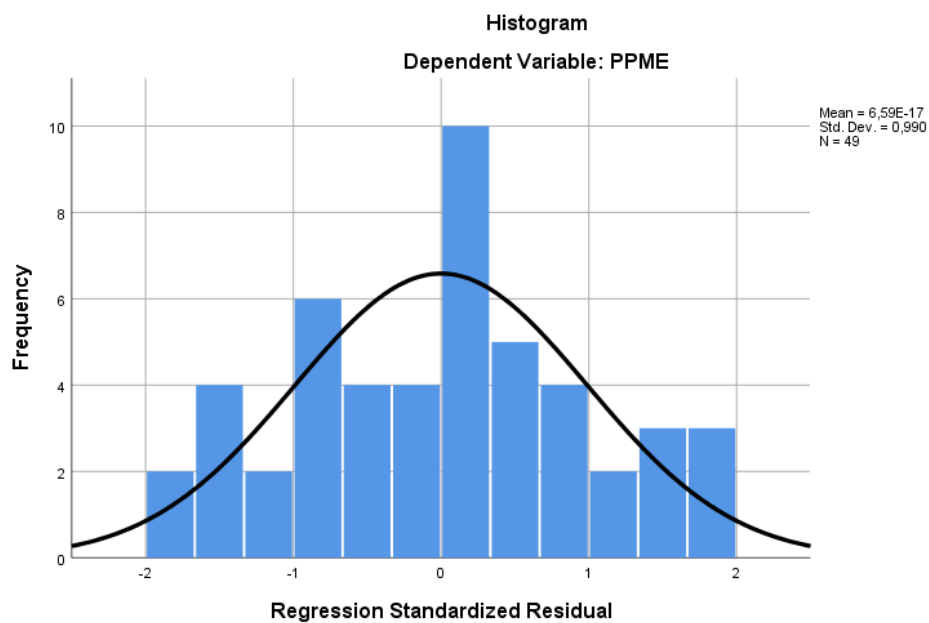
Figure 25

Scatterplot of the residuals opposing the predicted value for weekly project hours X PPME

Scatterplot
Dependent Variable: PPME

R^2 Linear = -2,220E-16

$y = -1,31E-14 - 1,8E-15 \cdot x$

Figure 27

Normal probability plot for the residuals of years working at Mediq X PPME

Histogram
Dependent Variable: PPME

Mean = 4,13E-16
Std. Dev. = 0,990
N = 49

Figure 28

Scatterplot of the residuals opposing the predicted value for years working at Mediq X PPME

Scatterplot
Dependent Variable: PPME

R^2 Linear = -2,220E-16

$y=-1,95E-15+1,7E-16*x$

Figure 30

Normal probability plot for the residuals of gender X PPME

Figure 31

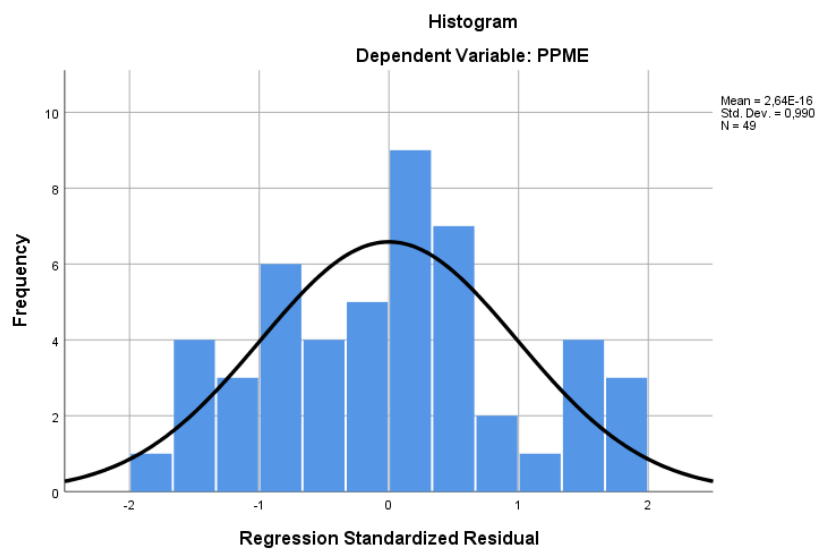*Scatterplot of the residuals opposing the predicted value for gender X PPME*

Figure 33

Normal probability plot for the residuals of age X PPME

Figure 34

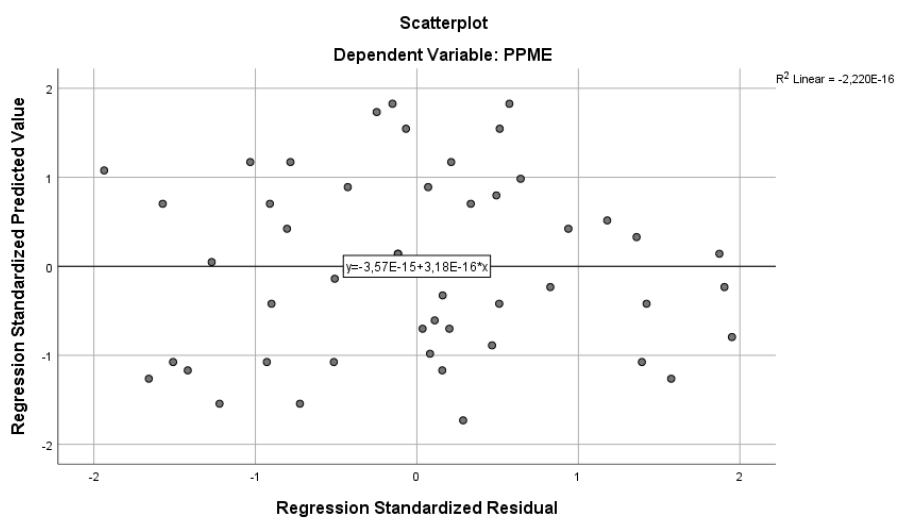*Scatterplot of the residuals opposing the predicted value for age X PPME*

Figure 36

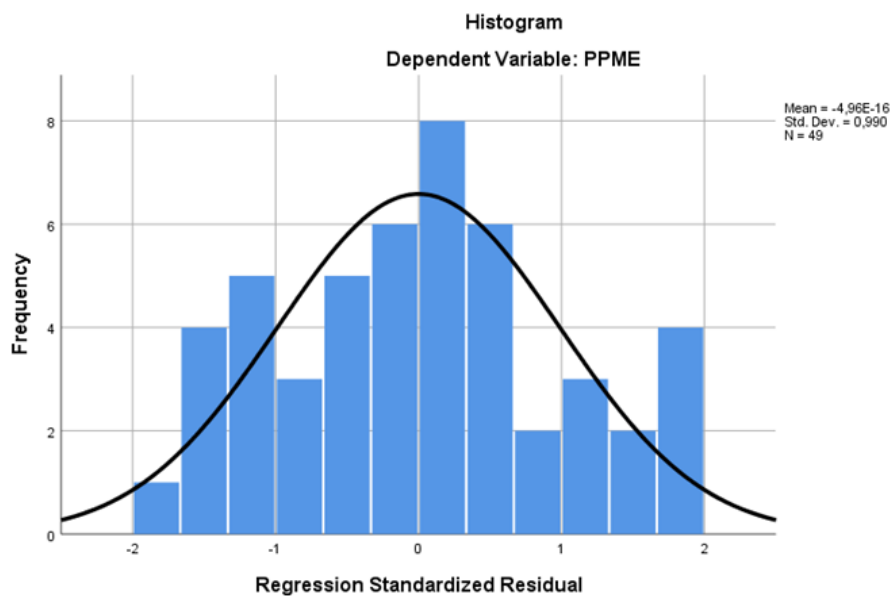*Normal probability plot for the residuals of MPA X PPME*

Figure 37

Scatterplot of the residuals opposing the predicted value for MPA X PPME