

MASTER

What are the advantages of portfolio management in innovative organizations?

Tauber, J.A.

Award date:
2012

[Link to publication](#)

Disclaimer

This document contains a student thesis (bachelor's or master's), as authored by a student at Eindhoven University of Technology. Student theses are made available in the TU/e repository upon obtaining the required degree. The grade received is not published on the document as presented in the repository. The required complexity or quality of research of student theses may vary by program, and the required minimum study period may vary in duration.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain

Eindhoven, December 2012

***What are the advantages of
Portfolio management in Innovative
organizations?***

By

J.A. (Jip) Tauber

Student identity number 0665630

in partial fulfilment of the requirements for the degree of

**Master of Science
in Innovation Management**

Supervisors:

dr. S. Rispens, TU/e, HPM

dr. J.M.P. Gevers, TU/e, HPM

External supervisor:

L. de Zoete, Capgemini, FS

TUE. School of Industrial Engineering.

Series Master Theses Innovation Management

Subject headings: PMO, Portfolio management, Programme management, Project management, Role clarity, Standardization, Project start-up, Project success, Project anticipation.

Abstract

This Master's thesis concerns the analysis of PMO and its association with project success. Furthermore, it is investigated whether the expected positive association of PMO on project success can be explained by an increase in role-clarity, standardization, anticipation and a decrease in start-up time.

Preface

This master's thesis is the result of a graduation project carried out within the Financial services department of Capgemini Nederland. The 27th of May 2011, I went to the Business Technology Event of Capgemini, after which I found the company very interesting. I came into contact with Lia de Zoete who I want to thank for the opportunity to conclude my master's programme on the subject of PMO. She gave me great help and feedback on the survey, thesis, and insights on PMO. I also enjoyed the events to which she invited me.

Furthermore, I want to thank my first supervisor, Sonja Rispen, for her incredible support, the amount of feedback, meetings and her flexibility. She was of great help in making this report scientific. In addition I would like to thank my second supervisor, Josette Gevers, in the several meetings, her ideas and thoughts on the research proved to be valuable for the completion of this study. Finally, I want to thank all participants of the interviews and the questionnaires, without them I would not have been able to finish this research.

Above all, I want to express my gratitude to my family, friends and the N-gang. My parents because of their support during my entire study period of more than 8 years. Without them I would not have been able to finish this second study. Then I would like to give my appreciation to my brother, who was always there for me when I needed him for advice or for social support. I want to thank the N-gang for sharing the frustration of writing a report, for the great lunches, midday walks on the campus, and for the many coffees we drank. And finally, all friends, who helped me having the time of my life.

Jip Tauber

Eindhoven, November 2012

Management Summary

In order to give the management a good overview of this thesis, the essence of this study will be summarized in this chapter, containing the research method, results, conclusion, and recommendations.

This study focuses on portfolio, programme, and project management offices (PMO), which is a form of project, programme and portfolio management support. Though there has been done a lot of research on project success, still many projects fail to meet their goals or turn out to be unsuccessful (Barczak, 2009). The main goals of PMO are: implementation of standard methods and tools, just in time availability of scarce specialist knowledge where it is needed most, and to optimize the change capacity.

PMO has an assumed positive relation with project success, caused by an increase in role-clarity, standardization, anticipation and a decrease in start-up time, though this has not been empirically proven. This leads to the research model shown in Figure 1. The goal of this study was to verify this model.

The main research question of my thesis research is: **“how and to which extent does PMO increases project success?”**

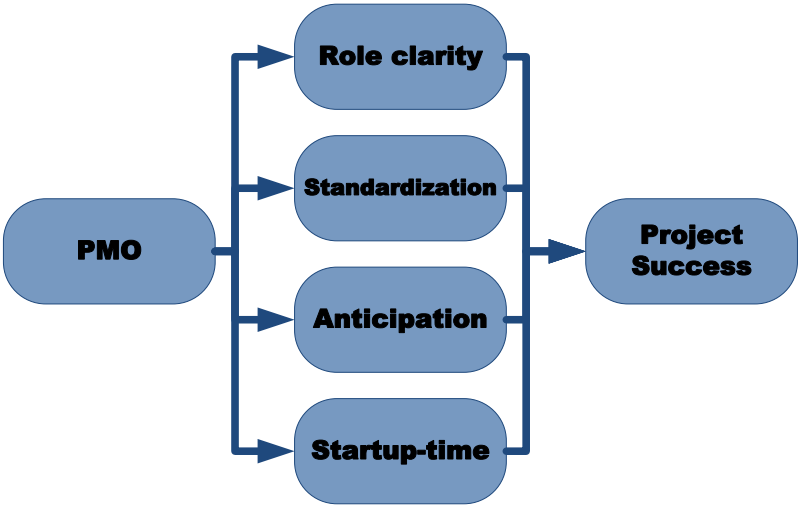


Figure 1 - Research model

In order to gain information about the constructs I have held two interviews with two people each (thus four people in total). I used the information of the literature study and the knowledge of my company supervisor (who is an expert in the field of PMO) to create a list of topics interesting to discuss during the interviews. After the interview the survey was created (it is shown in Appendix 2), it is divided into several types of questions (Likert scale, percentage scale, open questions). The fieldwork (interviews) is used to provide important insights (Gable, 1994). Where the survey is used to objectively verify the hypothesis (Landy and Conte, 2007). Furthermore, the survey had a strong diversity in participants. In both groups (with and without PMO) companies out of multiple sectors participated. Diversity is desirable for the generalization of the results (Blair and Zinkhan, 2006).

The survey held among 44 participants (32 with PMO, 12 without PMO), did not demonstrate that organizations with PMO outperformed organizations without PMO. Furthermore, no indications were found that organizations with PMO better prevent project problems, or experienced more role-clarity, standardization, and project management success compared to the organizations that have not implemented PMO. However, the results did show significant differences in duration of the start-up phase and the amount of schedule adjustments. Companies with PMO have a significantly longer start-up phase, and more schedule adjustments than companies without PMO. The amount of employees working within an establishment has also a significant positive correlation with schedule adjustment and start-up time in days. Finally, this study associated standardization with project management satisfaction.

After discussing the results with an expert in the field of PMO it is found that most likely the differentiation between companies with PMO and without PMO cannot be made dichotomous. PMOs are too different from each other in a way that they can be implemented at different levels (on project, programme and portfolio level), they differ in size which makes

them able to do more or less tasks, and PMOs change through the years (Aubry et al., 2007), which is called PMO maturity. Future research should take PMO characteristics like the ones just named into account because these influence the benefits created by the PMO. These same differences in the different kind of PMOs also indicate that if management wants to implement PMO, they should keep in mind that different kinds of PMO, create different kinds of benefits and thus give solutions to different kind of problems.

Furthermore, the results of this study show that companies that use PMO adjust their schedule more often than organizations that do not use PMO. This seems to suggest that the monitoring of the innovative process is higher among those organizations. This is conform the literature (Tengshe and Noble, 2007; Rangaswamy and Lilien, 1997) which documented that PMO is associated with the use of project management tools, and the way in which these tools are used. This finding has practical implications such that companies which find it difficult to properly manage their schedules should look into PMO, because this could well be an option to remedy this problem. Though this study also negatively associates schedule adjustment with project success. To explain this correlation more research is needed, but management should keep in mind that the amount of schedule adjustments does not increase project success.

Finally, when project management satisfaction is low, a project manager should look at the level of the standardization of the protocols. This research positively associated project management satisfaction with standardization, meaning that it could well be that employees are more satisfied when project managers standardize more protocols.

Content

Abstract	2
Preface	3
Management Summary	4
Content	7
Table of Figures	9
1. Introduction	10
2. Theory & hypotheses	13
2.1 Portfolio, programme and project level	13
2.2 Standardization	16
2.3 Anticipation	17
2.4 Role clarity	19
2.5 Start-up time	20
3. Method	22
3.1 Procedures	22
3.2 Sample & Participants	24
3.3 Measurement of standardization.....	25
3.4 Measurement of anticipation	25
3.4.1. Previsé	26
3.4.2. Schedule adjustment.....	27
3.5 Measurement of role clarity.....	27
3.6 Measurement of start-up time.....	28

3.7	Measurement of project success	28
3.8	Measurement of project management success.....	29
4.	Results	30
4.1	Role clarity	31
4.2	Standardization	32
4.3	Anticipation	33
4.3.1.	Previsé	33
4.3.2.	Schedule adjustment.....	34
4.4	Start-up time	35
4.5	Project success	37
4.6	Project management success	38
4.7	Additional analysis	40
5.	Discussion	43
5.1	Limitations & Future research	47
5.2	Practical implications	49
6.	Bibliography.....	51
	Appendix	55
	Appendix 1: Interview.....	55
	Appendix 2: Enquête.....	58
	Appendix 3: Descriptive Statistics	66
	Appendix 4: Pearson Correlation Table	66

Table of Figures

Figure 1 - Research model 4

Figure 2 - Portfolio, programme, project example..... 15

Figure 3 – Research model..... 21

1. Introduction

Innovation is crucial for companies' survival. Companies which stop the development of new products will see a sales drop of 66% within the first 8 years (Langerak, 2010). It is thus very important for companies to do innovative projects. Another fact is that 86% of the product ideas will not make it to the market (Cooper et al., 2004; Barczak, 2009). This means that many projects consume resources (e.g. equipment, human capacity, funds, and time) but in the end are not able to gain profit because the projects are not finished or the products are not launched. Although many researchers have studied innovation project success and how to ensure this (Hoegl & Gemuenden, 2001; Keil et al. 2000), still many projects fail to meet their goals or turn out to be unsuccessful in the sense of sales or profits (42% according to Barczak, 2009). This indicates thus that for companies to survive it is important to invest in innovative projects, and even if they do, projects can fail to make profit.

Therefore, it is important to study project success and how to assure this. To manage projects, project management is needed, to manage the portfolio (whole of all the projects), portfolio management is necessary. Portfolio management refers to a dynamic decision process, in which a business constantly updates and revises its list of active new product and R&D projects. In this decision process new projects are evaluated, selected, and prioritized, while existing projects may be accelerated, killed, or deprioritized, and the resources are allocated and reallocated to the active projects (Cooper, 1999). Doing so, allows companies to align their portfolio strategically, maximize their portfolio value, seek balance in their portfolio, and allocate resources to the right project (Cooper and Egett, 2010).

According to research, 76% of the businesses have a poor balance between resources (e.g. human capacity, equipment) available and the number of projects underway (Cooper et al, 2004). Projects need resources, thus if there is no balance between projects and resources this

increases costs because resources not used (not enough projects) cost money and do not deliver anything or because of resources shortage (too many projects) because this will lead to project delay or projects which do not finish at all. This increases costs and is thus unwanted.

In this current research the advantages of a Project Management Office (PMO) will be investigated. PMO can be implemented in many different ways to serve different purposes (Aubry et al., 2007). PMO can be a role one fulfils, in which case we speak of a project management officer. A project management officer supports the project manager. This person makes sure that the methods or programs are used consistently throughout the entire organisation. Furthermore, the project management officer will have a good overview of the interconnections between projects and is instrumental in safeguarding an optimal allocation of people and resources (Capgemini Academy, 2011; Office of Government Commerce, 2008).

PMO can also be a department. In this case it is a staff department that delivers a centrally organized structure that offers support to project, program and portfolio management. Some of the tasks of a project management office are, implementation of standard methods and tools, just in time availability of scarce specialist knowledge where it is needed most (Capgemini Academy, 2011; Office of Government Commerce, 2008). PMO can be implemented in greater or lesser extent (Aubry et al., 2008), though in this research the only difference that will be made is if there is some sort of PMO or no PMO at all.

Though many companies have implemented some form of PMO (70% according to the research centre for Business Practices, 2000; 87% according to PMsolutions, 2012), PMO has not been evaluated properly. Therefore, its expected advantages are still assumed rather than empirically proven. Assumed is, PMO leads to better-structured portfolio's, and shorter and clearer project start-ups. The implementation of a PMO throughout an entire organization is a costly and time consuming operation. Though if the outcome of this research is very positive towards the implementation of PMO, it is worth the investment. This is important to

companies without PMO because, these insights gives them knowledge about whether or not they should consider the implementation of PMO.

This leads to the following main research question of my thesis research, which is: **“how and to which extent does PMO increases project success?”**.

This research uses time, cost, and quality parameters to measure success because, they are the predominant indicators of project success (Müller et al, 2012).

In this study, four possible mediators of the correlation between PMO and project success are investigated, namely: standardization, anticipation, role clarity and start-up time. These mediators will be further explained in Chapter 2. These four mediators lead to the following four sub-research questions:

Research question 1: “Are companies with PMO more standardized in their processes then companies without PMO?”.

Research question 2: “Are companies with PMO better in foreseeing problems, and anticipate on them then companies without PMO?”.

Research question 3: “Is it in companies with PMO clearer for employees what their tasks are, with who they should perform this task, and when they should perform this task, then for employees in companies without PMO?”.

Research question 4: “Have companies with PMO a shorter start-up phase then companies without PMO?”.

To examine the potential benefits of PMO, I conducted a field study among organizations that do and do not use PMO. The remainder of this thesis is organized as follows: first the theory is explained in more detail and the hypotheses are stated, second the method is explained, where after the results are shown, and finally the discussion is presented.

2. Theory & hypotheses

PMO is a supportive structure which can operate at three different levels, namely: project, programme and portfolio level. To understand PMO, it is important to know what these levels at which the PMO can be implemented are. This will be explained in paragraph 2.1. Hereafter the hypotheses and the research model are initiated.

2.1 Portfolio, programme and project level

In this section, the meaning of a project, a programme and a portfolio will be explained. A project is a temporary activity designed to produce a unique product, service or result. It is temporary because it has a start and an end, and therefore defined scope and resources (Project Management Institute). Projects are smaller tasks, which deliver one or more outputs on a *specific* business case. When a PMO is implemented on operational level (project level) it supports projects to deliver a result within the scheduled timeframe, budget and quality norms. To achieve these goals; administrative tasks are performed, risks and issues are managed, project managers are challenged, best practices are collected and provided, and it is guarded that deliverables match the requirements of the client.

A programme is a group of related or unrelated projects, which are launched in order to achieve a common business or change objective. When this is done a programme management office can be implemented. A programme management office creates the business cases of the projects. And is designed to provide assistance to change and delivery initiatives. The main tasks of a programme management office are project coordination and control (Lester, 2007). A programme management office has a beginning, a middle, and an end phase and is thus temporary by nature, where a portfolio is not.

When on an operational level (programme level) PMO is implemented other tasks than the ones just named are: data collection and data storage so reports can be made (progress, risks, audits, benefits, etc.)¹. From historical data it is possible to construct metrics out of which project plans can be scheduled (Lederer et al., 1990). When project plans can be better tested the quality of the plans will increase. When project plans are more correct, a better planning can be made. Which is one of the critical success factors in new product development is planning (Haughey, 2001). A good planning contains clearly documented project milestones and deliverables, and a valid and realistic time-scale. If these milestones are not met, the planning will act as an early warning system, because it provides visibility of task slippage by which it keeps the project team focused and aware of project progress.

In the example of Figure 2 the on-demand production is a large change in the organization, it changes the entire way of producing, the way in which the cars are ordered, and the way in which suppliers have to deliver certain products (i.e. car seats). This total change has a programme, which is in this case called on-demand production. The programme has different projects which have to be done to successfully change the business.

Programmes and projects have different deliverables, budgets, time schedules, and resources. A portfolio is a collection of multiple projects of an organization, and often includes multiple programmes. A portfolio can be defined as follows: the totality of an organization's investment (time, financial, human, equipment) in the changes required to achieve its strategic objectives (OGC, 2008). When a PMO is implemented on a strategic level (portfolio level) the main tasks of the PMO are: supports management/ steering group and the client, by monitoring a number of related projects which together deliver the strategy. The main objectives of a portfolio management office are the alignment and prioritization of portfolios

¹ This can also be called Centre of Excellence, which is closely related to PMO though Centre of Excellence is out of the scope of this research thus it will not be further discussed.

(i.e. programs, projects and services) and the management of risks associated with these programs, and to optimise the chance capacity. It answers the questions, are we doing sufficient and the necessary projects to get the benefits we would like to have. One should keep in mind that PMO does not have the power to make decisions, but merely to give advice. An example of a portfolio is shown in Figure 2. In this example a car manufacturer has a portfolio with a project named, the development of a new colour, which is for the cars which are manufactured. Furthermore, the car manufacturer wants to change the way it produces cars. It wants to be able to produce cars the moment the cars get ordered, instead of having cars in stock. This change is called on-demand production.

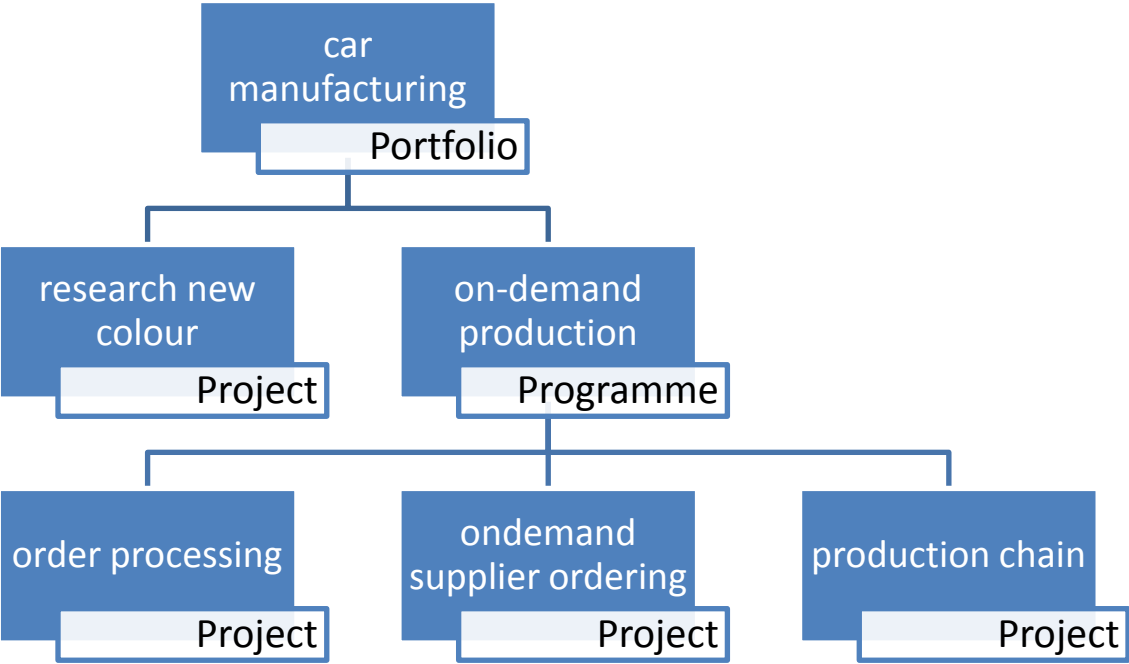


Figure 2 - Portfolio, programme, project example

To summarize, PMO is a supportive structure that organizations can implement at different levels of abstraction (operational, tactical, and strategic) to achieve better resource management, more correct project plans, a more consistent and efficient way of working and a better balanced portfolio, which is all needed to get the optimum out of the change capacity.

2.2 Standardization

An overall goal of PMO at every level is standardization of work processes, and consistency in the way of working (Aubry et al., 2007; Khalilzadeh and Kianfar, 2011). Standardized procedures raise efficiency by increasing consistency in organizations (Ungan, 2006). For example, when a project start-up has a standardized protocol a manager can follow the plan step by step, and the PMO can lead the project manager through the project in a stepwise manner.

To give an example in which consistency is important, first the RAG (Red, Amber, Green) notation is explained (Rajegopal et al., 2007). This abbreviation is used by many companies in their reports to indicate the parts of the report which need close attention (i.e., it signals problems). When parts are given the colour green it means that those parts of the project are going like planned, when parts are given the colour amber it means that those parts need attention, to prevent them from turning into a major problem. As soon as a part is given the colour red it means: this part needs immediate attention because something is completely wrong.

When for example, it is agreed upon when a project will not be finished on time, though the delay is less than 5%, the report is given the colour amber, this is clear to everybody. When in an organization the colour amber is used inconsistently, meaning some people use it if an overshoot of 5% occurs, and some as an overshoot of 10% occurs, misinterpretation is likely to occur. Furthermore, standardization is positively associated with project success (Milosevic and Patanakul, 2005). In this research, I examined the level of standardization, because it is assumed PMO increases standardization, though this is not proven. This leads to the expectation that companies with PMO have more standardized processes than companies without PMO.

Hypotheses 1 – ‘Companies with PMO have more standardised protocols than companies without PMO’

2.3 Anticipation

Poor project management can have far reaching consequences. Companies spend more resources (e.g. time, money, people, and equipment) than would be strictly necessary for the results and benefits they obtain (Keil, 1995), so-called “waste”. For example: in a company two partly similar projects are started by different departments. Both projects need the same software, but because it is unknown to a department what the other departments are doing the software is developed twice. With proper portfolio management, this might have been prevented which would have saved money and time. Another example of a problem of poor project management is that it may happen that half way project development it is discovered that a large overshoot in budget will occur when finishing the project. Underestimating costs can result in project failure (Lederer et al., 1990). When a project manager does not keep a clear track of its actuals (actual resources a project consumed and, and actual amount of resources available to finish the project) it might be a project consumes far too many resources which is unknown to the project manager. The sooner a project manager knows the project consumes more resources than planned the sooner actions can be taken to solve this problem. This will most likely increase the chances of solving the problem on time. Project management tools (e.g. CA Clarity) call this process registration of the actuals, thus which resources are actually needed to finish the project (instead of: resources needed to finish the project = planned total resources - resources spend, because this would only work if the project uses exactly the amount of resources which are planned).

One of the objectives of PMO is to continuously monitor projects (Aubry et al. 2007), keep track of the actuals (spend resources, and indicate how much resources are still necessary to

finish the project), and increase predictability (premise potential problems). When projects are better monitored (more accurate and with a higher frequency), most likely schedules are changed more often, because it is unknown if this really is the case this study will investigate this.

Foreseeing problems is also important because it enables project managers to prevent potential problems before they actually occur. As an example, it could be that every week the project is late a certain penalty has to be paid. When the deadline approaches long before the project is finished, it is too late to do something about it and a penalty has to be paid, and the project has to be rushed (which is expensive as well) to prevent further penalties. When a project manager foresees the project will run out of time at a moment while there is still time to fix this problem this can save a lot of money (no penalty, and less costs because of a less extreme form of rushing the project), and thus an increase in project success. This also explains the value for companies to increase capabilities of foreseeing problems.

This leads to the expectation that companies with PMO will be better at foreseeing problems, and anticipate on them than companies without PMO.

Hypotheses 2 – ‘Companies with PMO more often premise potential project problems than companies without PMO’

Hypotheses 3 – ‘Companies with PMO more often adjust their schedules than companies without PMO’

2.4 Role clarity

According to Thiadens et al. (2010), and Thiadens and Steenbakkens (2010), more than 50% of the companies in the Netherlands use spreadsheets or simple database applications to manage their portfolio. Most benchmarks are difficult to perform with these tools, because these tools are not created to do such thing (Thiadens et al., 2010). Meaning, when for example one wants to create a top 10% list of best projects according to a few selection criteria like: a project needs to fit the company's strategy, and it has to gain a return on investment as high as possible. To get a top 10% list out of excel with these criteria will be difficult while this can be done with project management programs like CA technologies, Clarity, and Microsoft Enterprise Project Management. Furthermore, Excel is not build to look deeper into project parts, if projects are partly equal and both projects are done these cost do not have to be counted double which increases the return on investment. One of the tasks of a PMO department is to monitor projects, and aligning portfolios. This is done with tools like the ones just named. PMO also trains employers to use the tools (Tengshe and Noble, 2007) which increases the consistency in how the tools are used.

Specialised portfolio tools help with the management of resources (Rangaswamy and Lilien, 1997) because they have a database in which the knowledge, and expertise of the employees is present, and in which the available resources are known. When creating a portfolio this knowledge helps in selecting projects, because the program knows which projects can be done simultaneous, and which projects cannot (due to lack of resources or employees with the required knowledge and skills, this is named knowledge management (Yahya and Goh, 2002)). After the selection of the projects, these tools help to create a project planning and to keep the planning up to date (Rangaswamy and Lilien, 1997). This is done because these tools also keep track of how well projects are developing and if problems are going to occur.

When projects can be better planned, project planning's stay better up to date, and employees know what they have to do. This will most likely lead to clearer assignments for the employees (Rangaswamy and Lilien, 1997). Having a proper overview as described above is part of the tasks of PMO and will most likely lead to increased project success.

This research will look if PMO contributes to the role clarity within the company. This leads to the assumption that it is in companies with PMO clearer for employees what their tasks are, with who they should perform this task, and when they should perform this task, than for employees in companies without PMO.

Hypotheses 4 – 'In companies with PMO roles for employees are clearer than in companies without PMO'

2.5 Start-up time

Every project starts with a start-up phase. In this phase, goals are set and agreements are made (Turner and Cochrane, 1993). Even though the tasks, goals, and agreements differ for every project, the start-up phase can be standardized. The tasks performed in the start-up are in essence equal for every project such as the creation of a project plan (context, purpose, objectives) and the commitment of resources (Turner and Cochrane, 1993). Because one task of PMO is to standardize the start-up phase companies with PMO will most likely spend less time on the start-up phase than companies without PMO. Furthermore, finding the employees with the needed knowledge and skills to perform the project, should take less time because the PMO office has information about the knowledge and skills of all the employees and can provide the project manager with this information, this should decrease costs and thus increase project success. This leads to the assumption that companies with PMO have a shorter start-up phase than companies without PMO.

Hypotheses 5 – ‘Companies with PMO have a shorter start-up time than companies without PMO’

The general assumption which is made in this research, that companies with PMO more often successfully complete projects leads to the following hypotheses:

Hypotheses 6 – ‘Companies with PMO have a higher percentage of successful projects than companies without PMO’.

Hypotheses 7 – ‘In companies with PMO project management is perceived as more successful than in companies without PMO’.

In Figure 3, the research model is graphically displayed. Conform my reasoning in this chapter, I expect PMO to increase project success, because of a) more standardization, b) increased role clarity, c) better anticipation and d) a shorter start up time.

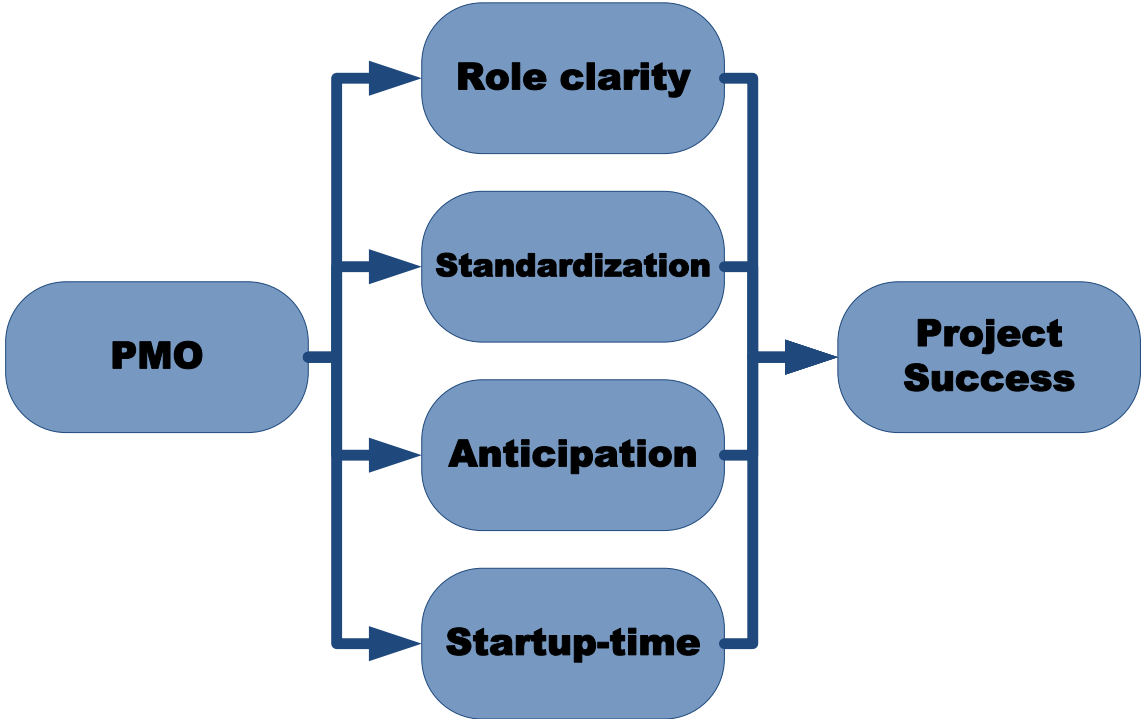


Figure 3 – Research model

3. Method

This section will give an overview of the research approach which will be used to investigate the hypotheses. I investigated if there is a significant difference on project success between two groups of organisations, the ones that use PMO and the ones that do not use PMO. First the procedure to create the survey will be discussed, second, the sample will be shown, and finally, the measurements will be explained.

3.1 Procedures

In order to provide an objective record of the components of the statistical analysis, a questionnaire is used (Landy and Conte, 2007). To create a good questionnaire, the constructs which I investigated had to be operationalized. In order to gain information about the constructs I have held two interviews with two people each (thus four people in total). Interviews are a good way to get good insights (Gable, 1994). First, I interviewed two people working in the transportation business, and the second two people I interviewed are working in the financial sector. The reason these people were chosen was because they work within companies with large portfolio's, and they are involved with PMO.

The interviews were semi structured. The interview guide can be found in Appendix 1. Furthermore, the interviews were recorded on tape which made it possible to listen to them afterwards, and elaborate them. I used the information of the literature study to create a list of topics interesting to discuss during the interviews. This list was discussed with my company supervisor Lia de Zoete. She is an expert in the implementation of PMO's and she is able to give good advice on which questions are important to ask during the interviews, and how to ask them. Lia de Zoete is IPMA and PMP certified, and has over 20 years of experience in project management. Furthermore, she has extensive experience in the professionalization of

project-based working within various organizations and in setting up PMO's with training activities. With the advice of Lia de Zoete, and the literature I had read during the literature study, I was able to create the interview guide. The interviews started with some personal questions, so I knew the relationship between the people I was interviewing and PMO. Because the goal of this research was to measure how much success PMO adds to a company some questions were asked about success. This gave me insight in how success is measured by the companies and what these companies know about their own project success. For example, in the companies of the people I interviewed it was unknown how many projects were successful or what the average project scores on its key performance indicators (KPIs) were. This is something which had to be taken into account when the questionnaire was created because, it was most likely more respondents would be unable to directly answer this question.

Based upon my literature study it became clear that a myriad of PMO types and definitions exists. Therefore I asked questions about how PMO was implemented in companies. In the last part of the interview I asked if there are any numbers available. Like if the percentages are known of how many projects finish on time, or what percentage of the projects is finished without exceeding the budget. The answers to these questions were that organizations do not keep track of this type of numbers and that there is no central database in which the KPIs are stored. This had important consequences for the design of the questionnaire, namely that questions should not be asked in an exact way, because exact numbers may be unknown. Instead of that most of the questions in the questionnaire have been asked on a 6 point forced choice Likert-scale. The reason a 6 point Likert-scale is chosen and not a 5 or 7 point Likert scale is to prevent people from crossing questions in the middle. According to Chang (1994) there is no difference in the criterion-related reliability between a 4 and a 6 point Likert scale and the issue of selecting 4 versus 6 point scales may not be generally resolvable. I choose a 6

point Likert-scale to increase the chance of finding a smaller difference between the two groups.

The questions which still need a percentage as an answer have been given the option to fill in that the answer is a guess instead of a fact (for examples see the survey in Appendix 2).

The interview provided answers to the following questions: can I answer the research goals with a questionnaire, what type of questions should I ask and what knowledge do companies have about project success and portfolio management.

After the interview the survey was created (it is shown in Appendix 2), it has 44 questions which are divided in several types of questions (Likert scale, percentage scale, open questions). The constructs measured by the questions will be explained further in this chapter, after the sample has been discussed.

3.2 Sample & Participants

This study's sample is a convenience sample using personal contacts and obtaining respondents via a message in a newsletter. The questionnaire is completed by two groups, a group with people who work in companies which use PMO, and a group of people who work in companies without PMO.

The questionnaire is answered by 44 respondents, out of which 32 respondents work in companies which do make use of PMO and 12 respondents who work in organizations which do not make use of PMO. These people work in different industries like: transportation, car manufacturing, sports, chip manufacturing, financial sector, oil industry and more. The company sizes are between 250 and 300.000, and the size of the PMO differs between 1 and 3000 employees. The groups are thus very diverse.

Then now the measurement of the constructs will be discussed.

3.3 Measurement of standardization

To measure standardization, two questions are asked, namely: is there a manual/ instruction book for the project manager; is there a manual/ instruction book for the start-up phase. These are yes or no questions. Both questions look at standardizations, namely is there a manual or instruction book for a certain task. The Cronbach's alpha of this is 0.689 (close to 0.7 not perfect but good enough), and the intercorrelation between these two variables is 0.525. Many articles are written about how high the Cronbach's alpha should be. According to Murphy and Davidshofer (1988), below 0.6 is unacceptable, according to Nunnely (1967), it should be above 0.5-0.6, though in 1978 Nunnely changed this recommendation to 0.7 (without explanation). Peterson (1994) wrote a Meta-analysis about the Cronbach's alpha and concluded no standards exist about which obtained alpha coefficient is the minimum. So even though the Cronbach's alpha of this Construct is not perfect the items are combined to one item (the average of the two). For this research 0.6 is taken as the bare minimum, though preferred is above 0.7.

3.4 Measurement of anticipation

The next construct which will be looked at is anticipation, thus if project managers foresee problems (project run out of budget or time) before they occur. To measure anticipation there will be looked at two parts namely: reports and schedule adjustment. To anticipate on a problem the project manager first has to know there is a problem, how this construct is measured is described in the prewise section. Thereafter the manager has to act on this knowledge, which often leads to schedule adjustments. This part will be displayed in paragraph 3.4.2.

3.4.1. Previsie

Project managers have to report to their supervisor how their project is going. This can be done using the RAG notation, which is explained in paragraph 2.2. If a project manager wants to prevent potential problems from occurring he or she first has to know which potential problems might occur in the near future. When a project manager knows a problem will occur, the report has to have an amber status (something has to change or else a problem will occur). When he or she finds out there is a problem at the moment the problem is already there the report status has to be red. When after a green report (project is going well) the next report is red (project has major problems) the revisie on problems is poor. This effect is used in this research to measure revisie on project problems. Two examples of questions asked about this construct are: Which percentage of the reports which is given the colour red did not had an amber report first? The answer options to this question were 0%-25%, 25%-50%, 50%-75%, 75%-100% (in addition participants were asked to indicate whether their answer was an educated guess or a fact, but because this additional question was not answered by the majority of respondents nothing is done with this information). Because it was unknown how many respondents were able to answer this question another question on this construct was asked, which was based on a 6 point Likert scale (1, completely agree to 6, completely disagree), this question was: reports are often unexpectedly given the colour red (the report before the red report was green). Although many researchers state that constructs should be measured by multiple items (Baumgartner and Homburg 1996), Rossiter (2002) proposes in some cases a construct does not need multiple items. As long as the construct can be conceptualized as concrete, it can be measured with a singular item. According to Bergkvist and Rossiter (2007), show that in some cases multi-time and single item measurements have an equally high predictive validity. This construct is in this case well conceptualized, as the

foresight of problems is good when reports are not reported in red when the report before was green.

3.4.2. Schedule adjustment

The last part of the measure of anticipation is about the adjustment of schedules. Companies using PMO most likely adjust their schedule more often. Because most companies do not keep track of the amount of time a project is rescheduled this question is asked on a 6 point Likert scale. The question which is asked is: “project schedules are often adjusted”. Answer options ranged from 1 (Completely disagree) to 6 (Completely agree). Like is explained before, constructs can be measured with a single item when the construct is conceptualized. Which is the case for this item. It looks at schedule adjustment, and it asks if this happens often.

3.5 Measurement of role clarity

Role clarity was measured with 11 items. Examples are: “Within the project we are known with each other’s way of working”; “During the entire project there is a clear division of tasks”. Respondents could answer on a scale ranging from 1 (disagree completely) to 6 (agree completely). This construct is measured by 11 items so it could measure role clarity in a broad way, meaning it not only looks at what the role is of one person, but it also looks if it is clear to this person what the role of his or her team members are. These items gave a Cronbach’s alpha of 0.876, which is high (which is far above 0.7, which is good like is explained before). The question: “After finishing the start-up phase it is clear to me what other people in my project group are doing” which was originally also an item to measure clarity is left out. This because it decreased the Cronbach’s alpha to 0.416 and because it differs from the other questions in a way that it looks to what other people are doing instead of what the respondent should do himself, and to what the role of the respondents team members is.

3.6 Measurement of start-up time

The absolute start-up time is measured in days with the question: “How many days takes the average start-up phase” (answer in number of days). Because large projects which take more time will most likely have a longer start-up, in addition the question “What percentage of the total project time is spent on the start-up” (answer in percentage) is asked. These two variables together tell something about if PMO shortens start-up time in absolute and in relative way, these items are separately analysed.

To get some additional information about what respondents think on average of the amount of days spend on the start-up phase, I asked respondents the following question: “The amount of time spend on the start-up phase is:”. In which the answer options are: 1=much too short; 2=too short; 3=precisely good; 4=too long; 5=much too long.

3.7 Measurement of project success

Project success was measured using four items namely: “what percentage of the projects achieves its objectives?”; “what percentage of the projects achieves its objectives within its time schedule?”; “what percentage of the projects achieves its objectives within its budget?”; and “what percentage of the total number of reports per year is reported in green?” (in addition participants were asked to indicate whether their answers were an educated guess or a fact, but because this additional question was not answered by the majority of respondents nothing is done with this information). The three predominant indicators of project success, time, cost, and quality (Müller et al, 2012) were kept in mind when the questions were devised. The reliability analysis gave a Cronbach’s alpha of 0.764 (should be above 0.7, like is explained before). Project success is measured using time, budget and quality parameters thus it should give a good representation of the type of project success meant in this thesis.

3.8 Measurement of project management success

To measure the construct project management success three questions are asked namely: ‘I am satisfied with the way the project is managed’; ‘I would like to see changes in how projects are managed²’; and ‘It often happens that the materials and / or products are not available when I need them³’. The questions are answered on a six point Likert scale ranging from 1 (disagree completely) to 6 (agree completely).

The first two questions both look at how people think of the way projects are managed so the Cronbach’s alpha is calculated to see if these variables are fit to combine. The Cronbach’s alpha is 0.535 which is below 0.6, which is, like is explained before, the bare minimum. These variables are too different in their internal consistency to combine thus all three variables will be analysed separately.

² Reversed coding

³ Reversed coding

4. Results

In this chapter the results of the analysis will be shown. First the way in which the analysis will take place will be explained, then some general information about the sample will be discussed and then the analysis is stated.

Because the two groups are unequal in size (the PMO group has 32 respondents and the group without PMO 12), the Levene statistic results will be shown. One-way ANOVA assumes homogeneity of variances, the Levene statistic looks if the assumed equality of variance is not violated. When the Levene statistic is non-significant (>0.05) the assumed equality of variance is not violated, which means the assumption of homogeneity of variance is met. Hereafter an oneway-ANOVA is done (could also be done with a t-test which would give the same result since we look at the means of two groups), which shows if the PMO group is significantly different from the group without PMO or not. The results of the ANOVA are shown in a table which shows the following variables: size (N) of the groups, average of the variable (Mean), and the standard deviation (Std. Deviation), significance (sig), F-value, Levene statistic and degrees of freedom (Df). This can be seen for the group with PMO, without PMO and of the scores of the total. Below the tables the p -value and the F-value of the ANOVA are shown. When the Levene statistic is significant a t-test is done and the results are shown of the test in which homogeneity of variances is not assumed. In this case, the results of the ANOVA will still be shown and in addition the significance level and the degrees of freedom of the t-test (2-tailed) will be stated.

In Appendix 3 the descriptive statistics of the overall sample are shown. This table shows the N, minimum, maximum, mean and standard deviation of the variables used in the analysis of this study.

In order to get an idea about the sample now some general information about the sample will be stated. The average size of an establishment of the participating companies is 1772 employees. For companies with PMO this is 2157 employees where it is 938 employees for companies without employees. When this difference is analysed the Levene's statistic is significant ($p=0.027$), a t-test is performed where the equality of variances is not assumed. The difference between the two groups on size of the establishment is not significant ($p=0.056$), though it does show a trend. The cut off value with a p -value of 0.05 is arbitrary, and the sample size of this research is quite small, thus further research is needed to elaborate on this correlation, and to show if a significant correlation between company size and PMO can be found.

The average project has a duration of 386 days, with an average for the group with PMO of 449 days and an average of 212 days in the group without PMO. This difference is analysed in the additional analysis (paragraph 4.7).

4.1 Role clarity

In Hypothesis 1 it was expected that the use of PMO is associated with more role-clarity.

I tested this hypothesis with an oneway ANOVA, and the results are displayed in Table 1.

Table 1 - ANOVA results of Role clarity

Role clarity	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	12	4,5303	,53829	0.71	0.82	42
With PMO	32	4,4642	,52692	F-value	Df. total	Df. between
Total	44	4,4822	,52457	0.14	43	1

The results show a mean of 4.5 in both groups, which is reasonably high (scale is 1 to 6). The standard deviation is around 0.5 for both groups which is not so large, the majority of the

respondents scored between 4 and 5 which means the respondents are on average between ‘agree a bit’ and ‘agree’. The correlation between the level of role clarity and the use of PMO has a significance of 0.71 which is not significant. Hence, these results do not confirm Hypothesis 1.

4.2 Standardization

In Hypothesis 2, it was expected that organizations that use PMO have more standardised protocols than organizations that do not use PMO. I again conducted an oneway ANOVA to test this expectation. The results of the ANOVA are displayed in Table 2.

Table 2 - ANOVA results of standardized protocols

Protocols	N	Mean	Std. Dev.	Sig. (<i>p</i>)	Levene St.	Df. Within
Without PMO	12	,67	,444	0,32	0,14	42
With PMO	32	,80	,356	F-value	Df. total	Df. between
Total	44	,76	,38	1,02	43	1

In both groups the majority of the measured protocols is standardized. Answer options on both protocol questions were yes or no. 80% of the items in the PMO group measured yes, and 67% of the items in the group without PMO measured yes. The standard deviation is reasonably large compared to the mean. Reason for this can be that the sample size is fairly small, which influences the accuracy of the research (Bartlett et al., 2001). Another option is that in reality, the standard deviation is quite large in reality. The results shown in table 2 indicate no difference between organizations that use PMO and those that do not. Consequently, Hypothesis 2 was not confirmed.

4.3 Anticipation

In this chapter the results of the measurement of the construct anticipation are shown. This is divided into the prewise of project problems, and into schedule adjustment.

4.3.1. Prewise

In Hypothesis 3, it was expected that organizations that use PMO are better in prewising project problems than organizations that do not use PMO. Two tests were done to confirm this hypothesis. For the first test the percentage of red reports without first having an amber report was asked. For the second analysis the question was asked on a 6 point Likert scale (reports are often unexpected given the colour red) in which 1=completely agree and 6= completely disagree. I again conducted an oneway ANOVA to test this expectation. The results of the ANOVA are displayed in Table 3 and 4.

Table 3 - ANOVA results of prewise 1

Red without amber	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	8	1,38	,744	1.00	0.34	30
With PMO	24	1,38	,495	F-value	Df. total	Df. between
Total	32	1,38	,554	0,00	31	1

Table 4 - ANOVA results of prewise 2

Red after green	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	9	4,22	,833	0,63	0,60	38
With PMO	31	4,03	1,080	F-value	Df. total	Df. between
Total	40	4,08	1,023	0,24	39	1

Table 3 shows the percentage of red report that did not had an amber report in advance is reasonably low (1,38 on a scale of 1 to 4). Only one participant answered with a 3 (the other answers are 1 or 2), which was in the “without PMO” group, this increases the standard deviation because the group had a sample size of only eight. For the other item the means are little above 4 (scale 1 to 6), meaning participants (slightly) disagree on the statement that it happens often that a report gets the colour red, without first having an amber report. Which is conform what is answered in the first question.

The results of both analysis indicate no difference between organizations that use PMO and those that do not; in both groups the number of unexpected red reports is equivalent. Consequently, Hypothesis 3 was not confirmed.

4.3.2. Schedule adjustment

In Hypothesis 4, it was expected that organizations that use PMO have a higher amount of schedule adjustments than organizations that do not use PMO. I again conducted an oneway ANOVA to test this expectation. The results of the ANOVA are displayed in Table 5.

Table 5 - ANOVA results of schedule adjustment

Schedule adjustment	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	12	3,75	0,622	0,004	0,24	42
With PMO	32	4,56	0,840	F-value	Df. total	Df. between
Total	44	4,34	0,861	9,26	43	1

The results indicate a difference between organizations that use PMO and those that do not; like was expected, a higher number of adjustments was reported by respondents from companies that used PMO. Consequently, Hypothesis 4 was confirmed. In both samples the mean is above 3.5 (which is the average of the scale), meaning on average both groups agree

to a certain extent on this statement. The standard deviation is less than 1 in both groups. This tells us something about the internal consistency, namely the majority of the sample did not answer far from the mean (answers are on a Likert scale, thus the smallest difference is 1).

4.4 Start-up time

In Hypothesis 5, it was expected that organizations that use PMO have a shorter start-up phase than organizations that do not use PMO. Two tests were done to confirm this hypothesis. An absolute measure of project start-up times, and a relative measure of project start-up times. I again conducted an oneway ANOVA to test this expectation. The results of the ANOVA's are displayed in Table 6 and 7. Because some of the respondents explained their company does not make use of a project start-up, not all of them were able to answer these questions.

Table 6 - ANOVA results of absolute start-up time

Days	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	8	27,50	30,74	0,03	0,23	28
With PMO	22	63,55	40,85	F-value	Df. total	Df. between
Total	30	53,93	41,22	5,12	29	1

Table 7 - ANOVA results of relative start-up time

Percentage	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	10	10,75	6,46	0,10	0,02	33
With PMO	25	16,82	10,46	F-value	Df. total	Df. between
Total	35	15,09	9,80	2,89	34	1

The result of the first analysis is indicates a difference between organizations that use PMO and those that do not; in the group with PMO the mean number of days spend on the project

start-up is more than twice as large as the mean of the participant group without PMO. This difference is significant, while the difference in the relative measurement is much smaller. Meaning that the project duration of projects in the group of companies with PMO is longer. The duration of projects will be further explained in paragraph 4.7. Furthermore, the standard deviation shown in Table 6, is reasonably large compared to the mean. In the group without PMO the standard deviation is even larger than the mean.

The second analysis has a significant Levene statistic, meaning the assumed equal variances is violated. When a t-test is performed, where the equal variances are not assumed the degrees of freedom is decreased to 26.75 and the significance level is 0.048 (2-tailed). Meaning this test shows a significant difference between the groups. This shows the start-up time in companies with PMO is significantly longer than in companies without PMO, measured in absolute start-up time, as well as in relative start-up time. Consequently, Hypothesis 5 is rejected.

In Table 8 the results can be seen of the ANOVA of the perceived duration of the start-up time. Thus, if respondents think the start-up time is too long or too short.

Table 8 - ANOVA results of perceived duration of start-up time

Perceived Start-up time	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	11	2,82	,603	0,975	0,084	38
With PMO	29	2,83	,928	F-value	Df. total	Df. between
Total	40	2,83	,844	0,001	39	1

Table 8 shows no significant difference between the groups, thus even though the differences in start-up time are significant, the data shows no difference on how people think of this time. In both groups the mean is around 2.8 which is a little below 3 (3 represents ‘the start-up time is precisely good’). The standard deviation in the group with PMO is a little larger, meaning people are a bit more divided in their opinion about the start-up time.

4.5 Project success

In Hypothesis 6, it was expected that organizations that use PMO have a higher percentage of successful projects than organizations that do not use PMO. I again conducted a oneway ANOVA to test this expectation. The results of the ANOVA are displayed in Table 9.

Table 9 - ANOVA results of project success

Project success	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	11	3,0227	,70227	0,16	0,70	39
With PMO	30	2,7056	,60558	F-value	Df. total	Df. between
Total	41	2,7907	,63986	2,03	40	1

The results indicate no difference between organizations that use PMO and those that don't; in both groups the percentage of successful projects is equivalent. Consequently, Hypothesis 6 was not confirmed. The means of the groups are 2.7 and 3.0 (2 represents 25 to 50%, 3 represents 50% to 75% of the projects is successful), according to the literature the average projects success is 58% (Barczak, 2009), thus an average outcome around 2.5 and 3, corresponds with the literature.

4.6 Project management success

In Hypothesis 7, it was expected that employers in organizations that use PMO are more satisfied with their project manager than employers in organizations that do not use PMO. Three measurements are done to examine this hypothesis. I again conducted a oneway ANOVA to test this expectation. The results of the ANOVAs are displayed in respectively Table 10, 11, and 12.

Table 10 - ANOVA results of management satisfaction

Satisfied	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	12	4,00	0,953	0,67	0,61	42
With PMO	32	4,13	0,833	F-value	Df. total	Df. between
Total	44	4,09	,858	0,18	43	1

Table 11 - ANOVA results of how much people would like to see the management changed

Change management	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	12	3.58	0.900	0,16	0,39	42
With PMO	32	4.03	0.933	F-value	Df. total	Df. between
Total	44	3,91	,936	2,05	43	1

Table 12 - ANOVA results of unavailable materials

Materials unavailable	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	12	3.42	1.084	0,55	0,53	42
With PMO	32	3.19	1.148	F-value	Df. total	Df. between
Total	44	3,25	1,123	0,36	43	1

All three analysis show no significant difference between the group with PMO and the group without PMO. The results indicate no difference between organizations that use PMO and those that do not. Consequently, Hypothesis 7 was not confirmed.

The first analysis shows that both groups are on average reasonably satisfied with the project management (4 on a scale of 1 to 6). The standard deviation is little below 1, meaning most respondents answered the question between 3 and 5, which is quite consistent.

The second analysis looks at how much the responds would like to change something within the management. The result is also not significant and has a standard deviation of around 0.9. Meaning most respondents answered between 3 and 5, which is reasonably consistent.

The last analysis looks if participants often have the feeling material is unavailable. The analysis is not significant, which was not expected. It was expected companies with PMO score better on this because it is a task of PMO to make sure materials are available. The mean is little above 3 which is just in the disagree zone (disagree to: materials are often unavailable), though the standard deviation is around 1.1, which is reasonably high.

4.7 Additional analysis

According to Hyväri (2006), company size has an important impact on project success and on communication. Looking at the organizations in my sample, I noticed that the mean size of the organizations that use PMO is 2157 employees whereas the mean size is 938 employees for organizations that do not use PMO.

After finding the difference in the absolute start-up time is much larger than in the relative start-up time I thought there could be a large difference in project duration. Thus in addition, based on the amount of days for the start-up, and the percentage of the total time that is spent on the start-up I was able to calculate the amount of days spent on an average project (start-up time / percentage of project time = project time). The average project time in the sample for companies that use PMO is 449 days and for companies that do not use PMO 212 days. When this difference is analyzed with an oneway ANOVA the following results are shown below in table 13.

Table 13 - ANOVA results of project time

Project Time	N	Mean	Std. Dev.	Sig.	Levene St.	Df. Within
Without PMO	8	212	114	0.13	0.09	28
With PMO	22	449	417	F-value	Df. total	Df. between
Total	30	386	375	2.48	29	1

The standard deviation is reasonably large, though the Levene statistic is 0.9, which is non-significant. Though when the equality of variance is not assumed and a t-test is performed the significance of this t-test is 0.02, with a degrees of freedom of 27.1 which is thus significant.

Till this point the correlations between PMO and the other variables of the model are shown.

The right part of the research model (shown in Figure 3), in which the variables standardization, start-up time, anticipation and role clarity have an assumed correlation with

project success are investigated with a Pearson correlation table. This table is shown in Appendix 4. Table 14 below shows the significant correlations shown in the Pearson correlation table:

Table 14 – Significant Pearson correlations

PMO	+ Schedule adjustment
PMO	+ Start-up (days)
Project Success	- Schedule adjustment
Employees (establishment)	+ Schedule adjustment
Employees (establishment)	+ Start-up (days)
Standardization	+ Satisfied with project management
Red without amber	- Red after green

In Table 14 the plus (+) means the constructs are positively associated and the minus (–) means the constructs are negatively associated. The details of the significance of the correlations can be found in Appendix 4.

When is looked at the correlations between project success and other factors it is shown that project success only (negatively) correlates ($p=0.039$) with schedule adjustment. Where it was expected that this relation would be positive, it is negative. Thus the assumption that more schedule adjustments would lead to increased project success is rejected. No other correlations with project success are found.

What is found is that standardization correlates ($p=0.036$) with satisfaction with project management. Meaning in companies, which have more standardized protocols, employees are more satisfied with the project management than in companies in with less standardized protocols.

Furthermore, there is a large deviation in the amount of employees, which can also be seen in Appendix 3. When is then looked at the Pearson correlation table it is shown that the amount of employees (in the establishment) has a significant correlation with schedule adjustment and

start-up time in days. Thus in companies with larger establishments start-ups take more time and there are more schedule adjustments. PMO also has a significant correlation with schedule adjustment and start-up time in days. As can be seen in Appendix 4, the correlation between PMO and the amount of employees (in the establishment), is not significant ($p=0.11$). The last significant correlation is about the RAG notation. A question about this construct is asked in percentage and on a Likert scale. When the percentage of reporting red without first reporting amber is high, it is logical people agree in a higher extend to the question “does it happen often red is reported without first having an amber report”. Because the Likert scale is 1, agree completely and 6, disagree completely this correlation is negative.

Overall, the conclusion of the additional analysis is that most correlations within the model are not confirmed by this study. In the discussion possible explanations will be given about what could be an explanation for the lag of significant correlations.

5. Discussion

The main goal of this research was to indicate whether use of PMO is associated with project success (compared to organizations that have not implemented PMO), and to investigate whether this expected positive association could be explained by an increase in role-clarity, standardization, anticipation and start-up time. The results of the survey held among 44 participants (32 with PMO, 12 without PMO) did not demonstrate that organizations with PMO outperformed organizations without PMO. Furthermore, no indications were found that organizations with PMO better pre-empt project problems, experienced more role-clarity, standardization, and project management success compared to the organizations that have not implemented PMO. However, the results did show significant positive relation between PMO and the duration of the start-up phase and the amount of schedule adjustments. The results of this study were discussed with Lia de Zoete an expert (reasons she is an expert are explained in paragraph 3.1) in the field of PMO to find possible explanations.

It was expected that companies which make use of PMO, adjust their schedule more often. Tengshe and Noble (2007) already mentioned PMO is associated with the better use of portfolio tools. When companies with PMO (better) register their actuals (actual resources a project consumed and actual amount of resources available to finish the project), and do this with a higher frequency because of the increased use of tools. As a result, project delays will be seen sooner which will lead to a higher frequency of schedule adjustment.

According to the expert, larger projects which take more time need a more accurate and precise project planning than small projects. The study showed the duration of the projects is longer for projects within companies with PMO. This could well be an explanation for the increased amount of schedule adjustments.

This research did not indicate that PMO increased clarity of roles which was unexpected because it was assumed PMO would create clearer assignments for the project members, and give clearer roles to all members. In both groups (with and without PMO) the scores on role clarity are 4.5 (on a scale from 1 to 6), which is reasonably high, indicating both groups have a rather clear clarity of roles.

According to the expert, role clarity is something most project managers find important thus if the PMO does not take care of role clarity the project manager will perform this task. This is a reason why it is done in both situations (with and without PMO).

On the other hand, according to the expert capacity management is one of the most challenging tasks for a PMO, it thus could be that in both situations much more can be improved. Most of the participating companies which have PMO, do not have a full grown mature PMO, which is able to properly manage capacity. With a full grown mature PMO is meant, a fully operating PMO which had the time it needed to develop a complete PMO and to implement it completely. Aubry et al. (2007) also describes that PMOs change when they mature. For example, knowledge is needed about the skills of employees, this is not collected in one day. When the process of implementing a PMO is half way this research labels the company as “with PMO” where the task capacity management is actually not performed by the PMO. This could have influenced the results of this study. PMO maturity is not measured in this study, though for future research this predictor should be taken into account.

Furthermore, it was expected that companies, which make use of PMO, have a more standardised procedure for their project management, but this is not indicated by this study. Though the sample shows a reasonably large difference (means are 0.67 and 0.80). A larger sample with two equal test groups might lead to a significant result.

Moreover, this study only looked at guidelines or manuals for the project manager, and for the start-up phase. The majority of the organizations standardized these protocols (with and

without PMO), many more protocols can be standardised, it could be that the difference in added value caused by standardization is larger in protocols which are not as often standardized as the protocols which this study looks at. The Pearson correlation table does show a significant ($p=0.036$) positive correlation between standardization and project management satisfaction.

Shorter start-up times were assumed because standardization leads to increased efficiency (Ungan, 2006), and because the increase in standardization is not indicated by this study it was not completely unexpected that PMO did not lead to shorter start-up times. Though it was unexpected that the opposite was seen in this research, namely that the start-up time was actually longer for companies with PMO. This difference was most likely partly created by the fact that the companies with PMO had longer projects in this study. Reasons for the other part can be that PMO could increase the amount of tasks done during the project start-up phase. Even if this would decrease the total project duration and thus increase efficiency, it would still lead to a longer start-up phase, though more research is needed to examine this.

It was also expected that PMO would lead to the better pre-emptive of project problems because a task of PMO is to monitor projects and status reports (Aubry et al. 2007). Although Aubry et al. (2007) also explains that PMOs can be implemented in different ways performing different tasks. It thus could be that the advantage that PMO better pre-emptive project problems depends on the way the PMO is implemented. According to the expert it might also be that it should be measured in a different way. This construct is difficult to measure, because most companies do not keep track of how often reports are reported in red or other facts to measure this hypotheses. It is now measured with estimated guesses about the amount of unexpected red reports. When I spoke to people who filled in the survey they found it difficult to guess these percentages. This could have influenced the results.

A better research method, to empirically investigate this model, might be to do research on one company before it has implemented PMO and measure the percentage of unexpected red reports, and the percentage of the total red reports (in according to green and amber reports), and then after the complete implementation of the PMO, do these measurements again and compare these measurements with the first measurements (this is also a recommendation of P3O⁴). Disadvantage of this kind of study is that it takes a much longer period of time to do, because in between the measurements the entire PMO has to be implemented, and if the advantages of a mature PMO are wanted it takes an even longer period of time, this is the reason this method is not chosen for this study.

Finally this study did not indicated that PMO increases project success nor did it indicate project management success. Standardization is connected with project success, though this research did not indicated more standardization within companies with PMO. When companies without PMO standardized their procedures otherwise than true PMO this advantage of PMO is negated (Dai and Wells, 2004).

Another reasons PMO did not significantly correlated with project success in this study could be that companies implemented PMO because project management was poor. These companies thus have a lag on project management compared to companies without PMO. Future research could implement a baseline measurement to indicate if this theory is correct. Furthermore, a task of PMO is to increase clarity including clarity on what goes wrong. When mistakes made by the management are clearer for employees this could lead to more ideas for improvements which could decrease how people experience project management as successful.

⁴ Portfolio, Programme and Project Offices (P3O) was published in 2008 as best practice guidance from the Cabinet Office

Finally, the results of this study are shortly discussed with the PMO Community of Practice (CoP) group of Capgemini (around 30 people), and the most important and general conclusion of this discussion was that PMO cannot be investigated in a way as “with PMO” or “without PMO”, the differences between the different PMOs are too large, and the benefits accomplished by the different PMOs differ too much as well.

5.1 Limitations & Future research

Every research has its strengths, but there are always some shortcomings that should be acknowledged. The most important strengths of this research are that it used a qualitative research to improve the quality of the quantitative research. First, fieldwork (interviews) is used to provide important insights. Where the survey is used to objectively verify the hypothesis. Fieldwork has a poor objectivity, though can give good insights (Gable, 1994).

Furthermore, the survey had a strong diversity in participants. In both groups (with and without PMO) companies out of multiple sectors participated. Diversity is desirable for the generalization of the results (Blair and Zinkhan, 2006).

The three most important limitations of the current study are the sample size, the lack of a baseline-measurement and the fact that the survey does an appeal on judgmental skills. This study used an unequal sample, in which the group without PMO is smaller than the group with PMO. This might have led to non-significant results while in the population a difference exists. Furthermore, this study used a convenience sample, this is the least time-consuming sample strategy, but it may result in a poor data quality and a lack of intellectual credibility (Marshall, 1996).

The second limitation is that it is unknown how the companies, which have PMO, scored on role clarity, project success, and the other constructs before they implemented PMO. As is suggested before it could well be that companies which implement PMO, implemented the

PMO because of their low project success scores and that these scores are already much better because of the PMO. For future research I would recommend a field experiment with a pre- and post measurement in which a pre-measurement is done in a company before the company implements a PMO and that a post-measurement is done in the same company after the PMO is fully implemented. The advantage of a pre- and post measurement with respect to this study is that the amount of confounding factors is reduced. Factors like organizational culture, the sector, and the size of the company most likely do not change. When different companies are compared to each other like is done in this study these factors are unequal.

When a cross-sectional study is done (like is done in this study) the maturity of the PMO should be included in the analysis. Companies, which just implemented PMO, do not have the same benefits which companies with a full grown mature PMO (Aubry et al., 2007). This can have an undesired influence on the results of the study.

Furthermore, multiple post measurements can be done. For example directly after the implementation of the PMO and a year after the implementation of the PMO this will increase the insights on the influences of the maturity of PMO on project success.

The last limitation is the fact that the survey does an appeal on judgmental skills. In the survey participants are asked to guess certain percentages, like the percentage of reports which is reported in green. Like already mentioned people find it difficult to answer these questions, when people repeatedly guess the percentages too high or too low could influence the validity. Future research could try to collect facts instead of guesses. This could be done in the type of research suggested before. Collect data on several items (like how many reports are reported in green) in an organization where the PMO is not implemented, than after the PMO is implemented collect data on the same items and look at the differences.

5.2 Practical implications

The results of this study show that companies that use PMO adjust their schedule more often than organizations that do not use PMO. This seems to suggest that the monitoring of the innovative process is higher among those organizations. This is conform (Tengshe and Noble, 2007) and (Rangaswamy and Lilien, 1997) who documented that PMO is associated with the use of project management tools, and the way in which these tools are used. This finding has practical implications such that companies which find it difficult to properly manage their schedules should look into PMO, because this could well be an option to remedy this problem. Though this study also negatively associates schedule adjustment with project success. To explain this correlation more research is needed.

Also this study gives an overview of advantages PMO might have but need further research, an example is standardization. For companies which lack efficiency standardization can be of help (Ungan, 2006). When PMO is associated with standardization this can be useful knowledge to these companies, though this study does not show a significant correlation between these variables. This study does show a large difference between the means of the two sample groups (with PMO and without PMO). Furthermore, the outcome of this study on standardization is interesting to researchers who want to investigate the link between standardization and PMO. This study did show a significant positive correlation between standardization and project management satisfaction. This can be interesting to companies which want to increase project management satisfaction.

This study also associated PMO with an increased start-up time. This can have multiple reasons like more tasks which are performed during the start-up. Though this study also associated amount of employees (within the establishment) with an increase in start-up time. This can be interesting to large organization, because if it turns out the start-up increases just

because of the amount of employees within an establishment and not because more tasks are performed during the start-up it could be the start-up decreased in efficiency.

Finally, this study also gives information on what type of follow-up research can be done to increase chances of getting more and better results. Overall, I think this study is meaningful to companies with and without PMO because it shows some advantages PMO can have, and to researchers for gaining insights for further research.

6. Bibliography

- Aubry, M., Hobbs, B., Thuillier, D. (2007). Organisational project management: An historical approach to the study of PMOs. *Elsevier International Journal of Project Management* 26, 38-43
- Barczak, A. G. (2009). PERSPECTIVE: Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study. *Product Innovation Management*, 3-23.
- Bartlett, J. E., Kotrlik, J.W., Higgins, C. C. (2001) Organizational Research: Determining Appropriate Sample Size in Survey Research. *Information Technology, Learning, and Performance Journal* 19(1), 43-50
- Baumgartner, H, Homburg, C. (1996) Applications of Structural Equation Modelling in Marketing and Consumer Research: A Review. *International Journal of Research in Marketing* 13, 139-61.
- Blair, E., Zinkhan, G. M. (2006) Nonresponse and Generalizability in Academic Research. *Journal of the Academy of Marketing Science* 34(1), 4-7
- Chao, R. O. (2008). A Theoretical Framework for Managing the NPD Portfolio: When and How to Use Strategic Buckets. *Management Science*, 907-921.
- Chang, L. (1994). A psychometric evaluation of 4-point and 6-point Likert-type scales in relation to reliability and validity. *Applied Psychological Measurement*, 18, 205-216.
- Cooper, R., Edgett S., Kleinschmidt E. (1999) New product Portfolio Management: Practices and performance. *Elsevier Science*. 16, 333-351
- Cooper, R. G., Edgett, S. J., and Kleinschmidt, E. J. (2004). Benchmarking best NPD practices. *Research-technology management* 47, 31-43.
- Cooper, R. G., Edgett, S. J. (2010). Developing a product innovation and technology strategy for your business. *Research Technology Management* 53(3), 33-40

Gable, Guy G (1994) Integrating case study and survey research methods: an example in information systems. *European Journal of Information Systems* 3(2) 112-126.

Ghasemzadeh, F. (1999). A Zero-One Model for Project Portfolio Selection and Scheduling. *The Journal of the Operational Research Society* 50(7), 745-755.

Hyväri, I. (2006) Success of Projects in Different Organizational Conditions. *Project Management Journal* 37(4) 31-41

Hoegl, M., and Gemuenden, H. G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organizational Science* 12(4), 435–449

Keil, M. (1995), Pulling the plug: Software project management and the problem of project escalation. *MIS quarterly* 421-447

Kester, L., Hultink, E. J., Lauche, K. (2008) An Exploratory study of the practices and challenges of portfolio decision making genres. *Journal of Management Science* 26(4), pp 327-341

Lederer, A.L., Mirani, R., Neo, B.S., Pollard, C., Prasad, J., Ramamurthy, K. (1990), Information System Cost Estimating: A Management Perspective. *MIS Quarterly* 14(2) 159-176

Marshall, M. N. (1996) Sampling for qualitative research. *Family Practice* 13, 522-525

Milosevic, D., Patanakul, P. (2005) Standardized project management may increase development projects success. *Elsevier International Journal of Project Management* 23(3), 181-192

Müller, R., Geraldi, J., and Turner, J.R. (2012). Relationships Between Leadership and Success in Different Types of Project Complexities. *IEEE transactions on engineering management* 59(1), 77-90

Murphy, K. R., Davidshofer, C. O. (1988), *Psychological Testing: Principles and Applications*, Englewood Cliffs, NJ: Prentice-Hall.

Nunnally, J. C. (1967). *Psychometric Theory*, 1st edition, New York: McGraw-Hill.

Nunnally, J. C. (1978), *Psychometric Theory*, 2d edition, New York: McGraw-Hill.

Peterson, R. A. (1994), A Meta-Analysis of Cronbach's Coefficient Alpha. *Journal of Consumer Research*, 21(2), 381-391

Rangaswamy, A., Lilien, G.L. (1997) Software Tools for New Product Development. *Journal of Marketing Research*, 34(1), 177-184

Thiadens, T., and Steenbakkens, W. (2010) resultaten van een empirisch onderzoek, portfolio management in Nederland. *Finance & Control*, 1-22

Thiadens, T., Theo, J.G., and Steenbakkens, C. G. A., (2010). Deciding about it: It portfolio management in 19 major organizations in the Netherlands anno 2010. *MCIS 2010 proceedings* 86.

Turner, J.R., Cochrane, R.A. (1993) Goals-and-methods matrix: coping with projects with ill defined goals and/or methods of achieving them. *Butterworth-Heinemann Ltd* 11(2)

Tushman, M. L. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Rev* 38(4), 8-30.

Ungan, M.C. (2006) Standardization through process documentation. *Business Process Management Journal*, 12(2), 135-148

Yahya, S., Goh, W.K. (2002) Managing human resources toward achieving knowledge management. *Journal of Knowledge Management* 6(5), 457-468

Non scientific references

Academy, Capgemini. (2011). *Has your PMO reached maturity?* Utrecht: Capgemini.

Haughey, D. (2001). Eight Key Factors to Ensuring Project Success. *Project smart*, 1-3

Khalilzadeh, M., Kianfar, F., (2011) The role of PMO in establishing knowledge management networks. *6th International Project Management Conference*

Landy, F.J., Conte, J.M. (2007) Work in the 21st Century. *An introduction to industrial and organizational psychology, second edition*. ISBN: 978-1-4051-4434-6

Langerak, F. (2010), Management van productontwikkeling: stand van zaken op het vakgebied. *Maandblad voor Accountancy en Bedrijfseconomie* 84(6), 315-325

Lester, A. (2007) Project management: Planning and control. *Published by Elsevier Ltd*. ISBN-10 0-7506-6956-X

Office of Government Commerce (2008). Portfolio, Programme and Project Offices. *Published by TSO*

Research center for business practices (2000). The value of project management.

PMsolutions research (2012). The state of the PMO 2012. Project management solutions, inc.

Rajegopal, S., Mcguin, P., Waller, J. (2007). Project portfolio management: Leading the corporate vision

Tengshe, A., Noble, S. (2007) Establishing the Agile PMO: Managing variability across Projects and Portfolios. *IEEE Computer Society*

Appendix

Appendix 1: Interview

Datum interview:

Tijdstip aanvang:

Plaats:

Vraag 1: Persoonlijk

Wat houdt uw huidige functie precies in, dus wat voor werkzaamheden verricht u voornamelijk?

Hoelang bent u al werkzaam in uw huidige functie?

Hoelang bent u al werkzaam binnen dit bedrijf?

Vraag 2: Project Succes

Hoeveel verschillende projecten worden er per jaar uitgevoerd?

Wat voor soort projecten zijn dit?

Wanneer is een project succesvol?

Hoe word dit gemeten?

Worden er veel projecten voortijdig gestop / gekilled? Dus voor het eind product word opgeleverd of op de markt word gebracht.

Wat zijn hier de voornaamste redenen van?

Vraag 3: PMO

Hoe is PMO geïmplementeerd in dit bedrijf?

Hoe wordt het gebruikt?

Heeft men het idee dat het een toegevoegde waarde heeft? Wat heeft het bespaard, gebracht, en gekost? waar blijkt dit uit?

Hoe wordt dit gemeten?

Gebeurt het vaak dat er onderdelen van projecten op verschillende locaties worden onderzocht (wordt het wel vaak meerdere keren uitgevonden)? Als iemand deze vraag niet snapt, uitleggen dat het met technische projecten vaak zo is dat software of hardware onderdelen vaak bruikbaar zijn voor meerdere projecten. Worden deze projecten als geheel steeds opnieuw uitgedacht of is het zo dat er wordt gekeken of delen van het project al eerder ergens zijn bedacht of dat ze daar nu ergens anders ook mee bezig zijn.

Vraag 4: Cultuur

Welke cultuur kenmerkt dit bedrijf?

Hierarchisch, word er goed naar elkaar geluisterd?

Wie maken de uiteindelijke portfolio beslissingen?

Op wat voor gronden worden portfolio beslissingen genomen?

(reactive, intuitive, strategic)

Denkt u dat de bedrijfscultuur invloed heeft op het succes van PMO? Waaruit blijkt dit?

Vraag 5: Strategy

Wat is de bedrijfs strategy, markt strategy, en of visie van dit bedrijf?

Word deze duidelijk nageleefd en gevolgd in deze keuzes die worden gemaakt voor het portfolio, waarom wel of waarom niet? (evt. uitleggen dat het idee is dat een bedrijf de keuzes voor de projecten kan baseren op de strategie van het bedrijf, op winstgevendheid (Financial methods) van de project of op intuïtie van de portfolio manager)

Word er gekozen voor een aantal projecten en worden deze dan met veel resources goed gedaan, of worden er iets meer projecten gestart maar worden deze dan met minder resources gedaan (met resources word bedoelt, geld, apparatuur, en FTE's). Vraag moet uitwijzen hoe gebalanceerd het portfolio is op gebied van resources/ aantal projecten.

Vraag 6: Cijfers

Zijn er binnen uw bedrijf cijfers bekend over de percentages van de projecten die op tijd klaar zijn, binnen het budget blijven en hoeveel projecten voldoen aan de kwaliteit eisen die vooraf waren bepaald? En zou u mij deze cijfers kunnen geven? (als er evt. andere cijfers bekend zijn die nuttig kunnen zijn voor dit onderzoek zou dit heel mooi zijn)

Is er iets bekend van de verschillen van voor invoering van de PMO en van na de invoering van de PMO

Appendix 2: Enquête

Beste deelnemer,

Hartelijk dank voor uw deelname aan dit onderzoek.

In het kader van mijn afstuderen aan de TU/e ben ik bezig met een onderzoek naar de voor- en nadelen van de implementatie van een portfolio management office (PMO).

Het invullen van deze enquête kost ongeveer 10 minuten. De informatie die verzameld wordt door middel van deze vragenlijst wordt alleen gebruikt voor dit onderzoek. Anonimiteit is gewaarborgd, niemand zal kunnen achterhalen wat u heeft geantwoord op de vragen in deze enquête.

U kunt de ingevulde enquête mailen naar j.a.tauber@student.tue.nl. Ook met vragen kunt u mijn docent dr. S. Rispens (s.rispens@tue.nl) of mij altijd mailen.

Alvast bedankt,

Jip Tauber

Over uw bedrijf en het PMO

Hieronder volgt een aantal vragen die nodig is voor de statistische verwerking van de gegevens. Ik wil u er nogmaals op wijzen dat alle informatie geanonimiseerd wordt verwerkt en geanalyseerd. Niemand zal dus kunnen achterhalen welke antwoorden u hebt gegeven of bij welk bedrijf de antwoorden horen.

Bij welk bedrijf bent u werkzaam?

Bij welke afdeling bent u werkzaam?

Hoeveel medewerkers heeft dit bedrijf wereldwijd?

Hoeveel medewerkers heeft de vestiging waar u werkzaam bent?

Wat is uw functieomschrijving?

Maakt uw organisatie gebruik van PMO? Ja/ Nee

Hoeveel mensen werken er in PMO?

Op welk niveau is PMO binnen uw organisatie aanwezig? (aankruisen wat van toepassing is)

- Portfolio
- Programma
- Project

De volgende vragen gaan over waar in de organisatie wordt bepaald welke projecten er worden uitgevoerd en welke niet. Er zijn vragen die naar aantallen vragen, het kan zijn dat u deze niet weet maar dat u een schatting kunt maken. Bij deze vragen is er een extra vakje welke u kunt aanvinken als het een schatting is waar het om gaat. Wilt u bij een schatting het extra vakje aanvinken. Mocht u het aantal weten dan kunt u dit vakje leeg laten.

Op welk niveau wordt bepaald welke projecten er worden gedaan?

- Top management
- Middenmanagement
- Programma management

Op welke gronden wordt bepaald welke projecten worden gestart?

- Risico analyse
- Of de projecten in lijn liggen met de strategie / visie van het bedrijf
- Intuïtie
- Ranking tool, namelijk:
.....
- Waarschijnlijke winst
- Anders, namelijk:
.....

Hoeveel projecten worden er per jaar gedaan binnen het gehele bedrijf?

- Wordt niet bijgehouden maar dit is een schatting
 - 0-50
 - 50-200
 - 200-1000
 - 1000+
-

Wat is het totale budget van het project portfolio?

Wordt niet bijgehouden maar dit is een schatting

< 1 miljoen

1 miljoen – 10 miljoen

10 miljoen – 100 miljoen

> 100 miljoen

Hoeveel procent is dit van de totale jaarrekening?

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

Hoeveel procent van de projecten haalt de doelstellingen?

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

Hoeveel procent van de projecten leveren de vooraf afgesproken doelstellingen op binnen de geplande tijd?

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

Hoeveel procent van de projecten leveren de vooraf afgesproken doelstellingen op binnen het budget?

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

De volgende vragen gaan over project rapportages. Het zou kunnen dat u zelf geen project rapportages maakt maar hier wel inzicht in heeft. Zou u deze vragen daarom toch in willen vullen

Er wordt gesproken over Groen, amber en rood rapporteren. Groen rapporteren betekent dat het goed gaat; amber rapporteren betekent dat er nog geen grote problemen zijn, maar dat er iets moet veranderen omdat ze anders ontstaan; rood rapporteren betekent dat het project kampt met problemen.

Veel bedrijven houden als vuistregel percentages aan voor deze kleuren. Binnen budget en tijd is groen, minder dan 5% boven budget en tijd is amber en alles daarboven is rood. Als er in uw bedrijf ook met deze kleuren wordt gerapporteerd, maar de regel is iets anders, dan kunt u de door uw bedrijf gebruikte vuistregel aanhouden.

Hoeveel procent van het totaal aantal rapportages op jaarbasis wordt in groen gerapporteerd?

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

In hoeveel procent van de gevallen wordt er rood gerapporteerd zonder eerst amber te rapporteren.

Wordt niet bijgehouden maar dit is een schatting

0%-25%

25%-50%

50%-75%

75%-100%

Geef aan in hoeverre u het met de stellingen eens bent, waarbij 1 = **helemaal eens** en 6 = **helemaal niet eens**.

	Helemaal eens			Helemaal niet eens		
Er wordt vaak onverwacht rood gerapporteerd (zonder eerst amber te rapporteren).	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Er wordt altijd op de afgesproken manier gerapporteerd. (er wordt bijvoorbeeld dus nooit iets amber gerapporteerd terwijl het volgens de afgesproken norm rood had moeten zijn)	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Er wordt eerlijk en open gecommuniceerd	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Als projecten niet lopen volgens planning wordt hier eerlijk en open over gepraat	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>

De volgende vragen gaan over de opstartfase. Met de opstartfase wordt bedoeld de fase waarin het project wordt uitgezet: de planning wordt gemaakt, er wordt uitgezocht welke resources op welk moment beschikbaar moeten zijn en er wordt bepaald welke persoon wat, wanneer en met wie gaat doen.

Is er een handboek/richtlijn voor de projectmanager? Ja Nee

Is er een handboek/richtlijn voor de opstartfase? Ja Nee

Welke taken vervult PMO in de opstart fase?

Hoe lang duurt de opstartfase gemiddeld? Dagen

Hoeveel procent van de tijd van het project wordt gemiddeld ingenomen door de opstartfase? (het gehele project is 100%) %

Geef aan in hoeverre u het met de volgende stellingen eens bent, waarbij **1 = helemaal niet eens** en **6 = helemaal eens**. Dit is dus **tegenovergesteld** ten opzichte van de vorige vragen die werden gesteld op een schaal van 1 tot 6.

	Helemaal niet eens				Helemaal eens	
De doelen van het project zijn voor mij helder na voltooiing van de opstartfase	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Gedurende het hele project zijn de doelen van de taak waar ik mee bezig ben helder	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Binnen onze projectgroep praten we over de doelen van het project	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Na voltooiing van de opstartfase is het voor mij helder wat andere mensen in mijn projectgroep aan het doen zijn.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
In mijn projectgroep weet ik de rol van anderen	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
In mijn projectgroep weet ik welke kennis en vaardigheden anderen bezitten	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
In mijn project groep zijn we bekend met elkaars manier van werken	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Na voltooiing van de opstartfase ben ik bekend met de manier van werken van mijn project groep	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Na voltooiing van de opstartfase weet ik welke kennis en vaardigheden anderen binnen de project groep bezitten	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Er is na voltooiing van de opstartfase een heldere taakverdeling	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
Er is gedurende het hele project een heldere taakverdeling	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>

Aan het begin van het project is het voor mij helder met wie ik zal gaan samenwerken	1	2	3	4	5	6
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
De hoeveelheid tijd die wordt besteed aan de opstartfase vind ik	<input type="checkbox"/> Veel te kort <input type="checkbox"/> Te kort <input type="checkbox"/> Precies goed <input type="checkbox"/> Te lang <input type="checkbox"/> Veel te lang					
Ik ben tevreden met de manier hoe het project management verloopt	1	2	3	4	5	6
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ik zie graag verandering in hoe projecten nu worden gemanaged	1	2	3	4	5	6
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project planningen worden vaak bijgesteld	1	2	3	4	5	6
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Het gebeurt vaak dat de benodigde materialen en/ of producten niet beschikbaar zijn op het moment dat ik ze nodig heb	1	2	3	4	5	6
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Dit was de enquête, nogmaals mijn hartelijke dank voor het invullen. U kunt deze mailen naar j.a.tauber@student.tue.nl

Appendix 3: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
PMO	44	0	1	,73	,45
Project success	41	1,75	4,00	2,79	,64
Project time (days)	30	33	1800	386	375
Employees (worldwide)	44	250	300000	32063	57243
Employees (establishment)	38	30	9000	1772	2181
Role Clarity	44	3,09	5,36	4,48	,52
Standardization	44	,00	1,00	,76	,38
Red without amber	32	1	3	1,38	,55
Red after green	40	2	6	4,07	1,02
Schedule adjustment	44	2	6	4,34	,86
Start-up (Days)	30	3	180	54	41
Start-up (%)	35	2	35	15,1	9,8
Satisfied	44	2	6	4,09	,86
Change management	44	2	6	3,91	,94
Materials Unavailable	44	2	5	3,25	1,12

Appendix 4: Pearson Correlation Table

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 PMO	1														
2 Project success	-,222	1													
3 Project time (days)	,285	-,142	1												
4 Employees (worldwide)	-,058	,143	,215	1											
5 Employees (establishment)	,263	-,156	,264	-,037	1										
6 Role Clarity	-,057	,137	-,056	,055	,056	1									
7 Standardization	,154	,120	-,078	,042	-,286	,235	1								
8 Red without amber	,000	-,205	,184	-,005	,236	-,196	,072	1							
9 Red after green	-,079	,133	,105	,110	,030	,210	,012	-,548	1						
10 Schedule adjustment	,425**	-,324*	,179	-,055	,388*	,003**	,006*	,183	,170	1**					
11 Start-up (Days)	,393*	-,019	,490**	-,120	,497*	,023*	-,128	-,247**	,204	,055*	1				
12 Start-up (%)	,284	,007	-,253	-,331	-,073	,150	,248	-,336	,103	-,150	,556	1			
13 Satisfied	,066	,271	,174	-,057	-,106	,281	,317	-,100	,054	-,295	,090	,183	1		
14 Change management	,216	-,077	,289	,180	,121	-,185	-,225	,016	-,028	-,047	,179	-,033	-,366	1	
15 Materials Unavailable	-,092	-,161	-,207	-,078	,171	-,105	,007	,221	-,040	,150	-,275	-,228	-,217	,089	1