

**A Study of Competency Model for a Project Portfolio Manager:
Triangulation Approach**

by

Alexey Lyashuk

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF BUSINESS ADMINISTRATION

Major: International Human Resource Development

Advisor: Lai, Chih-Chien Steven, Ph.D.

National Taiwan Normal University

Taipei, Taiwan

January 2022

ABSTRACT

Among various tools to track the implementation of changes and innovations, one of the top places is occupied by project portfolio management (PPM). With the enhancing importance of PPM, the attention to the person actively manages this process – a portfolio manager (PfM) – is increasing respectively. Organizations strive to have competent PfMs. Although the role is formally defined in professional standards, there is still a lack of description and ambiguity in needed PfM competencies. This research was aimed to offer the competency model of PfM by triangulating three sources: literature, job descriptions, and opinions of the professionals in the PPM area. The framework of the study was built according to the purpose and involved such methods as content analysis and corpus analysis. The research findings reflected the primary purpose: were analyzed corpora of competency-related textual information, each corpus was checked on the representativeness and used in topic modelling. The experts verified the international intersectoral competency model for PfM. The proposed competency model for PfM contains six competencies: business focus, diverse expertise, expedient communications, process stewardship, self-management, and transformational demeanour. Each element contains six to eight indicators divided into two levels – critical and desirable. Hence, the introduced competency model could be used to clarify PfM roles in the organisations and for the individual professional development of the PfMs.

Keywords: project portfolio management, portfolio manager, competencies, competency model, triangulation

TABLE OF CONTENTS

ABSTRACT	I
TABLE OF CONTENTS	III
LIST OF TABLES	V
LIST OF FIGURES	VI
CHAPTER I INTRODUCTION.....	1
Background of Study	1
Statement of the Problem.....	2
Purpose of Study	3
Questions of Study.....	4
Significance of Study	4
Definition of Key Terms.....	4
CHAPTER II LITERATURE REVIEW	7
Project Portfolio Management	7
Project Portfolio Manager in the Organization.....	12
Project Portfolio Manager Competencies	19
Summary of Chapter II	31
CHAPTER III RESEARCH METHODS	33
Research Approach	33
Methods of Study	35
Data Selection	39
Research Procedure.....	42
Research Quality	44
Summary of Chapter III.....	47
CHAPTER IV FINDINGS AND DISCUSSION	49
Data Representativeness	49

Frequently Used Stems in the Descriptions of Competency Elements	52
Topic Modelling Results.....	58
Validation of the Indicators by the Experts	66
International Intersectoral Project Portfolio Manager Competency Model.....	70
Summary of Chapter IV	76
CHAPTER V CONCLUSIONS AND SUGGESTIONS.....	77
Conclusions.....	77
Implications	79
Limitations	79
Suggestions for Future Study.....	80
REFERENCES.....	81
APPENDIX A: ONLINE SURVEY QUESTIONNAIRE	95
APPENDIX B: WORD CLOUDS	96
APPENDIX C: DENDROGRAMS FOR LDA TOPIC MODELS	99
APPENDIX D: TRANSITIONAL DATA FOR PFM COMPETENCY MODELLING	102

LIST OF TABLES

Table 2.1 Overview of a PfM Role.....	13
Table 2.2 Statistics on Number of Published PfM Vacancies on Job Search Websites.....	18
Table 2.3 Comparison of Three PPM Standards.....	29
Table 3.1 Profiles of the Experts Validated the Questionnaire.....	45
Table 4.1 Subset of Most Frequently Used Stems for PfM Knowledge Description.....	52
Table 4.2 Frequently Used Stems for PfM Ability Description.....	54
Table 4.3 Frequently Used Stems for PfM Behaviour Description.....	55
Table 4.4 Frequently Used Stems for PfM Attitude Description.....	56
Table 4.5 Frequently Used Stems for PfM Qualification Description.....	57
Table 4.6 Topics for the Competency Element “Knowledge”.....	58
Table 4.7 Topics for the Competency Element “Ability”.....	60
Table 4.8 Topics for the Competency Element “Behaviour”.....	61
Table 4.9 Topics for the Competency Element “Attitude”.....	62
Table 4.10 Topics for the Competency Element “Qualification”.....	63
Table 4.11 List of Competency Elements Based on Triangulation.....	64
Table 4.12 Results of Validation by the Experts.....	67
Table 4.13 Suggestions From the Experts After Competency Model Validation.....	69
Table 4.14 Final Competency Model for a PfM Based on the Triangulation.....	71
Table D1 Competency Model for a PfM With the Levels of Mastery.....	102
Table D2 Comparison of the Obtained PfM Competency Model With the Standard ICB.....	102

LIST OF FIGURES

Figure 2.1 Schema of Functional Project Management Flowchart in Organization.....	10
Figure 2.2 PPM Process.....	11
Figure 2.3 Model of Competency.....	22
Figure 2.4 The Search Rate for the PfM (From 2004 to Present).....	27
Figure 2.5 Frequency of Occurrence PfM in Printed Sources.....	28
Figure 3.1 Research Framework of Study.....	34
Figure 3.2 Screenshot of Form to Chatbot Output.....	36
Figure 3.3 Topic Modelling Process.....	38
Figure 3.4 Research Procedure.....	42
Figure 4.1 Representativeness of Countries Among Experts and in Job Descriptions.....	50
Figure 4.2 Representativeness of Industry Sectors Among Experts and in Job Descriptions	51
Figure 4.3 Frequently Used Stems for the Description of Knowledge.....	53
Figure 4.4 Dendrogram for LDA Topic Modelling of the Competency Element “Knowledge”	59
Figure B1 Frequently Used Stems for The Description of Abilities.....	96
Figure B2 Frequently Used Stems for The Description of Behavior.....	97
Figure B3 Frequently Used Stems for The Description of Attitude.....	97
Figure B4 Frequently Used Stems for The Description of Qualification.....	98
Figure C1 Dendrogram for LDA Topic Modelling of the Competency Element “Abilities”	99
Figure C2 Dendrogram for LDA Topic Modelling of the Competency Element “Behaviour”	100
Figure C3 Dendrogram for LDA Topic Modelling of the Competency Element “Attitude”	100
Figure C4 Dendrogram for LDA Topic Modelling of the Competency Element “Qualification”	101

CHAPTER I INTRODUCTION

Chapter I is devoted to bringing an overview of the study: its background and statement of the problem, purpose and the research questions, and its significance. At the end of the chapter states the definition of key terms.

Background of Study

Today organizations encounter strategic challenges since their surroundings are characterized by high levels of changes (Kopmann, Kock & Killen, 2017). Among various tools to track these changes and form a quick and effective answer, project portfolio management (PPM) is one of the top places. PPM can be defined as “a continuous decision-making process, whereby an organization’s list of portfolio components is subject to periodic review for alignment with the organization’s strategy. In this approach, new opportunities or threats are evaluated, selected, prioritized and authorized” (International Standard Organisation [ISO], 2015, p. 2). This term emphasizes a link between the strategy and its practical embodiment (Meskendahl, 2010) and holistic management of projects (Clegg et al., 2018).

The proposed definition highlights the key stages of the PPM process, so it is possible to track what should be done by a professional in PPM for the effective performance of the process. This person is usually called “project portfolio manager” (Filippov et al., 2014, Jonas et al., 2010) or “portfolio manager” (Butler, 2018; ISO, 2015). Abbreviation PfM will be used to shorten both phrases. PfM is a politically aware, active person implementing the integral control of the relationship between the portfolio components and the organization's strategy and applying specific knowledge and project portfolio management processes to the portfolio components.

PPM has significant benefits for the organization, including increased success in project delivery, better decision making, avoidance of overspending and inefficiencies (Aston, 2021). With the enhancing importance of PPM, the attention to PfM role is increasing respectively. The organization, hence, should have a skilful, perfectly incorporated PfM, able to drive the portfolio and reach the benefits (Filippov et al., 2014). In other words, organizations should have competent PfM. Moreover, the competencies of the PfM is one of the significant factors in how PPM is carried out in day-to-day practice (Martinsuo, 2013).

Competency is a demonstrated component of knowledge, skill, or judgment, which indicates required behaviour to be a successful performer in the respective context (Barbosa et al., 2018;

Moghabghab et al., 2018; Springer, 2019). Based on this, competency models refer to a collection of competencies and act as one of the key instruments in helping people develop towards strategic targets of the organization since the significant strength of these models is to link people and strategy (Campion et al., 2011). To keep up with the competitors or, more importantly, to be ahead of them, Hejase et al. (2016) and Thunnisen and Van Arensbergen (2015) advise organizations to develop employee competencies through the use of strategies beyond remuneration and make investments in developing human capital. Organizations that use competency-based approaches have more advantages, primarily because their recruiting, assessing, and training processes linked with the skills required for successful performance (Baker, 2015).

Thus, PPM links strategy with the projects performed and the organizations need competent PfM. In line with this, rising interest in the PfM could be seen. Scientific papers and professional competency-based standards pay attention to the human aspects of project management (Zhang, Fang et al., 2020) and give some hints on specific PfM competencies. These factors are causing research interest and study the competency model for PfM.

Statement of the Problem

Project management nowadays is a tool widely and frequently used by organizations. The more diverse projects a company implements, the more difficult it becomes to manage all of the projects as a whole and direct them towards achieving the company's strategic goals. Many companies adopt PPM processes to manage multi-project environments effectively and efficiently (Martinsuo & Hoverfält, 2018). These processes are usually implemented when an organization already has a group of competent and skilled human resources in project management (Barbosa & de Ávila Rodrigues, 2020). The role of a project manager is widely known, and the competencies of this role are elaborated from various angles. For example, were proposed the competencies for project managers (Moradi et al., 2020; Park, 2016; Podgórska & Pichlak, 2019) or were examined the role of the project manager's competencies in the performance and success of the projects (Irfan et al., 2021; Saidoun, 2016; Suifan et al., 2021).

While the project management competencies are known, we should consider other participants heavily involved in the realization of projects in the company. One of the critical roles in this process is assigned to PfM. This role is formally defined in professional standards (e.g., Australian Institute of Project Management [AIPM], 2021; International Project Management Association [IPMA], 2015) and scientific researches (Filippov et al., 2014; Jonas, 2010; Martinsuo

& Geraldi, 2020) but still there is a lack of scientific works exploring needed knowledge, abilities, personal, technical, contextual and other types of competencies. This may lead to a lesser understanding of human factors' influence on the PPM and achieve the strategy.

There are also some research issues, among which is the need for detailed study of the factors that lead to improvement of PPM in the contexts of the people and teams in the organization and the rising quality of PfM performance (Lima et al., 2016). Besides, the concept of portfolio management belongs not only to the project management area but is excessively used in several other spheres like investments (Deutsch & Beinker, 2019), marketing (Aaker & Joachimsthaler, 2000), education (Arifin, 2021).

These different perspectives and their process can lead to misunderstanding in the interpretation of the role of PfM and the competencies needed for this role in the organization. Thus, to avoid this issue, a PfM position in the company should be described: what is the role looks like, what are the job tasks and responsibilities, and what are the competencies needed for this role? Answers to these questions can be helpful to establish priorities for defining specific training and career objectives for PfM, expanding efforts into talent development, and establishing job evaluation criteria (Werner, 2021).

Since the competencies are not exclusively developed in the organization and for the organization (Barbosa & de Ávila Rodrigues, 2020), this research will present a more unified competency model that any organization uses or intends to use PPM. To increase the model's validity and make the model itself more precise in the description of PfM competencies, this study attempts to gather data from three different sources: literature and standards, job descriptions from the actual PfM vacancies on the web, and opinions of the professionals in PPM.

Hence, using all three sources of information will provide a more evident pattern of PfM competencies.

Purpose of Study

The purposes of this study are:

1. Clarify the competency indicators of PfM by triangulating three sources: literature, job descriptions, and opinions of the professionals in the PPM area.
2. Offer a competency model for PfM based on the triangulation.

Questions of Study

Taking into account the background, statement of the problem, and purposes of the study, research questions were formulated as follows:

RQ1: What competency indicators should be used in the competency model of a PfM according to the literature, job descriptions, and opinions of the professionals in the PPM area?

RQ2: How does the competency model for PfM based on triangulation look like?

Significance of Study

This study will be significant for different parties:

1. For academic researchers, this study will provide a comprehensive analysis of the PfM role and competencies of this role which could be helpful in a more accurate understanding of the PfM personality in the PPM performance and the context of the reaching organizational strategy.
2. For lecturers in the universities and trainers in the training centres who provide courses in PPM, the model of PfM competencies will help handle the content of the courses up-to-date and include the topics which could be helpful in the workplace.
3. For practitioners in a human resource designed competency model will be a valuable source of information for creating an adopted model of competence in the organization or using the proposed model as a decision-making tool in different human resource areas such as recruitment, employee performance evaluation, high potential employee identification, training design etc.
4. For consulting firms, the output of the study will raise awareness and better understand the human factors in the client's PPM processes and improve the proposed solutions in these processes, taking into account the role and competencies of PfM.
5. For current and future, PfM proposed competency model framework could be a personal development guide. It would be easier to plan future careers and see possible ways to be better in the role.

Definition of Key Terms

Competency – demonstrated component of knowledge, skill, or judgment, indicated required behaviour to be a successful performer in the respective context (Barbosa et al., 2018; Moghabghab et al., 2018; Springer, 2019).

Competency model – competency model refers to a collection of competencies linking the organization's strategy to the human attributes needed to implement the strategy and containing different characteristics of the performer, who do the job well (Campion et al., 2011; Spencer & Spencer, 1993).

Corpus – “machine-readable collection of (spoken or written) texts that were produced in a natural communicative setting, and in which the collection of texts is compiled with the intention (1) to be representative and balanced with respect to a particular linguistic language, variety, register, or genre and (2) to be analyzed linguistically” (Gries, 2018, p. 7).

Portfolio – “set of projects and/or programmes, which are not necessarily related, brought together to provide optimum use of the organization's resources and to achieve the organization's strategic goals while minimizing portfolio risk” (IPMA, 2015, p. 36).

Portfolio manager (PfM) – politically aware, active person implementing the integral control of the relationship between the portfolio components and the organization's strategy and applying specific knowledge and project portfolio management processes to the portfolio components (composed; based on literature analysis). For example, Butler (2018) described PfM as a politically aware role critical to the successful execution of the strategy, Jonas (2010) highlighted it is essential for a PfM to have specialized knowledge, while Unger et al. (2012) underlined controlling, supporting, and coordinating functions of a PfM role.

Project portfolio management (PPM) – “continuous decision-making process, whereby an organization's list of portfolio components is subject to periodic review for alignment with the organization's strategy. In this approach, new opportunities or threats are evaluated, selected, prioritized and authorized” (ISO, 2015, p. 2).

CHAPTER II LITERATURE REVIEW

This chapter presents an overview of PPM and PfM. The first section discusses the project management perspective among different perspectives on portfolio management and a description of the PPM process. The following section describes the roles and functions of PfM in the organization. The last section of Chapter II outlines competencies and competency models, gradually focusing on the competencies of PfM in the literature and standards.

Project Portfolio Management

Project Portfolio Management Among Different Perspectives

Today organizations encounter strategic challenges since their surroundings are characterized by high levels of changes (Kopmann, Kock, & Killen, 2017). Among various tools to track these changes and form a quick and effective answer, portfolio management is used. Portfolio management often links the strategy and its practical embodiment (Meskendahl, 2010) and aimed for creating value for a company (Hansell et al., 2016). However, it is necessary to use the concept of portfolio management carefully since it appears from several different perspectives:

- project management perspective: standard for portfolio management (PMI, 2017b) describes a portfolio as a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives. Hence, portfolio management is viewed as a continuous decision-making process to manage strategically aligned components within an organizational environment of varying complexity and uncertainty (ISO, 2015). From this perspective, researchers examine the effectiveness of a portfolio management process in the organizations (Hoffmann et al., 2020; Martinsuo & Lehtonen, 2007) and, also, the links between the portfolio management process and its stakeholders (Killen et al., 2020), context (Martinsuo & Geraldi, 2020), or strategy in the organization (Kopmann, Kock, Killen, & Gemünden, 2017).
- investment perspective: Markowitz (1952) was the first to introduce the portfolio concept to the financial sector. From this perspective, a portfolio is described as a set of stocks and assets (Vinell et al., 2021), and portfolio management is viewed as a process that helps in maximizing the return of an asset by minimizing or keeping control of risk (Deutsch & Beinker, 2019; Yun et al., 2020). The vast number of publications from the investment perspective related to the problem of portfolio optimization (Balbás et al., 2021; Gruszka &

Szwabiński, 2020) and select the most efficient assets (Lassance & Vrans, 2019; Zhang, Fang, et al., 2020) to describe the way investors can return their investments with the highest profit.

- marketing perspective: a portfolio from this perspective is described as a set of products or brands owned by the company and representing the company in the targeted markets (Keller & Swaminathan, 2019; Tolonen et al., 2015). Hence, the brand portfolio management process is a process to manage this set of brands or products to maximize the value, increase the loyalty of the customers, and reduce the time to market (Aaker & Joachimsthaler, 2000; Doorasamy, 2017; Sevel et al., 2018). The marketing perspective resembles the investment perspective since the primary purpose is maximizing profit and minimizing the risks of investments. Therefore, the areas of research are pretty alike, for example, examination of the effective strategies of portfolio architecture (Sousa Santos, 2018; Ostapchuk & Pashchenko, 2021) and optimization (Kral et al., 2019; Sarkar, 2019), but also with own uniqueness, such as brands and products positioning (Brunner & Baum, 2020; Kachersky & Carnevale, 2015).
- educational perspective: a portfolio here is mentioned as a “purposed collection of student work that exhibits the student’s efforts, progress and achievements in one or more area” (Paulson et al., 1991, p. 60). Also, widely used ideas of creating electronic portfolios (e-portfolios) can help learners collect their learning experience, analyze, evaluate and implement it to their learning path (Song, 2020). From the educational perspective, authors examine the portfolios and e-portfolios of students or teachers to evaluate or assess their skills (Arifin, 2021; Struyven et al., 2014) and explore the effectiveness of the portfolios and e-portfolios by offering new methods and technologies, like blockchain (Zheng, 2021), web-based technologies (Zulfikar, 2017) or specific e-portfolio systems (Iio & Wakabayashi, 2020).

By describing portfolio management from different perspectives, now it is possible to summarize and choose the direction for this research. According to the literature review, the project management perspective is the promising direction for research in the human resource area because, in the project management area, the role of the people and their competencies are critical to the success of the whole project (Banihashemi et al., 2017; Pandremmenou et al., 2013; Zia, 2020). In comparison, the primary focus in other areas relates to the process and its outputs.

Thus, after choosing project portfolio management as the primary field of research, it is necessary to describe the terms and the process. It will help to be more precise in defining project portfolio manager competencies.

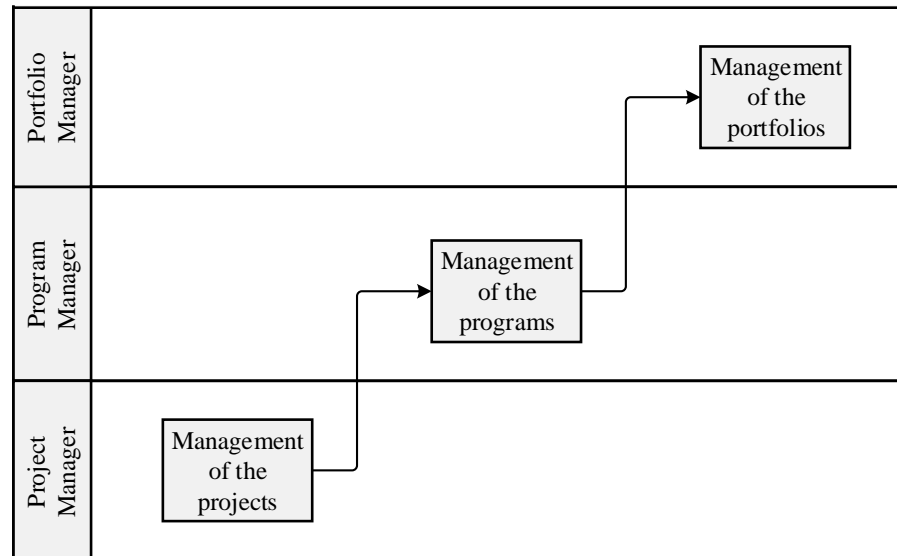
Project Portfolio Management Process

Project management is established as the leading method for implementing change in the organizations, and project, programme and portfolio managers are significant figures in this way (IPMA, 2015). Therefore, project management is a specific area of managing changes. As shown in Figure 2.1, functionally project management consists of three different areas:

- Management of the projects, where a project is “a temporary endeavor undertaken to create a unique product, service, or result” (PMI, 2017b, p. 4),
- Management of programs, where a programme is a “group of programme components managed in a coordinated way to realize benefits” (ISO, 2021, p. 3)
- Management of portfolios, where a portfolio is a “set of projects and/or programmes, which are not necessarily related, brought together to provide optimum use of the organization’s resources and to achieve the organization’s strategic goals while minimizing portfolio risk” (IPMA, 2015, p. 36).

Figure 2.1

Schema of Functional Project Management Flowchart in Organization

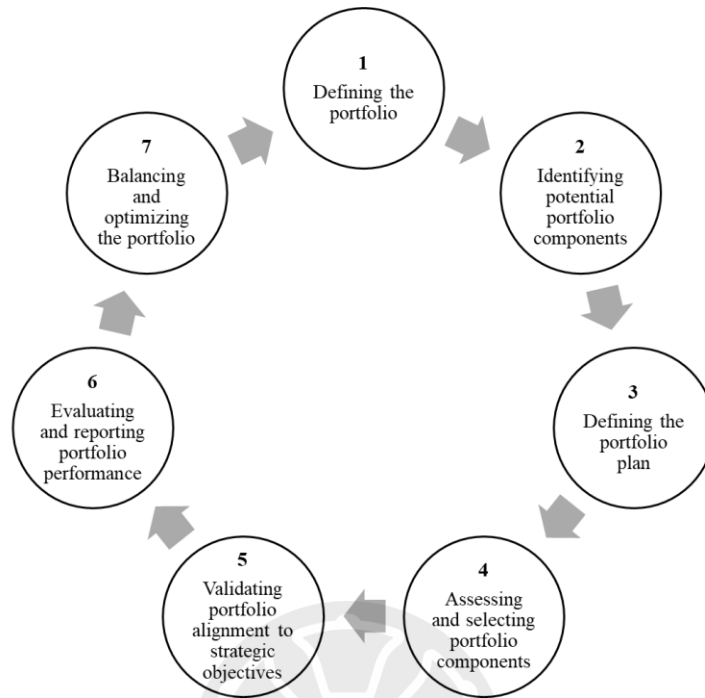


Note. Adapted from “A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition” by PMI. Copyright 2017 by PMI.

Comparison of these three areas presented by Stratton (2011) in his study of PPM in the perception of project managers. The key finding was that management of projects and programmes focuses more on the “how-to” aspects. While PPM is more about strategy realization and overseeing the project management elements within the company. The term project portfolio management is widely used and has different definitions offered by researchers (Aston, 2021; Meskendahl, 2010; Oltmann, 2006) as well as national (PMI 2017b; AXELOS, 2011) and international (e.g., IPMA, 2015; ISO 2015, 2021) standards. According to the international standard “Project, Programme and Portfolio Management – Guidance on Portfolio Management” (ISO, 2018), PPM is “a continuous decision-making process, whereby an organization’s list of portfolio components is subject to periodic review for alignment with the organization’s strategy. In this approach, new opportunities or threats are evaluated, selected, prioritized and authorized” (p. 2). This definition also highlights a link between PPM and the key stages of the PPM process, so it is possible to track what should be done by a professional in PPM for the effective performance of the process. Since the provided definition marked several key stages, Figure 2.2 represents all stages of PPM.

Figure 2.2

PPM Process



Note. Adapted from “Project, Programme and Portfolio Management – Guidance on Portfolio Management” by ISO (Standard No. 21504:2015), p. 13. Copyright 2015 by ISO.

As mentioned in the standard (ISO, 2015), for effective guidance, “portfolio components should be continuously identified, evaluated, selected, and authorized; and the status and performance of the portfolio regularly reported” (p. 6). Pilorget and Schell (2018), describing the PPM process, list the key objectives of it, among which are:

- optimizing the results of the whole project portfolio,
- selection of appropriate projects to be started,
- timely interrupting or stopping projects,
- continuous coordination of resources,
- organization of learning of and among projects.

All these objectives indicate the constant and continuous work of the people involved in PPM and emphasize the importance of working with the portfolio's components. Therefore, the process of PPM should be viewed as rhythmic in its continuity along with its specific components that need to be managed – and different types of components may potentially influence the

competencies needed from a managing person. There is no consensus about this influence in the literature (Blomquist & Müller, 2006; Killen et al., 2008); however, no one denies the existence of different types of components in the portfolio. Literature review on the topic of typology of the portfolio components indicates portfolio may contain components from the fields of

- research and development (Esponda et al., 2021; Hesarsorkh et al., 2021),
- informational technology (Bathallath et al., 2016; Mohagheghi et al., 2020),
- construction (Babkina et al., 2020; Uvarova et al., 2018),
- and others (Fedushko et al., 2021; Oliveira & Rabechini, 2021; Ratushnyi, 2019).

Despite its particular type, each portfolio component should include the management team's support in achieving its strategic objectives, creating value for the company, flow of revenue, and achievement of stakeholders' business objectives (Trentim, 2013). Project portfolio management cannot be considered static (Martinsuo, 2013). Therefore, the efficiency of this dynamic process is multi-dimensional (Müller et al., 2008) and depends, in particular, on the degree to which a portfolio is managed as a whole, maximizes the value of the organization and achieve portfolio objectives according to the expectations of the decision-makers (Martinsuo & Lehtonen, 2007).

PPM process, its stages, outcome and structure unveil the necessity of a managing person – the one who will evaluate, select, prioritize and manage portfolio components. This person is usually called “project portfolio manager” or “portfolio manager”. In this research for brevity, the second option is used – portfolio manager (PfM).

Project Portfolio Manager in the Organization

Project Portfolio Manager Role

Different perspectives of understanding portfolio management discussed in the respective section can cause misunderstanding in interpreting the role of a PfM. Thus, to avoid this issue, we have to describe a PfM position in the company: what is the role looks like, what are the job tasks and responsibilities, what are the competencies needed for this role? Answers to these questions can be helpful to establish priorities for defining specific training and career objectives for the portfolio manager, expanding efforts into talent development, and establishing job evaluation criteria (Werner, 2021).

The role of the PfM is discussed primarily according to the project management perspective and effectiveness of the process. Analysis of the sources on the topic of the role of PfM in PPM is shown in Table 2.1.

Table 2.1

Overview of a PfM Role

Author	Description of the PfM role	The focus of the research	Keywords in the PfM role
Gareis, 2000	No specific role was mentioned directly but mentioned the competencies and specific tools and methods of PPM needed in the organization (e.g., coordination of the project portfolio, project database administration, PPM reporting)	Program management and PPM as competencies of project-oriented organizations	Coordination, usage of the specific methods
Kendall and Rollins, 2003	PfM is a role in the PMO who regularly supports the decision-makers by using and improving PPM processes	PMO functionality and ways to implement it successfully	Regularly, support, use PPM, improve the effectiveness
Blomquist and Müller, 2004	PfM acts as an agent to utilize resources of the organization efficiently, improve portfolio and PPM process, coordinate portfolio components to achieve financial results of the organization	Roles and responsibilities of program and portfolio managers in the industry	Resource effectiveness, coordination, financial efficiency

(continued)

Table 2.1*Overview of a PfM Role (continued)*

Author	Description of the PfM role	The focus of the research	Keywords in the PfM role
Jonas, 2010	PfM is responsible for performing tasks throughout portfolio structuring, resource management, portfolio steering, and organizational learning and portfolio exploitation. PfM is a central coordination unit supporting senior management with its specialized knowledge about project portfolio practices.	PfM and its interplay with line and senior management	PPM tasks, support, specialized knowledge
Unger et al., 2012	PfM is a person inside the portfolio management office (usually, the head of it) who hands the challenges and performs coordination, controlling and support in PPM	Impact of the project portfolio management office on portfolio management execution and success	Coordination, control, support
Kissi et al., 2013	PfM is a middle-level manager whose role involves a strategic overview of projects, enhancing project performance by using transformational leadership, and ensuring business objectives are achieved	Transformational leadership behaviour in the UK project-based organization	Enhance performance, achieve business objectives

(continued)

Table 2.1*Overview of a PfM Role (continued)*

Author	Description of the PfM role	The focus of the research	Keywords in the PfM role
Filippov et al., 2014	PfM is a role and position within the organization with a social profile, which contains five levels of the portfolio manager's organizational embeddedness from supporter to a leader of change and a firmly embedded advisor. PfM is seeking to establish and maintain a transparent, rule-based system to avoid subjectivity and hidden conflicts	Exploration of PfM role according to organizational maturity and embeddedness	Supportive, driving change, advisor, politically neutral
Portman, 2015	PfM is a coordinator who supports the effective and efficient operation of the PPM and provides support to the top managers of business units (e.g., business change director)	Implementation of PPM in the organizations	Coordinator, supporter
Butler, 2018	PfM is a politically aware role critical to the successful execution of the strategy. PfM tends to optimize resources, is skilled in reporting, and is a provider of advice for senior management	PPM process and its application to practice	Politically aware, strategy execution, optimize resources, advisor

(continued)

Table 2.1*Overview of a PfM Role (continued)*

Author	Description of the PfM role	The focus of the research	Keywords in the PfM role
Martinsuo and Geraldi, 2020	PfM is an active agent who takes the context into account to deploy the strategy, lead the portfolio's autonomy and continually construct and modify the context to succeed within this context	Relationships of project portfolios with their contexts based on several theoretical rationales	Active with the context, succeed within the context
Aston, 2021	PfM often is a part of the PMO team. PfM performs an integral role in the successful execution of the organization's strategy, in guiding in PPM process by setting standards, and in a high-level overview of portfolio components	Steps, tools, benefits of PPM	The integral role, guide, high-level overview

In project management literature, the role of PfM have not been receiving special research attention – Table 2.1 clearly shows PfM is commonly described as one of the actors in the PPM process, and many academic publications are limited only to mention the PfM as a person who helps in achieving performance in the company. Very rare PfM is mentioned as a central figure of the research, and even in these rare researches, the figure of PfM usually united with other actors, like programme managers.

According to the sources cited in Table 2.1, PfM is a politically aware, active person implementing the integral control of the relationship between the portfolio components and the organization's strategy and applying specific knowledge and project portfolio management processes to the portfolio components. PfM could be responsible for the PPM process: coordination, support, guidance, and advising teams of portfolio components and people in the context of the

portfolio on achieving resource effectiveness, improving and enhancing the portfolio components' business performance (ISO, 2015; Pilorget & Schell, 2018). This description considers both the active position of the portfolio manager and his/her responsibility to the teams and the organization, including the vital role in achieving business indicators.

Project Portfolio Manager Job Functions

Despite the importance of the role of PfM, there are no clear and distinct descriptions of the job functions PfM should perform in the workplace. A job function is a list of actions performed by an employee in a particular position that describes the main responsibilities of their job (Indeed Career Guide, 2021). Description of job functions can help understand factors determining the employee's skills, form a set of required skills, and adjust them since the requirements have changed over time (Autor & Handel, 2013). Job functions are usually described as the described and documented job analysis results (Prien et al., 2009).

One of the detailed and broad databases for job descriptions – O*NET Online – was created for the US Department of Labor by the National Center for O*NET Development (O*NET, n.d.-a). This site offers a range of occupations with precise, detailed information and job descriptions that are based, among other things, on functional job analysis. Moreover, O*NET has grown from creating a common occupational language useful in describing any jobs (Sanchez & Levine, 2009) and can help provide more detailed data analysis of the jobs based on proposed job formulas (McEntire et al., 2006).

Search within O*NET Online database with a keyword “portfolio” returns 12 matched occupations: eight occupations in the list are of the investment and financial sphere, two of arts and performance, and for one of IT and marketing respectively. Only one occupation may be close to our topic – 11-3031.03 – Investment Fund Managers. The first five functions of this occupation describe a role where an employee plans, directs or coordinates investment strategy or operations for a large pool of liquid assets supplied by institutional investors or individual investors (O*NET OnLine, n.d.-b).

If we widen our search to two words, “project portfolio manager”, search results would contain more than 700 occupations, most of which contain the keyword “manager” or “project” and non-containing “project portfolio manager” keywords altogether. Thus, O*NET does not contain project portfolio manager occupation per se but contains the description of closely related

occupations, for example, from the investment perspective of portfolio management, described in the previous paragraph.

On the other hand, internationally known job search resources on the web (e.g., <http://indeed.com>, <http://glassdoor.com>, <http://linkedin.com>) contain a vast number of positions for the project portfolio manager. To underline this fact in Table 2.2 could be seen statistics for top three job websites (Gerencer, 2021) with three different keywords. It is raw statistics, and no clearing of the data was used. Therefore, the search could contain job posts that include any of the words in the search phrase.

Table 2.2

Statistics on Number of Published PfM Vacancies on Job Search Websites

Website	Number of vacancies for the different keyword phrases		
	portfolio manager	project portfolio manager	project management officer
Indeed.com	16 803	8 568	320
Glassdoor.com	16 105	8 220	2 025
Linkedin.com	10 449	22 076	3 649

Note. Retrieved date for all data – 28.06. 29.2021. For all job searches was used the exact location – worldwide. All searches included only jobs posted within a week (last seven days).

Thus, this situation unveils an issue from a human resource point of view. Despite the broad usage of PfM and a significant number of portfolio manager jobs worldwide, there is still no solid description of job functions and competencies needed for PfM job performance. With the development of project management and with the increasing of the project's complexity in the organization's portfolio, expectations for the PfM profession is rising – it is an emerging trend toward rethinking competencies in project, program and portfolio management (Ribeiro et al., 2021; Wen & Qiang, 2019). As a first step, we will describe competencies and competency modelling. The second step will be to highlight those needed for the effective performance of job functions in every step of the PPM process.

Project Portfolio Manager Competencies

Competencies and Competency Models

As a whole, people and human capital are some of the socially complex resources hard for competitors to picture and copy (Weigand, 2014). To keep up with the competitors or, more importantly, to be ahead of them, Hejase et al. (2016) and Thunnisen and Van Arensbergen (2015) advise organizations to develop employee competencies through the use of strategies beyond remuneration and make investments in developing certain human capital groups, such as high-potential or talented employees. Most organizations view talented employees as valuable resources that play a crucial role in achieving superiority and competitive advantage (De Boeck et al., 2018). Therefore, the competition for talents is increasing, and organizations put a lot of effort to grow talents, developing high-potential performers, and making an effort in “creating opportunities for people at work to be successful” (Welbourne, 2011, p. 659).

There are two approaches to address the question of who should be developed as a talented employee (Morethe, 2020):

- exclusive – an only particular group of people should be selected and developed,
- inclusive – development opportunities are open to all employees, regardless of their grade, level or positions in the organization.

Both approaches can be united under the umbrella of competencies – competency modelling can help detect talented people and track the company's developmental actions to the employees. Historically, the concept of “competence” was used more than 3000 years ago when civil servants in China had to pass special exams. Since then, it evolved and entered the management area, focusing on work effectiveness (Hoge et al., 2005). Modern understanding of the term had risen from several key scientific works.

- Taylor, in his book “Principles of Scientific Management” (1911/2020), stated the need to observe the most efficient working behaviour and transform these observations into the patterns that every worker should perform.
- a paper by White (1959) offered reconsideration of the motivational aspect of the behaviour and added a new concept in it – competence, which indicates the common property of the behaviour of humans and higher mammals helping to learn how to deal and interact effectively with the environment.

- McClelland (1973) opposed competence to the intelligence test because competence is a more reliable predictor of the workforce. His work marked the beginning of large-scale research of competence because he was the first who proposed it as an indicator of performance.
- Boyatzis (1982), in his classical work, defined competency as a significant, essential characteristic that leads to efficient performance in professional duties. Also, competencies can predict the employees' capabilities to execute the work functions. Hence, the set of competencies can reflect the abilities of the person to do the job on a desired level of excellence.

According to the vast number of scientific studies, competencies are usually researched from the three main domains:

- context-specific: Authors in this domain focus on the specific competency and research its role and functions in the specific area or the specific group. Examples: communicative competency (Rydell, 2018), emotional competency (Givron & Desseilles, 2021) or, even romantic relationship competency (Robinson et al., 2020).
- context-related: Authors in this domain usually examine a set of competencies of the specific group in general or in the specific area. Examples: competencies of the teachers (Nousiainen et al., 2018), competencies of project managers in the context of Industry 4.0 (Ribeiro et al., 2021) or, for example, mothers' competencies (Farkas et al., 2020),
- context-free: Authors in this approach offer a set of competencies without adoption to a specific area underlying the universal character of the competencies and forming a generic framework. Examples: Lancaster Model of managerial competencies (Burgoyne & Stuart, 1976); the Great Eight competencies (Bartram, 2005), a map of competencies (Filipowicz, 2016).

From the view of dictionaries, competence and competency could be used as synonyms (Merriam-Webster, n.d.-a, n.d.-b), but in the professional area of human resources more commonly used the term competency. Moghabghab et al. (2018) examined these two words from a regulatory perspective. They mentioned that despite the interchangeable usage of both terms, usually, in the organizations and the absence of the definition in the law, the result of concept analysis shows the difference between the terms for nursing practice:

- competency may be described as “a component of knowledge, skill, and/or judgment, demonstrated by an individual, for safe, ethical, and effective nursing practice” (Moghabghab et al., 2018, p. 56),
- competence may be described as an “individual’s capability for consistently integrating the required knowledge, skill, and judgment for safe, ethical, and effective nursing practice” (Moghabghab et al., 2018, p. 56).

Both terms – competence and competency – are used as synonyms in project management. For example, in the dictionary section of PMI standard “Project Manager Competency Development Framework” (2017a), competence is stated as a “cluster of related knowledge, attitudes, skills, and other personal characteristics that affects a major part of one’s job (i.e., one or more key roles or responsibilities), correlates with performance on the job, can be measured against well-accepted standards, and can be improved by means of training and development” (p. 188). At the same time, defining the term “competency” refers to the term “competence”. Another source, Competence Baseline of the IPMA, uses only the term “competence”.

On the other hand, researchers in the project management area usually use the term competency (Bolzan De Rezende et al., 2021; Chen et al., 2019; Springer, 2019). This is highly correlated with the opinions of human resource professionals, separating two terms: competence relies on a capacity of an employee to perform job functions. In contrast, competency is an observed performance of an employee in a particular situation. Barbosa et al. (2018), describing the views of different authors, identified two main definition groups:

- competence is a performance standard which is described the efficient performance of a task,
- competency is a behavioural characteristic a person must demonstrate to perform the job tasks and functions competently.

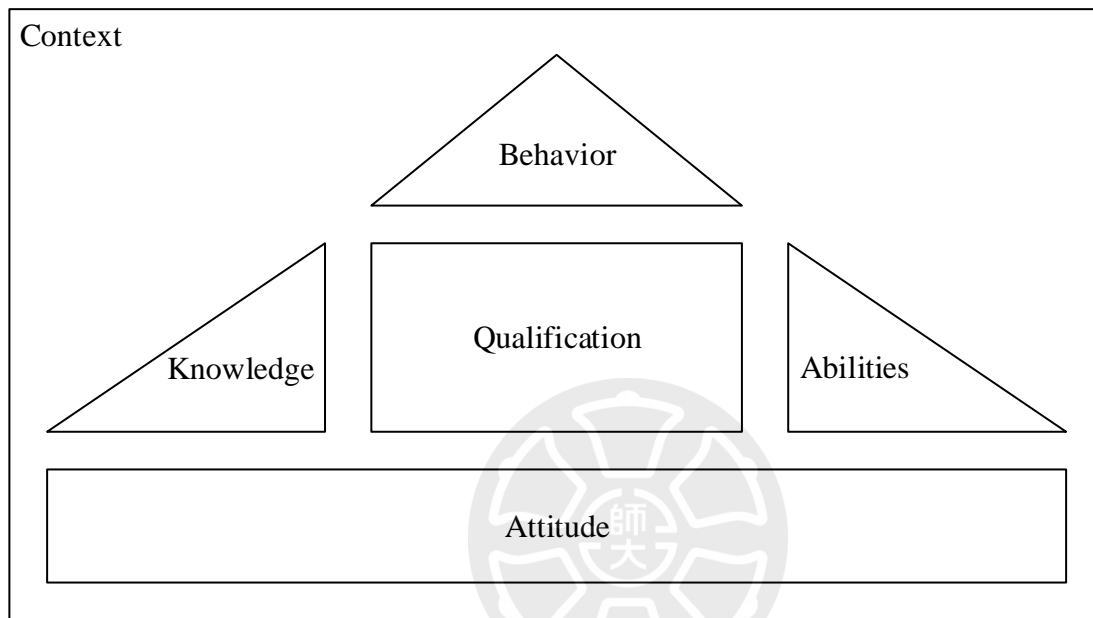
The study used the term competency, which was defined as adoption from different sources (Barbosa et al., 2018; Moghabghab et al., 2018; Springer, 2019): competency is a demonstrated component of knowledge, skill, or judgment, indicated required behaviour to be a successful performer in the respective context. Context is an essential addition in this definition: as Mulder (2015) said, “the meaning of competence is situation-specific or context-bound” (p. 19).

The definition of competence given above emphasizes the connection of the demonstrated behaviour with the employees' existing knowledge, skills, and aptitudes. This is entirely consistent

with the model of competencies proposed in the literature – both in project management and human resource areas (Filipowicz, 2014; IPMA, 2015). The structure of the competencies is shown in Figure 2.3.

Figure 2.3

Model of Competency



Note. Adoption from two different sources: (a) “*Zarządzanie Kompetencyjami. Perspektywa Firmowa i Osobista* [Competence Management. The Company and Personal Perspective]” by G. Filipowicz,. Copyright 2016 by Wolters Kluwer; (b) “Individual Competence Baseline for Portfolio Management. Version 4.0.1.” by IPMA. Copyright 2015 by IPMA.

All six mentioned in Figure 2.3 parts of competency are the competency elements. Each element is related to the job performance in its way (Filipowicz, 2016; IPMA, 2015, Mulder, 2015): context is about the job performance environment, behaviour reflects job tasks performance, knowledge is about needed information and understanding about a job, qualification represents specific requirements to access the job and may be interpreted as observable and documented skills, abilities are the capability to perform job-specific tasks, and attitude reflects values and approaches in task performance. Therefore, competency is based on the personal values and attitudes which manifest in knowledge, abilities, qualification and could be observed in a job context through the behaviour. Thus, competency should have an observable indicator, as stated in the term's definition.

The next step after describing the competency itself is to define the competency model and the process of competency modelling.

The competency model refers to a collection of competencies (Campion et al., 2011) linking the organization's strategy to the human attributes needed to implement the strategy. Competency modelling is the process of identification, compilation and linkage of competencies to various human resource management systems (Sanches & Levine, 2011). This process raises the importance of specific behavioural acts and aligns them with the organizational strategy. Therefore, the competency model should contain characteristics of the superior performer, who do the job well (Spencer & Spencer, 1993). Thus, the role of the competency model in the organization extends beyond the usual job analysis. The competency model can be used as (Redmond, 2013; Sanchez & Levine, 2009):

- a decision tool that describes the critical capabilities required to perform a job,
- an indicator of the most suitable behaviour for reaching performance maximum,
- an action guide to reach the strategy of the organization.

For these reasons, the model itself is designed to be a valuable decision-making tool in different human resource areas (Barbosa et al., 2018; McLagan, 1980):

- recruitment and selection,
- assessment and employee performance evaluation,
- individual development planning,
- training design,
- career planning,
- high potential employee identification,
- coaching, counselling, and mentoring.

The work of Prahalad and Hamel (1990), in which they described the core competencies of businesses, had the most considerable influence on the practice and implementation of competency modelling in business. Their idea was to focus on the organisation's vital and productive competencies (core competencies) to be advantageous in the business. And not only focus but also identify and cultivate them; thus, competitors could not copy core competencies. Their idea was picked up by business consultants and transferred from the level of the organization to the level of specific employees – by cultivating the competencies of human capital, it will be possible to increase productivity and become more successful in business (Morgeson et al., 2019).

Baran and Kłos (2014) discussed different approaches to competency modelling, pointed out two approaches in competency modelling:

- employee-oriented – in this approach central part is assigned to the properties or characteristics of a person (e.g. knowledge, skills, talents, attitudes), which allow people to work effectively and lead to certain types of behaviour at work,
- job-oriented – this approach is based on the description of a set of behavioural acts essential for job performance, which are then grouped to draw up an ideal employee profile.

There are many competence models, but these models are, in most cases, including competencies required for a specific organization (Baran and Kłos, 2014). But for this survey, a universal approach to competency modelling should be chosen since one of our purposes is to prepare the basis for creating a model of portfolio manager competencies in a specific organization. Spencer and Spencer (1993) and Campion et al. (2011) described the organization's unified competency modelling process. In combined adopted representation competency modelling steps can be described as follows:

1. Define performance effectiveness criteria (Spencer & Spencer, 1993).
3. Consider organizational context, goals and objectives (Campion et al., 2011).
4. Collect data (Spencer & Spencer, 1993).
5. Identify competencies (Campion et al., 2011).
6. Analyze data and develop a competency model (Spencer & Spencer, 1993).
7. Define levels of proficiency on competencies (Campion et al., 2011).
8. Validate the competency model (Spencer & Spencer, 1993).

A ready-to-use competency model should be stated as an output of competency modelling, consisting of specific competency statements. These statements in the competency model include three elements (Dessler, 2020):

1. Name and a brief description of the competency, for example, project risk management – identify, evaluate and monitor project risks.
2. Description of the observable actions or behavioural indicators representing the proficiency in the respective competency, for example, continuously manage project risks and dependencies by making timely decisions.
3. Proficiency levels. For example, for project risk management, the levels from low to high:

- Proficiency Level 1. Identify project risks and issues and communicate routinely to stakeholders
- Proficiency Level 2. Develop processes to monitor risks and issues and report changes
- Proficiency Level 3. Anticipate changing conditions and impact to risks and issues and take preventive action

Finally, there should be assumed the existence of three different strategies in the development of competency models (Chouhan & Srivastava, 2014):

- single-job strategy is common when competency models are developed for a single job;
- multiple-job strategy – description of multiply competency models based on the jobs and job levels, usually used when it is hard to define differences of the targeted jobs;
- one-size-fits-all strategy – one set of competencies is adopted and implemented for a vast number of jobs (e.g., for all managers or all manufacturing workers). It is essential to describe the target group of jobs clearly.

Thus, creating a competence model is a valuable and widespread tool in the arsenal of a human resource manager. At the same time, when creating a competence model, it is necessary to adhere to the algorithm and precise formulations of both competencies and their indicators. This research used a job-oriented approach to develop an international competence model for one position of PfM. Several examples of developed competence models for a portfolio manager in the literature. Their analysis will be carried out in the next section of the thesis.

Competencies of Project Portfolio Manager

PPM has significant benefits for the organization, including increased success in project delivery, better decision making, avoidance of overspending and inefficiencies (Aston, 2021). The organization, hence, should have a skilful, perfectly incorporated PfM, able to drive the portfolio and reach the benefits (Filippov et al., 2014). But it is essential to mark how people can reach these benefits. Moreover, the competencies of the PfM is one of the significant factors in how PPM is carried out in day-to-day practice (Martinsuo, 2013). As stated in a previous section, the competency model is one of the key instruments in helping people develop towards strategic targets of the organization since the competencies linked people and strategy.

There is an increasing trend in the usage of competency-based approaches in the project management area:

- provide competencies for project managers (Moradi et al., 2020; Pariafsai & Behzadan, 2021; Park, 2016; Podgórska & Pichlak, 2019),
- examine the role of competencies in the performance and success of the projects (Irfan et al., 2021; Saidoun, 2016; Suifan et al., 2021),
- application of project manager's competencies to offer proper educational, developmental and learning activities (Nijhuis et al., 2018; Guerrero & De Los Ríos, 2012),
- competency models are described according to the career of project managers (Ekrot et al., 2016; Lloyd-Walker et al., 2018) or forecasting the future of the project management area (Ribeiro et al., 2021; Walker & Lloyd-Walker, 2019).

Despite this variety of works exploring the competencies of project managers, only limited studies address the PfM competencies and competency models.

Gareis (2000) examined project-oriented organisations' program and project portfolio management competencies. He marked the importance of specific processes and specific methods required for PPM, such as preparing a project proposal and methods of project portfolio reporting. This research did not mention the specific person – PfM and described the competencies in PPM as a whole that needed to be incorporated into the processes and practices of a project-oriented organization.

Young and Conboy (2013) described the PfM competencies developed for the Australian Competency Standard for Project Portfolio Management under the aegis of AIPM. It was the first standard in PPM on the date, based on performance-based competencies and offered a complete competency model for PfM.

Obradovic et al. (2014) emphasized that the competencies of PfM are crucial for any organization performing PPM. But despite the intention of the authors to analyze PfM competencies, the research describes the competencies of a project manager and multiple-project manager.

Foroudi et al. (2019) proposed a framework of core competence for the portfolio management of the oil industry where represented refining, purchasing and marketing and sales. Their framework offers a guideline to manage a portfolio. But the described model was implemented to the organization as a whole, not to the PfM or another PPM-related person.

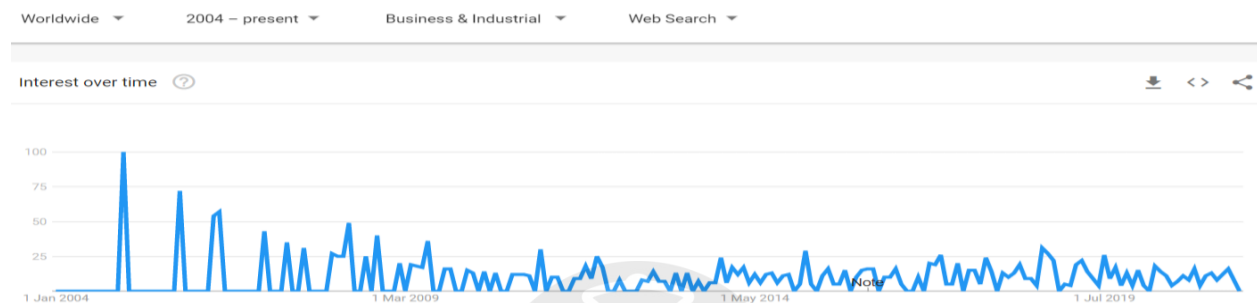
Therefore, PfM competencies rarely appear in the literature. PfM describes as a role inside the PPM process (see Table 2.1) but not as a critical actionable figure with his/her unique set of

competencies. This statement could be demonstrated using Google analytical instruments – Google Books Ngram Viewer and Google Trends.

According to Google Trends, maximum interest in searching for the PfM role was in 2005 and gradually lowered from year to year with rare bursts of search interest in 2006-2009, 2011, 2015, 2018 years, as is shown in Figure 2.4.

Figure 2.4

The Search Rate for the PfM (From 2004 to Present)

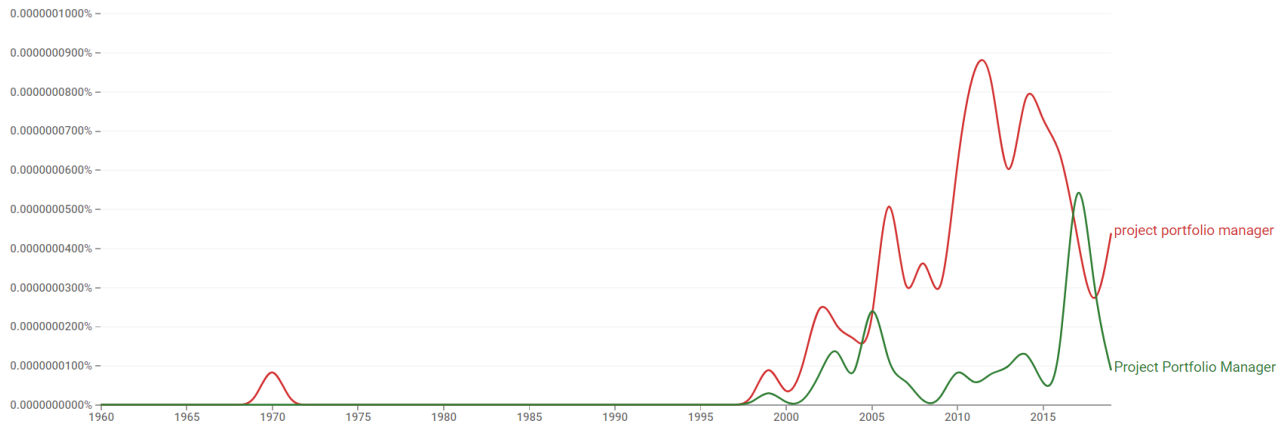


Note. The figure was taken from the website <https://trends.google.com/trends/> The search settings were: search term – project portfolio manager, region – worldwide, date – 2004 – present, sphere – Business & Industrial, search area – Web Search. Date of request 06.07.2021.

Google Books Ngram Viewer is a tool for finding the frequencies of the string's set of searches using a contiguous sequence of items from the text samples found in printed sources between 1500 and 2019 years in Google's text database. Following Google Books Ngram Viewer, the frequency of the phrase “project portfolio manager” in the printed publications was gradually rising from 1997 (see Figure 2.5). Since it is more common in official literature, the case-sensitive definition has a peak in 2017 when PMI has published “Project Manager Competency Development Framework” (2017a). Case-insensitive usage gradually rose in publication with the peak in 2011, after which the number of publications decreased with the peaks in 2014 and 2019.

Figure 2.5

Frequency of Occurrence PFM in Printed Sources



Note. The figure was taken from the website <https://books.google.com/ngrams/>

The search settings were as follows: search term – project portfolio manager, years – from 1960 to 2019, corpora – English (2019), Case-Insensitive – no, Smoothing – 0. Date of request 06.07.2021.

Journal publication is a part of printed publications. Another critical part of exploring PFM competencies is searching for information on this topic in the standards. In PPM area could be highlighted three essential PPM standards:

- international standard “Individual Competence Baseline for Portfolio Management” (ICB) by IPMA (2015),
- national competency model “Project Manager Competency Development Framework” (PMCDF) by PMI (2017), which contains a part dedicated to PFM competencies,
- national standard “Professional Competency Standards for Certified Practicing Portfolio Executive” (CPPE) by AIPM (2021).

The comparison of these standards is represented in Table 2.3.

Table 2.3*Comparison of Three PPM Standards*

Criteria of comparison	Standard		
	ICB	PMCDF	CPPE
Level	International	National	National
Country	67 countries	USA	Australia
Approach	Employee-oriented	Job-oriented	Job-oriented
Strategy	“One-size-fits-all”	Multiple-job	Single-job
Number of competencies	29	12	8
Structure	Perspective competence: Strategy, Governance, Structures and processes, Compliance, Standards and Regulations, Power and Interest, Culture and Values	Performance competence: Portfolio Strategic Management, Portfolio Governance Management, Portfolio Performance Management, Portfolio Communication Management, Portfolio Risk Management, Portfolio Stakeholder Management	Identify, Categorize and Prioritize Projects and Programs, Assess and Select Opportunities and Balancing the Portfolio, Manage and Review Portfolio Performance, Govern the Portfolio, Manage Portfolio Resource, Manage Portfolio Communication and Change, Manage Portfolio Risk, Lead the Portfolio

(continued)

Table 2.3*Comparison of three competency-based standards (continued)*

Criteria of comparison	Standard		
	ICB	PMCDF	CPPE
Structure	People competence: Self-Reflection and Self-Management, Personal Integrity and Reliability, Personal Communication, Leadership, Teamwork, Conflict and Crisis, Resourcefulness, Negotiation, Results Orientation Practice competence: Portfolio design, Benefits, Scope, Time, Organization and Information, Quality, Finance, Resources, Procurement, Plan and Control, Risk and Opportunity, Stakeholders, Change and Transformation, Select and Balance	Personal competence: Communicating, Leading, Managing, Cognitive Ability, Effectiveness, Professionalism	

All standards mentioned in Table 2.3 were constructed similarly by interviewing subject-matter experts. Hence, standards seem similar in some ways, such as technical competencies like portfolio balancing and risk management. Despite similarities, there are several differences—the

main difference that matters is the level of standards. Only one standard was created by the international team and by interviewing international experts – IPMA. Second, not all standards include personality characteristics: CPPE does not contain any. Third thing, both national standards are more oriented to the link between PPM performance and PfM while ICB is looking at the PfM as the leading actor and describing areas of possible actions sometimes referring to PPM (e.g., practical competencies “Portfolio design” and “Select and balance”).

Since the thesis report is oriented on international human resource development, my choice for the future analysis was dictated by the followed idea: the source should be both international de jure and oriented on competencies of PfM. Only one source corresponds to the mentioned settings – ICB by IPMA. The information was one of the three corpora for analyzing and triangulating the PfM competency model.

Summary of Chapter II

Summing up Chapter II, the literature review highlighted that:

- concept of portfolio management used from four different perspectives among which PPM could be promising for research in the human resource area since the role of the people and their competencies are critical to the success of the whole project,
- PfM is a politically aware, active person implementing the integral control of the relationship between the portfolio components and the organization's strategy and applying specific knowledge and project portfolio management processes to the portfolio components,
- only limited studies address the PfM competencies and competency models, and according to the analysis of the existing scientific papers, PfM was described as a role inside the PPM process and not an active person with his/her unique set of competencies,
- three competency-based standards for PfM were analyzed, and ICB by IPMA was chosen as a source of information for future triangulation.

CHAPTER III RESEARCH METHODS

The following sections highlight the research approach in terms of sources of the information, objects as the main focus, and methods as a set of tools needed for the research. The data Selection section describes features of selecting the literature sources, job websites, and participants among professionals in PPM. The section Methods of the Study describes a set of tools for collecting and analysing data. The research procedure describes as a series of steps, achieving the purposes of the study. The last section covers supporting methods and approaches, which empower the study's quality.

Research Approach

The selection of the research approach should be based on the research design and purpose of the study (Creswell & Creswell, 2018). This study aims to clarify the competencies of PfM and build a competency model for PfM based on different sources of information. A qualitative approach was chosen because “an important goal of qualitative methods is discovery, that is, developing holistic, comprehensive descriptions of systems, theories” (Jason & Glenwick, 2016, p. 13). Moreover, all RQs of the study tend to conduct a deep analysis of the text data. Hence, the qualitative research approach is suitable if we are seeking answers to the question “how?” rather than “how many” and want to conduct a more analytically astute study (Silverman, 2018).

The research design was incorporated the triangulation approach. As a research approach, triangulation refers to the use of a multi-method approach in which different methods of investigation are applied to the same phenomenon to raise the accuracy of determination and enforce validity (Ashour, 2018). The main idea of the concept is that the studied phenomena can be understood better with a combination of research methods or mining the information from different sources (Bekhet & Zauszniewski, 2012; Gibson, 2016). Moreover, Given (2008) mentioned a consensus among qualitative researchers about triangulation to deepen understanding of a single phenomenon or a contextual set of interrelated phenomena. Hence, according to the purposes and RQs of this study, the triangulation approach was the best choice to design a competency model for PfM.

Figure 3.1 shows the study's research framework with qualitative methods and a triangulation basis.

Figure 3.1

Research Framework of Study

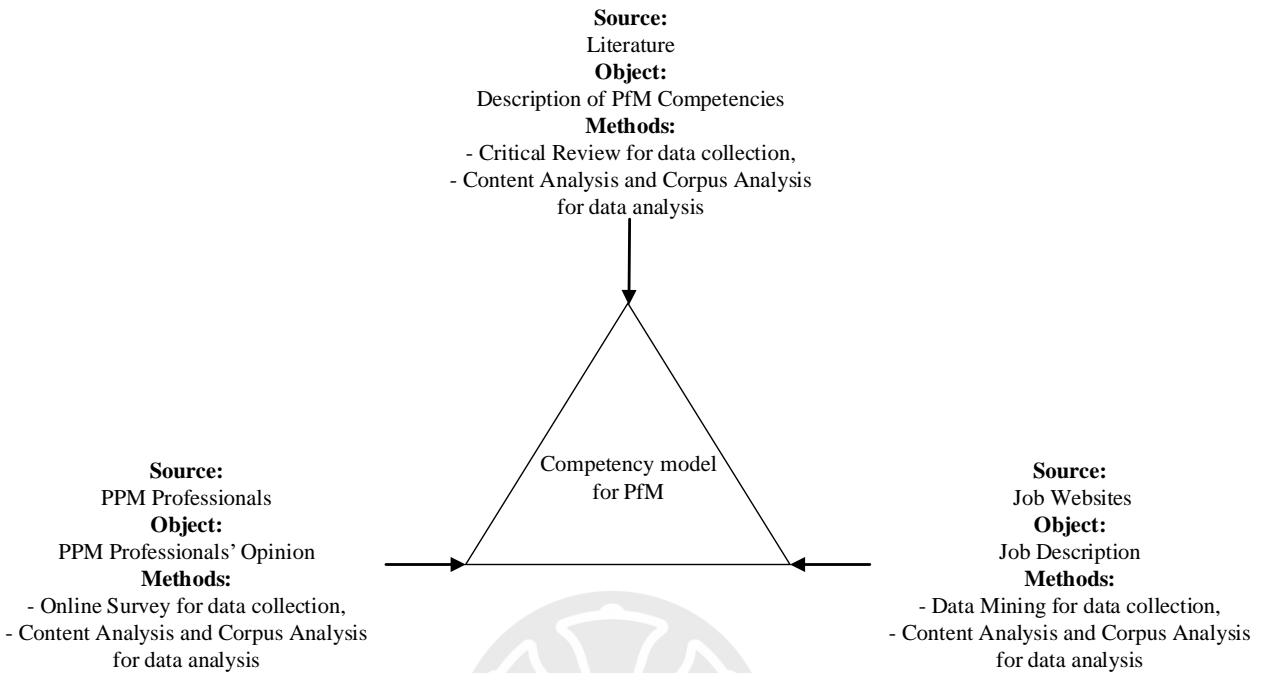


Figure 3.1 highlights three main parameters for every point in triangular:

- Source – an origin point for gathering information; the primary question is “Where to gather the information?”
- Object – a primary focus for data investigation; the primary question is “Which information to investigate?”
- Methods – the procedures that help gather and explore the information; the primary question is “How should gather and investigate the information?”

Hence, Object, Subject, and Methods are the three primary parameters of the study and should be read as follows:

Search for *Source* to investigate *Object* by *Methods* in the context of PfM competency modelling.

This framework describes gathering and investigating the data from different sources for triangulation aiming to build a competency model of PfM. The following section will describe the specific data selection and the choice of the sources.

Methods of Study

The methods of study were divided into two groups – methods for data collection and methods for data analysis.

Data Collection Methods

For data collection was used two methods.

One of them is the online survey: since the online survey is an efficient method for collecting the views of large groups during a short period (Given, 2008), it was conducted for collecting opinions on PfM competencies among PPM professionals. The online survey contained seven open-ended questions related to the competency model (see Figure 2.3). The survey's instructions and questions are stated in Appendix A of this work.

As the instruments for online survey used:

- Google Sheets is a free tool that works from any web browser or device, is fast in the visualization of data in real-time and can seamlessly transfer the data to Microsoft Excel for the following analysis.
- Form to Chatbot – add-one integrates with Google Sheets and builds a chatbot instead of the more commonly used tables for collecting data. The website of this add-one <https://collect.chat/> The add-one was used to attract the participants' attention by a more friendly and contemporary interface. The example of the interface is presented in Figure 3.2.

Figure 3.2

Screenshot of Form to Chatbot Output

The screenshot shows a chatbot interface with a green background. At the top, there is a black speech bubble icon. Below it, the title "Project portfolio management competencies" is displayed in bold. A welcome message follows: "Hello dear participant! Thank you for your readiness to participate in the international research on the topic of project portfolio management competencies. Below you will see three general questions, helping me to know more about you, and five open-ended questions devoted to the various parts of competencies. I am kindly asking you to share your professional opinion on these questions." Below the message is a horizontal line. The chatbot's avatar is a circular icon with a stylized face. Three questions are listed, each with a response button: "The country you represent:" with a "Russia" button, "Years of experience in project portfolio management:" with a "7" button, and "Industry in which you have the most working experience as a project portfolio manager:". A large, faint watermark of a gear-like logo is visible in the background of the chat area.

The second method for data collection was data mining. It could be described as the process of “extraction of meaningful knowledge from useful but non-evident information which is hidden within large datasets” (Jimenez-Carvelo & Cuadros-Rodríguez, 2021, p. 77). The study used data mining in data preprocessing to extract information from the raw data, as was mentioned in the research conducted by Zhang, Zhao et al. (2020). Preprocessing contained two steps:

- Data cleaning: detect the incomplete data, correct or remove incomplete parts, remove duplicates etc.
- Data transformation – convert the data into formats suitable for further analysis. This step contained such procedures as sorting the data and constructing tokens.

The instrument for data mining in the study was RStudio (Version 1.4.1717), and the packages for text processing Readtext, Readxl, Tidyverse, and Quanteda.

Data Analysis Methods

First of all, corpus analysis was a primary method. In general, a corpus represents a collection of texts with such properties as authenticity, representativeness, and size (Stefanowitsch, 2020). Since this study is based on computer-related processing of information, a corpus was defined by Gries (2018) as a

machine-readable collection of (spoken or written) texts that were produced in a natural communitive setting, and in which the collection of texts is compiled with the intention (1) to be representative and balanced with respect to a particular linguistic language, variety, register, or genre and (2) to be analyzed linguistically (p. 7).

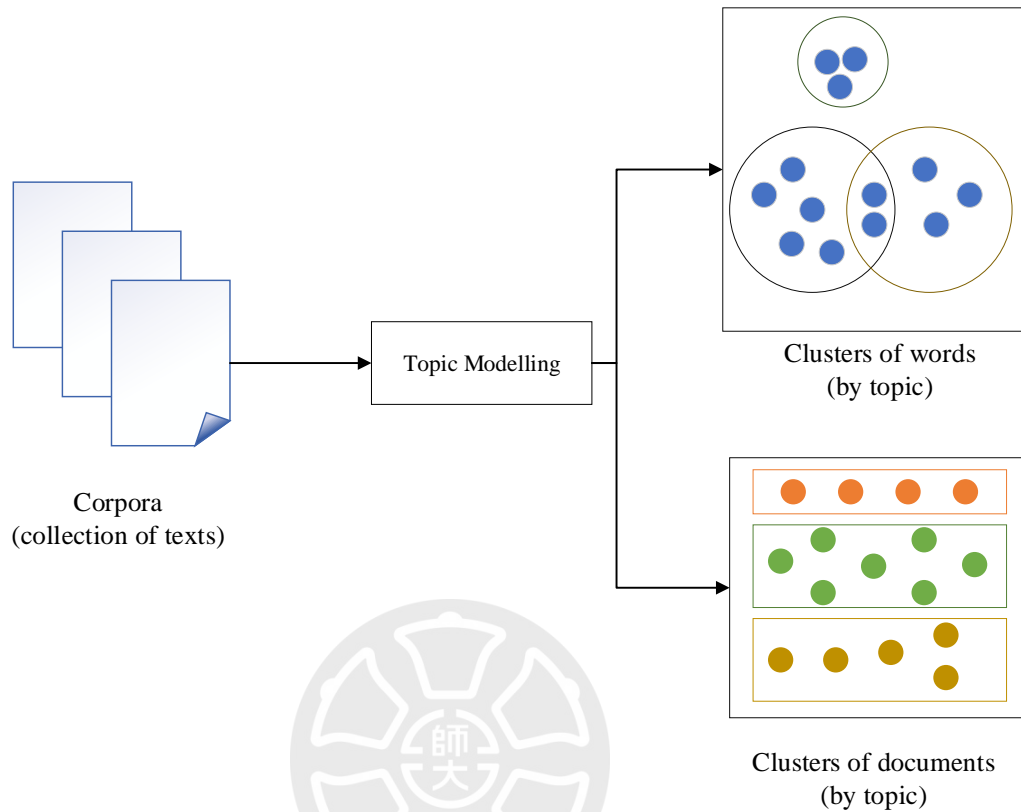
Hence, corpus analysis is used to identify patterns of words, their cooccurrence and can help characterize word types and performance, leading to the representation of the constructs in the selected category or area (LaFlair et al., 2021). The instrument for data analysis in the study was RStudio (Version 1.4.1717) with the packages for text analysis and plotting the data: Ggplot2, Tidyverse, Quanteda, Wordcloud2, Gsl, and Topicmodels.

While there are different computational approaches to work with the corpora, I chose related to the purpose of my research – word frequencies and topic modelling. The frequency of the words is widely used as a starting point of the research as it may present the most frequently used words in a corpus (Baron et al., 2009). Counting frequencies helped check the variation of the words in the corpora and characterized the PfM competency context in my research.

Topic modelling refers to the procedure of seeking groups or patterns of words that tend to appear together in the corpus (Lindgren, 2018). This method is helpful in the essential statistical relationships between words which is similar to clustering in quantitative research. The simplified schema of topic modelling is shown on Figure 3.3.

Figure 3.3

Topic Modelling Process



Note. The process, shown in figure above, is a simplified version of the textual description given in “Latent Dirichlet Allocation” by D.M. Blei, A.Y. Ng, and M.I. Jordan, 2003, *The Journal of Machine Learning Research*, 3, 993–1022. Copyright 2003 by D.M. Blei, A.Y. Ng, and M.I. Jordan.

I used the latent Dirichlet allocation (LDA) algorithm for topic modelling. LDA is the algorithm that considers each corpus as a topics’ mix, each topic considers as words’ mix, and models topics based on Dirichlet distribution (Silge & Robinson, 2017). The output of topic modelling represents the answer to the question: Which kit of topics can characterize and represent the targeted corpus in the best possible way? Hence, topic modelling together with word frequencies can help in answering RQ1. Additionally, the topic would be visualized according to the distance between them, for this was used dendrogram as a visual representation of clusters and distances and hierarchy between different clusters (Klimberg & McCullough, 2017).

Corpus analysis is a helpful method in the text exploration, but “an ideal process would involve combining the corpus analysis with one or more of the qualitative analysis samples as this would enable a better understanding of the representativeness of a finding, but also allow us to uncover features of discourse that go beyond the concordance line” (Baker, 2021, p. 105). That is why I decided to involve additional methods.

The second method for analysis of textual data was content analysis. It is used in social sciences for “analyzing various qualitative and unstructured data such as those collected during unstructured or semi-structured interviews or web-based documentary research” (Seuring & Gold, 2012, p. 546). Since this research was used an online survey with open-ended questions and collected textual data from the job websites, content analysis is the best choice for this type of data. The study provided computer-aided content analysis is “a form of content analysis that enables the measurement of constructs by processing text into quantitative data based on the frequency of words” (McKenny et al., 2016, p. 2910). In this research, content analysis was used to determine the competencies of PfM after receiving the outputs of corpus analysis.

Finally, the third method is critical review. It serves as a method of research aimed to “carefully identify and synthesize relevant literature to evaluate a specific research question, substantive domain, theoretical approach, or methodology and thereby provide readers with a state-of-the-art understanding of the research topic” (Palmatier et al., 2017, p. 1). The critical review was conducted while analyzing literature sources in several sections of the literature review: analysis of different perspectives on portfolio management, unveiling the PfM role and comparing the standards on PfM competencies.

The abovementioned methods were performed to obtain information from the raw data and then analyse it. The whole procedure for the study is described in the next section.

Data Selection

The study was based on the triangulation approach in data sources. According to the purposes and RQs, it is necessary to specify the selection of the literature sources, participants among professionals in PPM for collecting opinions and choice of websites for collecting job descriptions.

Selection of Data From the Literature

To find the literature sources, firstly, I searched the information in several databases:

- Scopus, Google Scholar and Science Direct for scientific papers and books,
- Open Access Theses and Dissertations and E-Thesis Online Service for dissertations,
- open search in Google and Yandex searching engines for other possible sources (e.g., standards, posts in the social networks, etc.).

All databases showed a vast number of publications with keywords “portfolio manager”, “competencies”, and “competency models”. For example, the EThOS database offers more than 700 theses with the keyword “portfolio manager”, Science Direct offers more than 200 000 articles if searched using the “competency model” keyword. But when the search was narrowed to find “project portfolio manager competency model” or, at least, “portfolio competency”, the number of relevant sources was not less than 2-5 depending on the database. All articles corresponding to PfM competencies were analyzed in the “Competencies of PfM” section. One of the relevant sources was the paper by Young and Conboy (2013), in which they described the development of the Australian competency-based standard for portfolio management. This paper gives the idea of using the standards as a basis of the research. The search on the web unveils three frequently mentioned competency-based standards in English, corresponding to PfM:

1. “Individual Competence Baseline for Portfolio Management” by IPMA (2015),
2. “Project Manager Competency Development Framework” by PMI (2017), which contains a part dedicated to PfM competencies,
3. “Professional Competency Standards for Certified Practicing Portfolio Executive” by AIPM (2021).

All standards are widely used, but only the first standard is international de jure, while two others are national standards of the USA and Australia. Since the major of MBA degree in International Human Resource Development, the international standard was chosen as the suitable source of information. Moreover, the development of the standard took part professionals from different countries, including the USA and Australia (IPMA, 2015).

Selection of the Job Websites

The RQ1 implies searching for job descriptions among job websites as one of the information sources. The search and selection for job descriptions in the vacancies were made by using the following conditions:

- “project portfolio manager” or “portfolio manager” in the vacancy title with the description in the way of project management perspective,

- the job should be listed within a week (last seven days),
- description of the job should be in English,
- full-time or contract job type,
- three or more years in job requirements for a potential PfM.

According to the survey of Gerencer (2021), the three most popular websites for vacancy searching are:

- <http://indeed.com> – during the selection of descriptions was analyzed 675 vacancies,
- <http://glassdoor.com> – during the selection of descriptions was analyzed 425 vacancies,
- <http://linkedin.com> – during the selection of descriptions was analyzed 820 vacancies.

As stated in the list above, the study used information from all three websites. The search for vacancies lasted three weeks from November 9 to 30, 2021. Three weeks were necessary to follow the condition “the job should be listed within a week (last seven days)” and avoid duplicates since one vacancy could be posted on all three sites.

From all analyzed 1920 vacancies, were selected 119 fully met with the conditions.

Selection of the Participants

The study aimed to build a competency model for a PfM professional. This model should contain information about the superior performer (Spencer & Spencer, 1993). Hence, for the collection of opinions about competencies needed for PfM, were used the following criteria:

- a participant is working or has worked as a PfM,
- should have at least three years of working experience in the PPM area,
- speaks English since the online survey was in English.

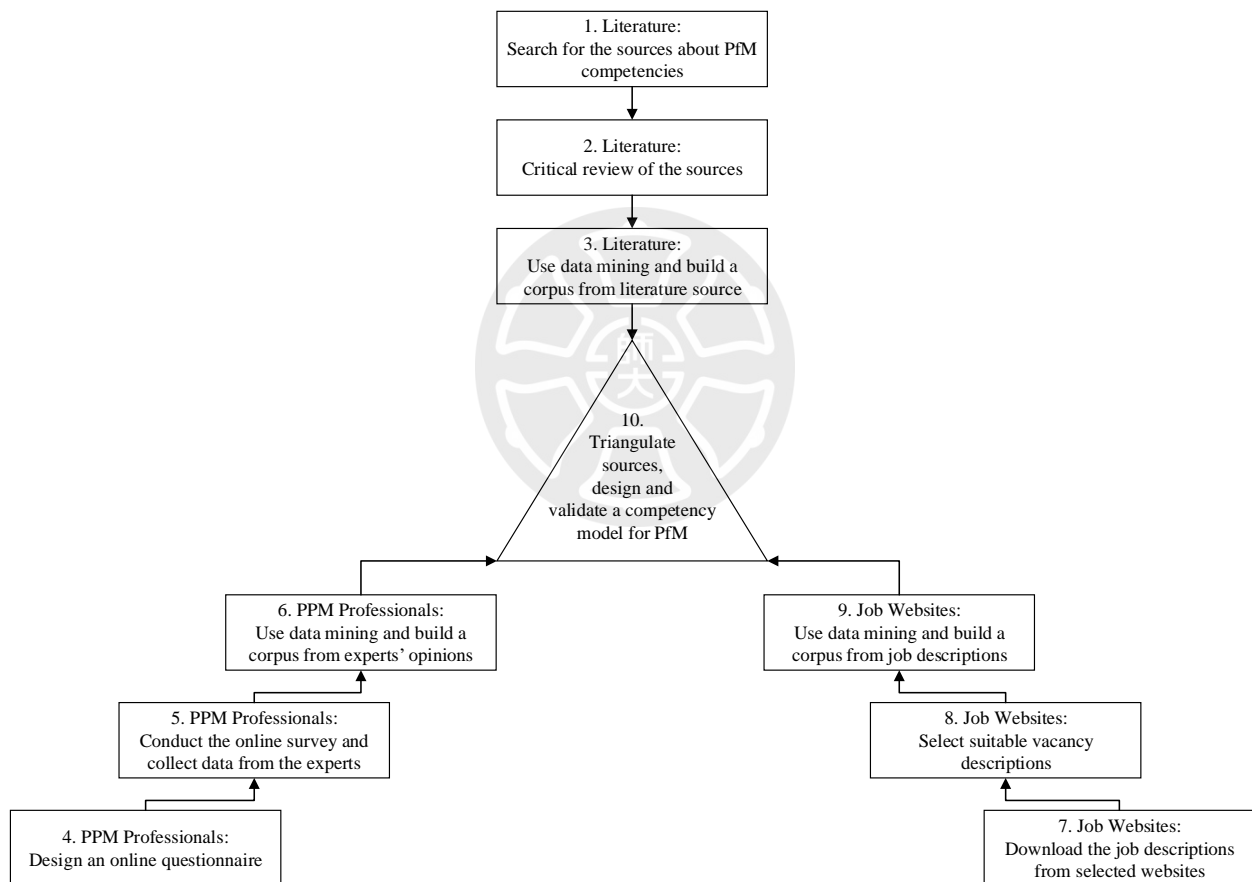
The call for participation in the study was put in the professional groups of PfM on Facebook and LinkedIn. Also, an invitation was sent personally among the network of contacts of the author. Each expert filled the questionnaire (see Appendix A). The answer rate was moderately low – only 28 opinions from the professional PfM was collected. According to the three-year-of-experience condition, three participants were excluded. The final list of participants included 25 professionals in the PPM area. Each expert was asked to provide major information, such as represented country, years of experience in PPM, and industry in which the expert has the most working experience as a PfM. No other information was provided to protect the personal data of the experts and avoid unnecessary actions on the part of the participant to fill out the questionnaire. The details about participated experts are shown in the next chapter's section Data Representativeness.

Research Procedure

The basis of the research is the triangulation approach. Furthermore, the research procedure has reflected this triangulation. I performed the final step – designing the competency model for PfM after three procedures were done. The graphical representation of the research procedure can be seen in Figure 3.1.

Figure 3.4

Research Procedure



The details of each step from Figure 3.4 are mentioned below:

1. I searched for information about portfolio management, PPM and PfM, and looked for sources on the topics of competencies, competency modelling, and competencies of PfM. During this step, I browsed through databases like Google Scholar, Research Gate, Science Direct, etc.

2. With the support of the critical review method, all selected sources found from the previous step were examined according to the purpose and formed the limited set of information for the theoretical basis of the research.
3. The final step in literature sourcing is to select the source for PfM competencies. With the support of a critical review, I compared three sources (see Table 2.3) and chose one to use in further triangulation. The chosen source was processed through data mining. As a result, I was built the first corpus with the PfM competencies from the literature.
4. Based on findings in the literature review, I designed and validated¹ a questionnaire for an online survey (see Appendix A). The purpose of this step is to collect the opinions of professionals about the possible competencies of PfM.
5. After the questionnaire was designed, I collected the data from professionals. The link for the online survey was sent to the network of personal contacts and through social networks like Facebook and LinkedIn. The link was active from September 29 to December 5, 2021. All characteristics of the professionals in PfM to join the survey were described in the section Methods of the Study.
6. After the collection of opinions was finished, I conducted data mining for data processing and built a corpus of professionals' opinions. The response rate was lower than expected, so a corpus of professional opinion on PfM competencies was the smallest of all three corpora.
7. The third source of data was downloaded from the different job websites. Through the three most popular websites – Indeed, Glass Door, and LinkedIn – I searched job descriptions of the PfMs in published vacancies.
8. I conducted a critical analysis for all collected vacancies to meet the stated conditions. Hence, was selected the limited dataset fully corresponds to the data selection criteria.
9. The dataset of vacancies was also processed through data mining. This step helped to construct a third corpus for future triangulation.
10. The final step of the research was devoted to triangulating the competencies from three corpora. I conducted a corpus analysis and found a possible set of competencies for this step. Six professionals validated this set. The final design of the competency model was set after the validation.

¹ Details on validation procedure are described in Research Quality section.

Research Quality

The study outcome should be a designed model of competencies for PfM based on the literature, job descriptions, and opinion of professionals in PPM. Hence, one of the key approaches to increasing the quality of the study has already been incorporated into the research: three different sources were used for triangulation of the data and forming a set of competencies. The study used triangulation, which means using two or more data collection procedures in quantitative or qualitative research (Bekhet & Zauszniewski, 2012). Triangulation could be mentioned as an alternative way to validate qualitative research (Flick, 2007), which increases the validity of the newly achieved results or gain a broader understanding of the known results in a new context or outlook (Edmondson & McManus, 2007).

Another essential quality enhancing approach in the study was validating the questionnaire and the designed competency model.

As to the questionnaire, was conducted face validation:

- by the author – the author of this thesis report has 15 years of work experience, including five years in PPM and ten years in human resource development. Therefore, the validation was done by the author himself: the check if each question corresponded to the purpose of the research and the competency structure or not;
- by the experts – this validation was done after the author's validation to assure the questionnaire corresponds to the portfolio management area, to the human resource development area, and is constructed without language mistakes. Hence, three experts took part in the validation procedure (Table 3.1). Each participant was contacted individually by messengers in social networks. All three people were asked to check the questionnaire for consistency of the expertise area and send feedback. After I received the feedback from each person, the questionnaire was changed and sent for re-validation.

Table 3.1*Profiles of the Experts Validated the Questionnaire*

Expert	Country	Current position	Area of expertise	Years of experience in the area of expertise
Mr H. Po****	Netherlands	CEO, Consultant, Coach and Trainer	Portfolio management	30+
Ms M. Fu****	Latvia	Instructor & Service Trainer, Corporate Trainer	Human resource development	15+
Dr A. Ba****	Russia	Associate Professor, Programme Academic Supervisor	Language assessment and English writing	15+

The final competency model was also validated. Washington and Griffiths (2015) mentioned that after designing the prototype of the competency model, a researcher should convert it into a questionnaire and ask subject-matter experts for their examination and verification of the competency set. I followed this approach: while asking respondents to share their opinions on PfM competencies, I also asked to provide an email whether a respondent wants to validate the designed set of competencies or not. According to the final list of 25 professionals in the PPM area, six had provided their emails. Therefore, the competency model was validated with the same procedure of face validity as the questionnaire, except the author of the thesis report was excluded to prevent potential subjectivity and biases.

Each involved expert received an email with the link on Google Forms. For conducting face validation of the PfM competency model, I used the Likert scale with the following instruction to check every competency indicator of each competency element:

Hello dear participant!

Thank you for your participation in the first stage of the international research on the topic of project portfolio management competencies. Here is the second part of the research.

Below you will see five sections devoted to the different competency elements of portfolio management – knowledge, ability, behaviour, attitude, and qualification. Each section contains from 6 to 8 indicators of each competency element.

I am kindly asking you to share your professional opinion on these indicators. Please, mark each indicator on the scale from zero (“indicator should be excluded”) to four (“indicator is essential for a portfolio manager”). Your marks will help me to validate the final competency model of the project portfolio manager.

Important note: words for the indicators were extracted from different sources and were clustered by semantic methods. Hence, all expressions were built on the original wording. If you have any suggestions to correct this wording, feel free to propose your ideas in the ending question after each section.

After receiving the scores from the experts, the data for each competency indicator were summed up. The resulted sum was matched with one of the four quartiles (Q) equal by size:

Q4 (25% of the data): up to 6 scores

Q3 (50% of the data): from 7 to 12 scores

Q2 (75% of the data): from 13 to 18 scores

Q1 (more than 75% of the data): 19 and more scores

I used the approach of Moore et al. (2016) to select the borders of quartiles. In my case, the maximum score was 24, and all scores are integers, so, for example, median (upper border for Q3) is equal to 12.5, which means 12 belongs to Q3 while 13 belongs to Q2.

For validity purposes to accept the indicator, three conditions were set:

- competency indicator should be removed from the final model if at least one expert grade it with zero scores which means “competency indicator should be excluded”;
- competency indicator should be removed from the final model if it will fall into Q4;
- competency indicators should be divided into two groups – desirable (for the indicators in Q3 and Q2) and critical (for the indicators in Q1). These groups were used as competency levels.

These conditions helped to set and shape the final competency model more precisely. However, excluded elements were mentioned in the suggestions for future study as the potential areas of exploration PfM competencies deeper since a possible gap appears: indicators were found by triangulation but excluded by the experts.

Finally, to enhance credibility and utility in the research used several of the strategies for qualitative research, proposed by Patton (2015):

1. Keep analysis connected to purpose and design by constantly analyzing data according to the main topic of PfM competencies.
2. Integrate and triangulate diverse sources of qualitative data: professional opinions, literature analysis, and actual job descriptions as evidence from practice.
3. Integrate and triangulate data when collecting them from different sources.
4. Triangulate analysts while interpreting results by using the opinions of subject-matter experts to design a questionnaire and verify the final competency model for PfM.
5. Undertake theory triangulation by looking at the designed model through the lenses of different approaches or theories.

Summary of Chapter III

This chapter described different research attributes of the study such as:

- The research design which based on the triangulation approach: both for raising the accuracy of the data determination and increasing the validity of the research itself.
- Methods of the study included data collection (online survey and data mining) and data analysis (corpus analysis, content analysis, and critical review) with the RStudio as the primary tool for data processing.
- Data selection was explicitly and precisely implemented to all three sources – literature sources, job websites for job description collection in the vacancies, and participants among professionals in PPM.
- The research procedure reflected the triangulation approach and contained ten steps.
- Research quality was raised by using triangulation, face validation both for questionnaire and for the competency model, and strategies for qualitative research, proposed by Patton (2015).

CHAPTER IV FINDINGS AND DISCUSSION

The chapter represents the description of the results. The Data Representativeness section shows the variety of countries and industry sections from which data for the research were extracted. Section with the frequencies of stems characterizes the corpora of textual information from the standard, job description, and experts. The topic modelling section specifies unique indicators for knowledge, abilities, behaviour, values, and qualification of PfM. Finally, the section with the competency model validation will summarize results of indicator validation received from subject-matters experts, and the last section portrays the competency model.

Data Representativeness

The first step in the description of the research findings is a characteristic of the sources under the dimension of data representativeness. The characteristic of the standard as a literature source was given in Chapter III. Common characteristics of experts and job descriptions are also presented there, but some specific details like countries and industries were obtained during data collection; that is why I put the abovementioned details in Chapter IV.

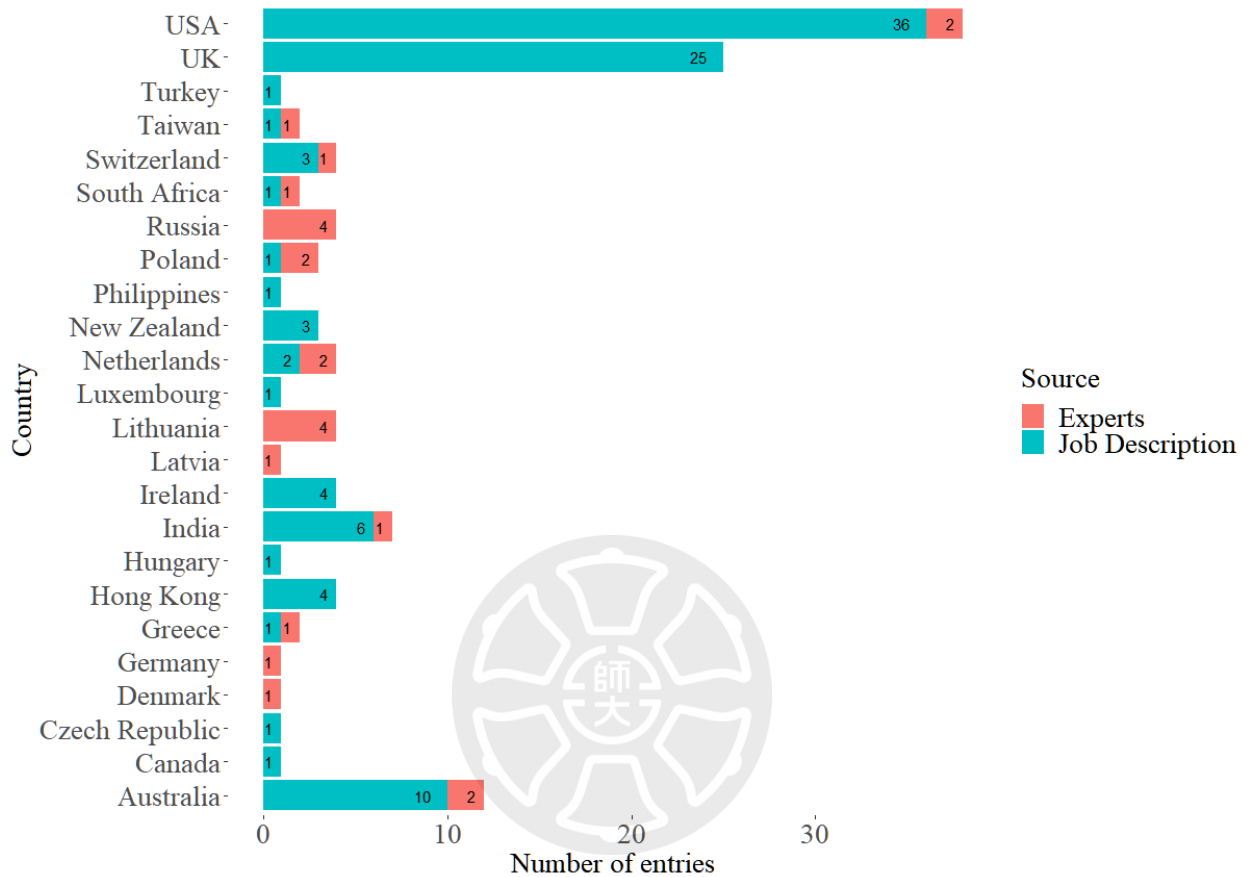
According to the research, the main idea is to use triangulation. This means all sources are representative and have something in common. In Chapter II, there was selected standard ICB for the future triangulation as this source is international and was made by professionals from different countries and industries. It means the other two sources – experts’ opinions and job descriptions – should also follow the same route: represent different countries and industries.

Countries

This research aims to offer a competency model under the aegis of the international human resource development perspective. It means both experts and job descriptions should represent different countries. It allows generalizing the research output wider and call the final model “international”. Figure 4.1 describes the countries of experts and job descriptions.

Figure 4.1

Representativeness of Countries Among Experts and in Job Descriptions



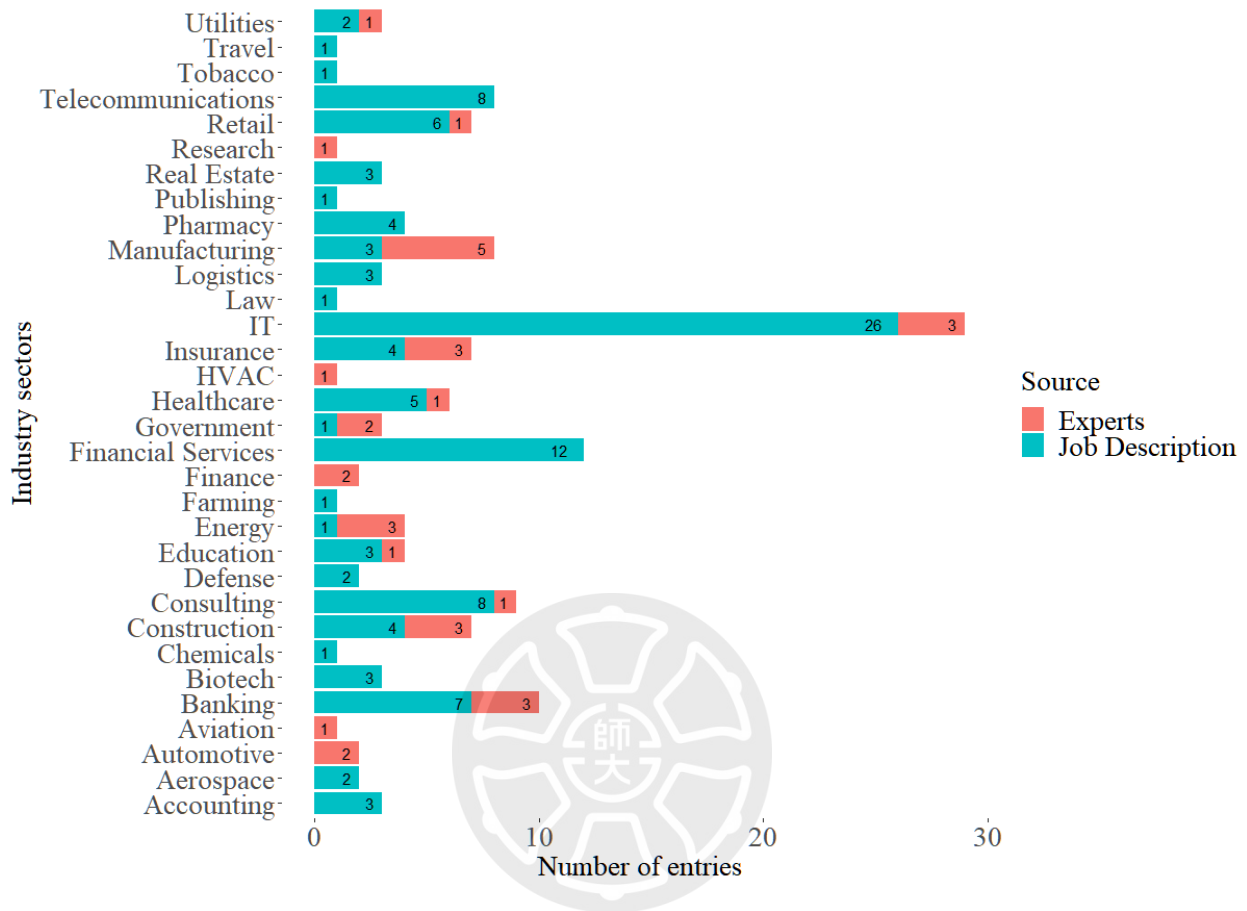
As shown in Figure 4.1, this research is represented by 24 different countries with 14 unique countries for experts and 19 for the job descriptions. Among these countries, nine are overlapping, which shows the data from two different sources could support each other by country. Therefore, I can conclude that the representativeness of the countries allows naming the future research model “international”.

Industry Sectors

Similar to representativeness by country, the research should include a variety of industry sectors. It means both experts and job descriptions should represent different professional areas and provide data according to their experience. It allows generalizing the research output wider and call the final model “intersectoral”. Figure 4.2 describes the industry sectors of experts and job descriptions.

Figure 4.2

Representativeness of Industry Sectors Among Experts and in Job Descriptions



Note. HVAC – Heating, Ventilation, & Air Conditioning

As shown in Figure 4.2, this research is represented by 32 different industry sectors with five unique sectors for experts and 14 for the job descriptions. Among these 32 sectors, 12 are overlapping, which shows the data from two different sources could support each other by industry. Therefore, I can conclude that the representativeness of the industry sectors allows naming the future research model “intersectoral”.

Representativeness check leads to the following action – checking each competency element's data sets and exploring the variability of the words in them. This step was done using word frequencies in all three sources and visualizing the data with word clouds.

Frequently Used Stems in the Descriptions of Competency Elements

For the triangulation procedure, firstly, was applied a procedure according to which occurrence (abbreviation OCCR in Tables 4.1-4.5) of each word in all three datasets was counted. After counting the occurrence, were counted occurrence percentages of each word in three data sets which gave occurrence frequency of the word related to all words in a selected data set (abbreviation FRQ in Tables 4.1-4.5). These two parameters characterize the data set as a frequency list where each word may appear more or less often. Tables 4.1-4.5 presented the most frequent words for each data set. It is important to mark:

1. Corpus analysis often use stems for the exploration of corpora (Gries, 2017) since they have a wide variety of different forms (e.g., run, runs, running, runner). Instead of words, researchers used stems that could be converted into words after analysis.
2. A subset of frequently used stems was based on 1% occurrence ($FRQ \geq 0,01$)

Table 4.1

Subset of Most Frequently Used Stems for PfM Knowledge Description

Job descriptions			Experts			Standard		
Stem	OCCR	FRQ	Stem	OCCR	FRQ	Stem	OCCR	FRQ
project	35	0.072	strategi	9	0.078	manag	38	0.038
busi	17	0.039	project	8	0.069	techniqu	31	0.031
process	16	0.019	risk	7	0.06	method	23	0.023
develop	12	0.018	busi	4	0.034	analysi	21	0.021
tool	12	0.013	financi	4	0.034	organis	20	0.02
system	11	0.013	agil	3	0.026	project	16	0.016
agil	10	0.012	capac	3	0.026	theori	15	0.015
portfolio	10	0.011	chang	3	0.026	plan	14	0.014
technolog	10	0.011	compani	3	0.026	risk	13	0.013
applic	9	0.011	govern	3	0.026	programm	12	0.012
chang	9	0.01	plan	3	0.026	inform	10	0.01
manag	9	0.01	polic	3	0.026			
program	9	0.01						

Note. Starting now in Tables 4.1-4.5 used the same style for data highlighting: **grey fill** in a cell means a highlighted lemma occurs at least in two data sets; the **bold font** of a lemma means a lemma occurs in all three data sets.

According to Figure 4.3, I can distinguish four stems, critical to the PfM knowledge: “project”, “busi”, “tool”, and “develop”. Hence, the knowledge area of a PfM should be oriented to business acumen and tools, essential for developing a project portfolio – as it was mentioned in the description of the PPM (ISO, 2015; Pilorget & Schell, 2018). Moreover, PfM should know how to develop new tools and methodology. Kendall and Rollins (2003) noticed this in the description of the improvement function for the PfM role.

The next competency element describes the abilities derived from the three sources. The frequencies of stems are shown in Table 4.2.

Table 4.2

Frequently Used Stems for PfM Ability Description

Job descriptions			Experts			Standard		
Stem	OCCR	FRQ	Stem	OCCR	FRQ	Stem	OCCR	FRQ
manag	81	0.03	communic	9	0.078	team	21	0.024
communic	79	0.029	priorit	9	0.078	manag	17	0.019
project	47	0.017	manag	5	0.043	techniqu	13	0.015
work	43	0.016	negoti	4	0.034	use	13	0.015
team	38	0.014	plan	4	0.034	analysi	12	0.014
busi	36	0.013	present	4	0.034	communic	12	0.014
effect	36	0.013	report	4	0.034	awar	11	0.012
written	32	0.012	think	4	0.034	conflict	10	0.011
level	31	0.011	analyt	3	0.026	plan	10	0.011
present	26	0.01	portfolio	3	0.026	develop	9	0.01
						opportun	9	0.01
						organis	9	0.01
						valu	9	0.01

All three sources have two similar stems in describing ability elements: “manag” and “communic”. This situation unveils the importance of PfM ability in communication and managing of project portfolio and, according to the frequently used stems, managing the team. Hence, the role of PfM could be described as a communication hub in the PPM – important both for teams whose projects are involved in portfolio management. Moreover, frequent stems highlight presentation abilities and the ability to plan. All mentioned above elements of abilities were described to some degree by Filippov et al. (2014) and Portman (2015) when forming an idea of PfM role as a leader of change and efficient operator of the PPM.

Along with the abilities, it is vital to understand behavioural patterns of PfM, which can describe one more part of competencies. Table 4.3 presents stems from corpora on the topic of behaviour.

Table 4.3

Frequently Used Stems for PfM Behaviour Description

Job descriptions			Experts			Standard		
Stem	OCCR	FRQ	Stem	OCCR	FRQ	Stem	OCCR	FRQ
project	492	0.042	reliabl	7	0.063	portfolio	100	0.037
manag	399	0.034	flexibl	6	0.054	organis	65	0.024
portfolio	247	0.021	communic	4	0.036	identifi	58	0.021
team	193	0.016	orient	4	0.036	project	43	0.016
busi	161	0.014	result	4	0.036	manag	42	0.015
ensur	153	0.013	leadership	3	0.027	use	38	0.014
plan	140	0.012				programm	37	0.014
develop	136	0.012				communic	28	0.01
process	136	0.012				develop	28	0.01
support	121	0.01						

Corpus based on the expert opinions reflects the characteristics of the person while standard and job descriptions rely more on characteristics of the process. Firstly, this could be explained with the research design – experts were asked about personality representation as a behavioural characteristic. It was done for balancing the information from the sources: job descriptions contain no information about personality while standard ICB contains both personality and functions in the description of behaviour. The second explanation relates to the data representation: almost all stems from the expert opinions’ corpus could be found in the standard corpus. Therefore, all three corpora underline the idea of PfM, whose behaviour should be based not only on job functions (“manag”, “portfolio”, “plan”) but also on personality indicators (“communic”, “leadership”). The mentioned idea is also supported by word cloud for behavior (Figure B.2) and standard in project portfolio management (IPMA, 2015; PMI, 2017).

Attitudes were described through the values in the corpus of expert opinions, purposes in the corpus from standard, and specific parts of job descriptions related to values and/or purposes of a

job in the corpus from job descriptions. Frequently used stems for attitudes are presented in Table 4.4.

Table 4.4

Frequently Used Stems for PfM Attitude Description

Job descriptions			Experts			Standard		
Stem	OCCR	FRQ	Stem	OCCR	FRQ	Stem	OCCR	FRQ
high	26	0.019	transpar	10	0.081	individu	32	0.058
work	26	0.019	connect	6	0.049	enabl	31	0.056
busi	21	0.015	orient	6	0.049	compet	29	0.053
team	20	0.015	improv	5	0.041	purpos	29	0.053
chang	16	0.012	focus	4	0.033	element	28	0.051
focus	16	0.012	project	4	0.033	portfolio	15	0.027
communic	15	0.011	benefit	3	0.024	organis	7	0.013
deliv	13	0.01	compani	3	0.024	agre	6	0.011
detail	13	0.01	organiz	3	0.024	influenc	6	0.011
			prioriti	3	0.024	outcom	6	0.011
			strategi	3	0.024	process	6	0.011
			valu	3	0.024	project	6	0.011

Corpus of job description used more frequently stems for orientation on business, communications, and delivering results (“work”, “busi”, “deliv”, “focus”). Experts showed opinions that PfM’s attitudes should be devoted to the company and its values (“valu”, “company”, “organiz”, “orient”, “strategi”). Finally, corpora from the standard contain stems describing attitudes of PfM related to the implementation of interaction (“agree”, “influenc”, “compet”, “enable”). Hence, Table 4.4 points out the lack of similarity in corpora on the topic of attitudes. But even though overlapping is appeared in such stems as “focus”, “organiz”, “project”. This could be interpreted as focusing on organizational needs (e.g., strategy, values) while managing the portfolio of projects. This station is highly correlated with the literature, where PfM is usually shown as a central figure for the strategy implementation within the organization (Aston, 2021; Blomquist & Müller, 2004; Martinsuo & Geraldi, 2020).

Qualification of PfM from the frequently used stems represented in two sources – in the corpus of expert opinions and in the corpus of job descriptions. Standard does not contain the information about qualification in each description of PfM competency element, instead, it contains a common description of qualification for certification needs. For my work, information for

certification cannot be used for competency description. The frequencies for stems in two corpora are presented in Table 4.5.

Table 4.5

Frequently Used Stems for PfM Qualification Description

Job descriptions			Experts		
Stem	OCCR	FRQ	Stem	OCCR	FRQ
manag	193	0.073	manag	13	0.112
project	147	0.055	project	10	0.086
portfolio	57	0.021	certif	4	0.034
work	47	0.018	knowledg	4	0.034
busi	46	0.017	portfolio	4	0.034
bachelor	34	0.013	program	4	0.034
team	29	0.011	languag	3	0.026
deliveri	28	0.011			
certif	26	0.01			
lead	24	0.01			

Both sources imply the importance of experience in project and portfolio management. To support the experience, PfM should be certified in the area of expertise. For example, it could be certificates Project Management Professional (PMP®) or Projects in Controlled Environments (PRINCE2®). These elements – previous experience and certification – are also presented in the word cloud (Figure B.4) and could be seen in the next section dedicated to topic modelling.

To sum up the results about frequently used stems, all five elements of the competency – knowledge, abilities, behaviour, qualification, and attitude – were presented and split into stems for frequency analysis. According to the frequencies:

- knowledge of a PfM covers theory and practice of portfolio management;
- abilities of a PfM concentrated on communication and managing of project portfolio;
- the behaviour of a PfM extend into personal and processual characteristics;
- the attitude of a PfM primarily focused on organizational needs while performing PPM;
- qualification of a PfM includes previous experience in portfolio management and capability to support the experience with the professional certification.

These aspects and stem frequencies are the indicators of diversity and validity of the corpora: collected textual information varies inside the corpora. At the same time, there are clear semantic borders between different corpora. Hence, collected data could be used in topic modelling.

Topic Modelling Results

After frequency analysis was implemented, topic modelling for every competency element, all three sources were merged by their information about each separate competency element. For example, all data from the standard, job descriptions and experts about knowledge of PfM were merged in one corpus and used in another topic modelling. The same was done with other elements.

For each competency element, I chose ten topics. The number of topics was chosen according to the research results conducted by Blei et al. (2003). According to their exploration of corpora performance, LDA perplexity exponentially decreases after the topic number equals ten.

Table 4.6 shows topics for the knowledge as an element of the competency. Each topic contains four stems that have a commonality in occurrence within the corpus. LDA helps to unveil these common stems for each topic. There is no agreement about the number of stems needed for the topics, and each researcher decides to experiment with the outputs of LDA and choose the appropriate number (Silge & Robinson, 2017). The topic modelling results were interpreted with the visual representation of topics as clusters in a dendrogram. For all competency elements, dendrograms are presented in Appendix C, except the dendrogram for knowledge as a competency element which dendrogram was shown in Figure 4.4 as an example of dendrogram clusters.

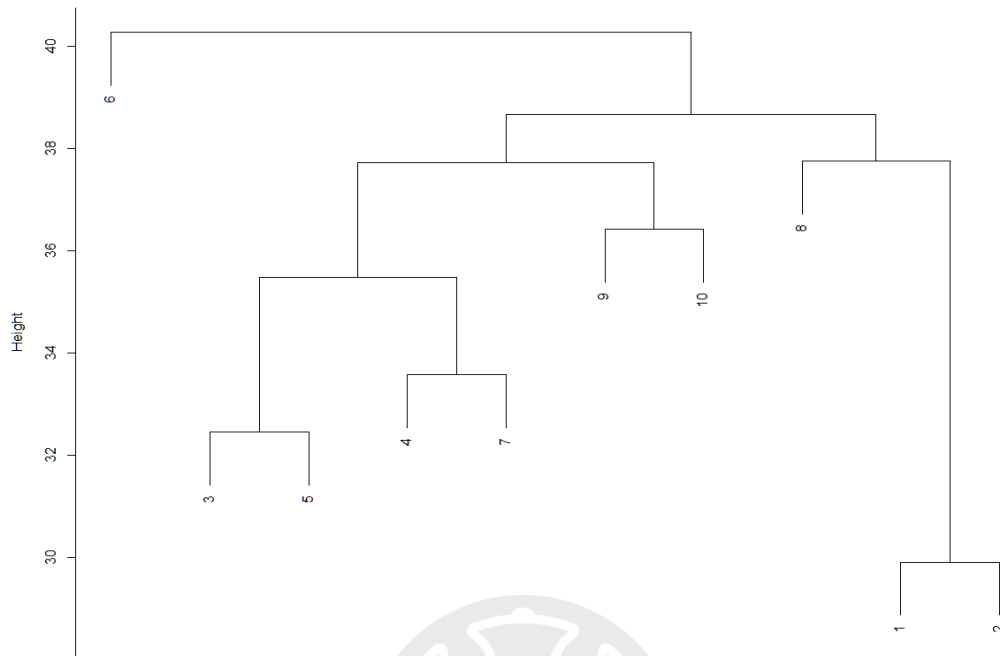
Table 4.6

Topics for the Competency Element Knowledge

Topic	Topic-related stems			
1	manag	portfolio	project	programm
2	report	principl	understand	system
3	resourc	plan	assess	design
4	risk	techniqu	opportun	communic
5	analysi	process	busi	manag
6	techniqu	method	transform	think
7	project	manag	agil	methodolog
8	method	cost	standard	estim
9	manag	project	strategi	risk
10	inform	negoti	regulatori	practic

Figure 4.4

Dendrogram for LDA Topic Modelling of the Competency Element Knowledge



Note. The dendrogram was created in RStudio with the help of packages Gsl and Topicmodels.

According to the clustering, each numbered topic represents the separate unit, but linked pair of topics on the lowest level of a dendrogram is considered together as it means the close distance between the units (Klimberg & McCullough, 2017). Also, if no supported words were found, I added the phrase “knowledge of” for each indicator. The same was done for other elements by adding a phrase related to the element. Finally, some stems were united together, and a new word was produced in several cases since they may represent another, high-level word (e.g., steps in resource planning).

Hence, for the competency element Knowledge should be considered following indicators:

- knowledge of techniques and methods of transformational thinking (Topic 6);
- understanding of principles and systems of reporting in project portfolio management (Topics 1 and 2);
- knowledge of steps² in the resource management business process (Topics 3 and 5);

² Steps may differ but several sources (IPMA, 2015; Young & Conboy, 2013) include the steps like mentioned in the topics 3 and 5 in Table 4.6: analysis, design, assessment, management.

- knowledge of managing risks and opportunities in agile and waterfall methodologies (Topics 4 and 7);
- knowledge of regulatory practices, information and negotiation strategies for managing project risks (Topics 9 and 10);
- knowledge of standard methods for cost estimation (Topic 8).

Table 4.7 shows topics for the abilities as an element of the competency. There are seven stems for each ability topic since the ability dataset is one of the biggest (together with the behaviour) and, according to the data collection, more words were used to describe abilities than knowledge.

Table 4.7

Topics for the Competency Element Ability

Topic	Topic-related stems						
1	manag	project	plan	opportun	lead	portfolio	complex
2	conflict	product	identifi	detail	senior	attent	assess
3	set	time	person	scope	result	task	organis
4	analyt	present	develop	portfolio	process	write	deliv
5	team	stakehold	level	collabor	member	intern	audienc
6	chang	execut	priorit	think	problem-solv	plan	strateg
7	communic	written	verbal	interperson	leadership	effect	present
8	busi	relationship	problem	build	solv	across	work
9	work	influenc	high	multipl	organ	environ	prioriti
10	use	inform	solut	project	other	organis	make

Table 4.7, together with Figure C.1, led to consider for the competency element Ability following indicators:

- ability to attentively assess details in complex plans for leaded projects and products to identify opportunities for the organizations (Topics 1 and 2);
- ability to set personal time and tasks to organizational resulted scope (Topic 3);
- ability to write and deliver analytical presentations on the portfolio process (Topic 4);
- leadership in effective presentations and verbal, written, and interpersonal communications with stakeholders on all levels (Topics 5 and 7);

- ability to execute change plans and problem-solving thinking in priority of the strategy (Topic 6);
- ability to build business relationships across work and use them for solving problems (Topic 8);
- ability to prioritize work for multiply stakeholders (Topic 9);
- ability to use benchmarking informational solutions for projects (Topic 10).

Table 4.8 represents stems for behaviour as an element of PfM competencies. There are seven stems for each behavioural topic – similar to the topics for abilities – since the data set, and descriptions were large enough to use more behaviour-related stems.

Table 4.8

Topics for the Competency Element Behaviour

Topic	Topic-related stems						
1	manag	project	support	team	portfolio	develop	includ
2	manag	develop	strategi	busi	portfolio	product	process
3	project	develop	process	manag	strateg	perform	strategi
4	ensur	project	busi	program	execut	support	plan
5	project	manag	portfolio	plan	support	deliveri	product
6	manag	identifi	team	ensur	improv	program	work
7	project	manag	requir	process	report	team	goal
8	portfolio	project	ensur	busi	team	make	need
9	project	resourc	identifi	organis	team	implement	busi
10	portfolio	manag	plan	team	project	develop	perform

Competency element Behaviour represents the actions PfM should perform. Together with Table 4.8 and Figure C.2 proposed the following indicators:

- ensure plans and executed according to the business strategy and support management teams of the projects, programs, and products included into a portfolio (Topics 1 and 4);
- develop a portfolio management plan and a process to support the delivery of the projects and products according to the business strategy (Topics 2 and 5);
- develop strategy and performance management process for the strategical projects (Topic 3);
- ensure project and program teams identify works, manage and improve resources according to the business of the organization (Topics 6 and 9);

- manage the process of portfolio reporting by ensuring the project team makes required goals and business needs (Topics 7 and 8);
- plan and develop the portfolio according to the performance of the project management teams (Topic 10).

Table 4.9 shows stems for attitude as an element of PfM competencies. There are three stems for each attitude topic because the data set, and descriptions were the shortest from all data set, and during the tuning, the number three stems in the topic given the meaningful information.

Table 4.9

Topics for the Competency Element Attitude

Topic		Topic-related stems	
1	detail	attent	analyt
2	chang	valu	problem
3	transpar	connect	time
4	communic	custom	improv
5	focus	orient	result
6	stakehold	build	work
7	team	environ	work
8	manag	portfolio	project
9	individu	enabl	perform
10	organis	deliv	commerci

Competency element Attitude represents the values PfM should provide. Together with Table 4.9 and Figure C.3 were proposed following indicators:

- analytical attention to the details (Topic 1);
- attitude to problems as valuable changes (Topic 2);
- transparency and connection to time (Topic 3);
- attitude to improvement teams' and stakeholders' communications and work environment (Topics 4 and 7);
- result-orientation focus (Topic 5);
- attitude to commercialisation of work delivery for stakeholders within the organization (Topics 6 and 10);
- enable individual performance in project portfolio management (Topics 8 and 9).

Table 4.10 shows topics for the qualification as an element of the competency. Each topic contains five stems parsed within corpora of job descriptions and expert opinions.

Table 4.10

Topics for the Competency Element Qualification

Topic	Topic-related stems				
1	team	work	technolog	lead	includ
2	busi	bachelor	relat	field	oper
3	certif	prefer	pmp	pmi	profession
4	program	qualif	english	leadership	strategi
5	relev	level	master	stakehold	technic
6	project	lead	role	analysi	divers
7	manag	project	portfolio	agil	programm
8	plan	environ	deliveri	budget	track
9	chang	servic	deliv	senior	financi
10	process	develop	industri	improv	understand

Competency element Qualification represents the special requirements PfM should comply with. Together with Table 4.10 and Figure C.4 were proposed following indicators:

- inclusion in leading technologies for teamwork (Topic 1);
- bachelor degree or operations in a related field (Topic 2);
- mastering level in relevant stakeholder management technics with preferable professional certification (e.g., Project Management Professional - PMP®) (Topics 3 and 5);
- certificates of participation in strategical or leadership international programs (Topic 4);
- diverse experience on analytical or leading roles in projects (Topic 6);
- experience in managing a portfolio in agile and waterfall environments (Topics 7 and 8);
- experience in dealing with various business processes within an industry (Topics 9 and 10).

Topic modelling unveiled the answer to the RQ1: What competency indicators should be used in the competency model of a PfM according to the literature, job descriptions, and opinions of the professionals in the PPM area? Table 4.11 shows the resulting list of competency indicators grouped by the proposed competency elements (see Figure 2.3).

Table 4.11

List of Competency Elements Based on Triangulation

Competency element	Competency indicator
Attitude	<ol style="list-style-type: none"> 1. Analytical attention to the details 2. Attitude to problems as valuable changes 3. Transparency and connection to time 4. Attitude to improvement teams' and stakeholders' communications and work environment 5. Result-orientation focus 6. Attitude to commercialisation of work delivery for stakeholders within the organization 7. Enable individual performance in project portfolio management
Ability	<ol style="list-style-type: none"> 1. Ability to attentively assess details in complex plans for leaded projects and products to identify opportunities for the organizations 2. Ability to set personal time and tasks to organizational resulted scope 3. Ability to write and deliver analytical presentations on the portfolio process 4. Leadership in effective presentations and verbal, written, and interpersonal communications with stakeholders on all levels 5. Ability to execute change plans and problem-solving thinking in priority of the strategy 6. Ability to build business relationships across work and use them for solving problems 7. Ability to prioritize work for multiply stakeholders 8. Ability to use benchmarking informational solutions for projects

(continued)

Table 4.11*List of Competency Elements Based on Triangulation (continued)*

Competency element	Competency indicator
Knowledge	<ol style="list-style-type: none"> 1. Knowledge of techniques and methods of transformational thinking 2. Understanding of principles and systems of reporting in project portfolio management 3. Knowledge of steps in the resource management business process 4. Knowledge of managing risks and opportunities in agile and waterfall methodologies 5. Knowledge of regulatory practices, information and negotiation strategies for managing project risks 6. Knowledge of standard methods for cost estimation
Qualification	<ol style="list-style-type: none"> 1. Inclusion in leading technologies for teamwork 2. Bachelor degree or operations in a related field 3. Mastering level in relevant stakeholder management technics with preferable professional certification (e.g., PMP®). 4. Certificates of participation in strategical or leadership international programs 5. Diverse experience on analytical or leading roles in projects 6. Experience in managing a portfolio in agile and waterfall environments 7. Experience in dealing with various business processes within an industry

(continued)

Table 4.11*List of Competency Elements Based on Triangulation (continued)*

Competency element	Competency indicator
Behaviour	<ol style="list-style-type: none"> 1. Ensure plans and executed according to the business strategy and support management teams of the projects, programs, and products included into a portfolio 2. Develop a portfolio management plan and a process to support the delivery of the projects and products according to the business strategy 3. Develop strategy and performance management process for the strategical projects 4. Ensure project and program teams identify works, manage and improve resources according to the business of the organization 5. Manage the process of portfolio reporting by ensuring the project team makes required goals and business needs 6. Plan and develop the portfolio according to the performance of the project management teams

Therefore, among all three triangulated corpora were selected sub-corpora related to the five elements of the competency model (Figure 2.3). Each sub-corpus was explored with LDA topic modelling. I interpreted the outputs of the topic modelling, and for every competency, elements were described indicators. All indicators could already show the PfM competency model, as shown in Table 4.11. To raise this unveiled model's quality and answer the RQ2, subject-matter experts should verify each indicator, i.e. experienced PfMs. The following section presents the results of the verification.

Validation of the Indicators by the Experts

After the revelation of the topic modelling results, I conducted the procedure of competency model validation. Six subject-matter experts from different countries and industry sectors examined and assessed the indicators – the validation procedure results are in Table 4.12. Grey colour was used to highlight competency indicators in the first quartile (the highest 25% of the scores).

Table 4.12*Results of Validation by the Experts*

Competency element	Indicator number	Sum of the scores	Quartile
Attitude	atd.1	18	Q2
	atd.2	17	Q2
	atd.3	22	Q1
	atd.4	20	Q1
	atd.5	20	Q1
	atd.6	14	Q2
	atd.7	14	Q2
Ability	abl.1	16	Q2
	abl.2	12	Q3
	abl.3	23	Q1
	abl.4	23	Q1
	abl.5	21	Q1
	abl.6	20	Q1
	abl.7	23	Q1
	abl.8	21	Q1
Knowledge	knl.1	15	Q2
	knl.2	19	Q1
	knl.3	18	Q2
	knl.4	19	Q1
	knl.5	13	Q2
	knl.6	20	Q1

(continued)

Table 4.12*Results of Validation by the Experts (continued)*

Competency element	Indicator number	Sum of the scores	Quartile
Qualification	qlf.1	14	Q2
	qlf.2	16	Q2
	qlf.3	20	Q1
	qlf.4	15	Q2
	qlf.5	24	Q1
	qlf.6	21	Q1
	qlf.7	16	Q2
Behaviour	bhv.1	22	Q1
	bhv.2	22	Q1
	bhv.3	21	Q1
	bhv.4	18	Q2
	bhv.5	21	Q1
	bhv.6	17	Q2

Note. Indicator's numbers were formed by adding three letters from the respective competency element to the indexes from Table 4.10. Description of the quartiles was given in the section Research Quality of Chapter III.

Table 4.12 highlights that all of the experts accepted and validated all of the competency indicators. Among all 34 indicators, 19 could be marked as critical and 15 as desirable. None of the indicators obtained a zero score from the experts. Hence, I can conclude that the competency indicators and the model are valid. Only one indicator obtained low scores – abl.2. But even though, it is in the third quartile and, according to the settled in Chapter II conditions, it could be accepted as a desirable competency indicator. Table D1 in Appendix D shows the competency model with the added levels.

Some experts gave valuable suggestions for the indicators and the competency model during the validation procedure. All given suggestions and decisions according to given suggestions are presented in Table 4.13.

Table 4.13*Suggestions From the Experts After Competency Model Validation*

Competency element	Suggestion	Decision
Ability	Ability to set personal time and tasks to organizational resulted scope: unclear, reformulate.	Suggestion relates to the indicator abl.2, which was scored the lowest among all competency indicators. Hence, according to the scores and the suggestion, indicator abl.2 was removed from the final model.
Knowledge	Business strategy (standards, knowledge) is also a valuable knowledge for PfM. Strategic thinking should be one of the core portfolio manager competence. Somehow related with transformational thinking.	This suggestion was taken into account as a suggestion for future studies. Suggestion relates to the indicator knl.1. The phrase “strategic and transformational” was added instead of the word “transformational” in the final competency model
Qualification	Replace PMP with PfMP.	Suggestion relates to the indicator qlf.3. PfMP [®] was added to the list of certifications together with PMP [®] in the final competency model.
Overall	Projects prioritization taking into account capacity constraints, strategic and financial value is core deliverable from portfolio manager. "Which projects to do first?" then "How to do the projects?" is the second deliverable from enterprise PMO (portfolio office).	This suggestion was taken into account as a suggestion for future studies.

According to Table 4.13, the final PfM competency model should be excluded one indicator, and two indicators should be slightly modified. As to other suggestions, as mentioned in Table 4.12, they were considered as a future studies suggestion because none of the suggested indicators was revealed in the study, but this does not necessarily mean the proposed indicators should not be excluded from the competency model. For example, understanding business strategy while governing a portfolio was met in the Australian standard (AIPM, 2021), and understanding business objectives is widely used in the international standard (IPMA, 2015).

After summing up all results, I can answer the RQ2: How does the competency model for PfM based on triangulation look like? The final competency model for a PfM is presented in the next section of the report.

International Intersectoral Project Portfolio Manager Competency Model

According to the previous sections in Chapter IV, the final model was triangulated and validated. The proposed competency model contains five competency elements: attitude, abilities, knowledge, qualification, and behaviour. Each element contains six to eight indicators divided into two groups (see Table D1).

The first group of indicators was called critical. This group was formed with the indicators from the first quartile (Q1³). It may be interpreted as the must-have level of mastery necessary for every PfM.

The second group was called desirable. This group was formed with the indicators from the second quartile (Q2). This set could be interpreted as the additional competency indicators. If the PfM has indicators from this set, the proficiency level of PfM is still insufficient to reach proficiency in PPM.

While some of the indicators (e.g., atd.5, abl.7, bhv.2, etc.) have been discussed in the literature (Aston, 2021; IPMA, 2015; Jonas, 2010), no evidence of offering levels of mastery was discovered. Therefore, this research could help build competency elements within an organization and better understand the possibilities of professional development for PfMs.

On the other hand, the proposed competency model should be compared to existing models. Since one of the sources for triangulation was the standard proposed by IPMA (2015), I compared competency indicators from my research with the competency indicators from the standard. The

³ Description of the quartiles was given in the section “Research Quality” of Chapter III.

comparison is more technical and transitional for this work. Therefore the resulting table (Table D2) was inserted into Appendix D.

According to the comparison, proposed competency indicators fully correspond to the standard. Each indicator has at least one fitting, which outlines that the research output can be used in the practice of PPM without any losses in quality. On the other hand, proposed indicators are more condensed: the majority of them have fitted three competencies from the standard. Hence, using the model from the research may help understand needed PfM competencies quicker and with less effort. This is significant for organizations that put a lot of effort into finding suitable and effective work opportunities for employees (Welbourne, 2011) and strive to raise talented employees as valuable resources and competitive advantage (De Boeck et al., 2018) in current competitive conditions.

The final step in answering RQ2 is a competency model grouped by key elements. Naming was based on the meanings of the obtained indicators and the comparison results of these indicators with the standard (Table D2). The final competency model for PfM is shown in Table 4.14.

Table 4.14

Final Competency Model for a PfM Based on the Triangulation

Resulted name of the competency	Indicator number	Competency indicator	Level
Business focus	atd.5	result-orientation focus	Critical
	abl.5	ability to execute change plans and problem-solving thinking in priority of the strategy	Critical
	abl.8	ability to use benchmarking informational solutions for projects	Critical
	bhv.2	develop a portfolio management plan and a process to support the delivery of the projects and products according to the business strategy	Critical
	atd.1	analytical attention to the details	Desirable
	atd.6	attitude to commercialisation of work delivery for stakeholders within the organization	Desirable

(continued)

Table 4.14*Final Competency Model for a PfM Based on the Triangulation (continued)*

Resulted name of the competency	Indicator number	Competency indicator	Level
Business focus	abl.1	ability to attentively assess details in complex plans for leaded projects and products to identify opportunities for the organizations	Desirable
	bhv.4	ensure project and program teams identify works, manage and improve resources according to the business of the organization	Desirable
Diverse expertise	qlf.3	mastering level in relevant stakeholder management technics with preferable professional certification (e.g., PMP®, PfMP®)	Critical
	qlf.5	diverse experience on analytical or leading roles in projects	Critical
	qlf.6	experience in managing a portfolio in agile and waterfall environments	Critical
	qlf.2	bachelor degree or operations in a related field	Desirable
	qlf.4	certificates of participation in strategical or leadership international programs	Desirable
Expedient communications	abl.3	ability to write and deliver analytical presentations on the portfolio process	Critical
	abl.4	leadership in effective presentations and verbal, written, and interpersonal communications with stakeholders on all levels	Critical
	abl.6	ability to build business relationships across work and use them for solving problems	Critical
	qlf.1	inclusion in leading technologies for teamwork	Desirable

(continued)

Table 4.14*Final Competency Model for a PfM Based on the Triangulation (continued)*

Resulted name of the competency	Indicator number	Competency indicator	Level
Process stewardship	knl.2	understanding of principles and systems of reporting in project portfolio management	Critical
	knl.6	knowledge of standard methods for cost estimation	Critical
	bhv.1	ensure plans and executed according to the business strategy and support management teams of the projects, programs, and products included into a portfolio	Critical
	bhv.3	develop strategy and performance management process for the strategical projects	Critical
	bhv.5	manage the process of portfolio reporting by ensuring the project team makes required goals and business needs	Critical
	knl.3	knowledge of steps in the resource management business process	Desirable
	qlf.7	experience in dealing with various business processes within an industry	Desirable
	bhv.6	plan and develop the portfolio according to the performance of the project management teams	Desirable
Self-management	atd.3	transparency and connection to time	Critical
	abl.7	ability to prioritize work for multiply stakeholders	Critical
	atd.7	enable individual performance in project portfolio management	Desirable

(continued)

Table 4.14*Final Competency Model for a PfM Based on the Triangulation (continued)*

Resulted name of the competency	Indicator number	Competency indicator	Level
Transformational demeanour	atd.4	attitude to improvement teams' and stakeholders' communications and work environment	Critical
	knl.4	knowledge of managing risks and opportunities in agile and waterfall methodologies	Critical
	atd.2	attitude to problems as valuable changes	Desirable
	knl.1	knowledge of techniques and methods of strategic and transformational thinking	Desirable
	knl.5	knowledge of regulatory practices, information and negotiation strategies for managing project risks	Desirable

According to Table 4.14, the competency model is a set of six competencies:

- business focus – contains four critical and four desirable indicators devoted to specific business attitude and behaviour of a PfM; indicators characterize PfM as a person focused on the results needed for the business and different parties of stakeholders; in the researches of Blomquist and Müller (2004), Butler (2018), and Kissi et al. (2013) this competency was partially emerged as an essential in successfully achieving the strategical goals of the organization and ensuring business objectives could be achieved;
- diverse expertise – this competency contains three critical and two desirable indicators rely on the experience of a PfM and his/her knowledge in the area of PPM; most of the indicators could be found in the standard (IPMA, 2015) as a domain of practical competency of a PfM and usually contains useful tools and methods which means the indicators are core PPM process organization; this competency correlates with the ideas of Gareis (2000) who proposed a description of PfM as a person using specific tools for managing a portfolio;
- expedient communications – contains three critical and one desirable indicator that highlight the importance of information flow under the guidance of PfM and practical aspects of these interactions; competence-based standard ICB (IPMA, 2015) depicts that PfM's

“communication includes the exchange of proper information, delivered accurately and consistently to all relevant parties” (p. 76); in addition, indicators from the proposed model added practicality making the communications of a PfM expedient and oriented on sharing valuable information and solving problems;

- process stewardship – contains five critical and three desirable indicators describe a PfM as a careful and responsible person in PPM; indicators of this competency relies on dealing with the process of PPM, which Pilorget and Schell (2018) described with the accent on leading, coordinating, and improving all together with the consulting and supporting teams and senior management (Jonas, 2010); this competence according to the indicators mainly relies on the aspect of understanding each part of the process and delivering this understanding to others
- self-management – contains two critical and one desirable indicator that orient a PfM on his/her own resources as a significant source of enhancing PPM productivity and performance; in the PPM literature, PfM is rarely represented as seeking for own resources; as shown in Table 2.1 PfM role described as supportive to the PPM and focused on the process – not on something related to “self”; but as to standards, ICB (IPMA, 2015) provides self-orientation by including self-reflection and self-management into the competency model; I followed this idea and called received set of indicators as “self-management” since the indicators more fit to the description of self-management from the standard (ISO, 2015) as “the ability to set personal goals, to check and adjust progress and to cope with daily work in a systematic way. It includes managing changing conditions and dealing successfully with stressful situation” (p. 68);
- transformational demeanour – contains two critical and three desirable indicators that depict specific orientation in mindset and the behaviour of PfM to change and improve the environment of PPM, to understand risks and problems in a portfolio throw the lens of possibilities; Kissi et al. (2013) described a figure of PfM as a transformational leader who can positively transform project performance and create an innovational atmosphere in the portfolio components’ teams; on the other hand, Martinsuo and Geraldi (2020) indicated a PfM as a transformational agent which is fully correlated with the ideas of Kissi et al. (2013) and depicts transformational demeanour of a PfM.

Therefore, the proposed competency model is fully supported by the literature from one side: it could be seen that all competency indicators contain roots in the standard and scientific papers. On the other side, the competency model of PfM, which was based on triangulation, purifies and intensifies indicators of PfM performance. Hence, the proposed competency model is easier to use and implement because the number of competencies and indicators is significantly lower than the standards. For example, ICB (IPMA, 2015) contains 29 competency elements and 110 indicators with no levels proposed. Together with the confirmed validity, it makes the proposed competency model of PfM valuable and helpful for practical use.

Another aspect of the research is a proposed research framework for competency modelling. While Spencer and Spencer (1993) and Campion et al. (2011) described the organization's most unified competency modelling process, I added triangulation to these steps together with the implementation of corpus analysis. The received competency model and its validity showed the additional steps in competency modelling could be practical, functional, and valuable.

Summary of Chapter IV

Summing up Chapter IV, findings in triangulating various sources for competency model building can be presented as follows:

- various countries and industry sectors were widely represented in the study hence the final competency model was named “international” and “intersectoral”;
- analysis of stem frequencies showed corpus of each competency element had its inner aspects related to the meaning of the while there are clear semantic borders between different corpora;
- topic modelling answered RQ1 and helped to clarify the competency indicators for each of five competency elements: attitude, abilities, knowledge, qualification, and behaviour;
- validation of the proposed competency model helped to answer RQ2, and an international intersectoral competency model for a PfM was presented (see Table 4.14);
- The proposed competency model consists of six competencies: business focus, diverse expertise, expedient communications, process stewardship, self-management, and transformational demeanour.

CHAPTER V CONCLUSIONS AND SUGGESTIONS

The following chapter shows the research's main conclusions and shortly describes answers to the study's research questions. The section with implications discusses the possibilities of implementing the study's results in different areas. The section with limitations focuses on the boundaries in applying the results. The last section proposes suggestions for future studies.

Conclusions

In recent years, companies have adopted PPM processes to effectively and efficiently manage multi-project environments (Martinsuo & Hoverfält, 2018). This approach places great demands on various stakeholders who depend on it and the main actors within this process – PfMs. This work was attempted to clarify the PfM competencies and proposed a competency model for those who are going to work or already working in the area of PPM.

According to the literature review, the role of PfM had not been receiving enough of the researcher's attention: PfM is commonly described casually, mostly as a supporting figure who helps in achieving performance in the company. Very rare PfM is mentioned as a central figure of the research, and even in these rare researches, the figure of PfM usually united with other actors, like programme managers. However, for this study, PfM was set as the leading actor and was defined as a politically aware, active person implementing the integral control of the relationship between the portfolio components and the organization's strategy and applying specific knowledge and project portfolio management processes to the portfolio components.

As to the practice, despite the broad usage of PfM and a significant number of portfolio manager job vacancies worldwide, there is still no solid description of job functions and competencies needed for PfM job performance. The literature review showed two standards in the PPM area focused on the competencies needed for PfM.

Important to mention that competency is based on the personal values and attitudes that manifest in knowledge, abilities, and qualification and could be observed in a job context through the behaviour. Thus, competency should have an observable indicator, as stated in the term's definition. Moreover, the competency model should help define PfM role worldwide and in any industry sector. Hence, I defined only one standard, ICB 4.0 by IPMA (2015), which correlates with this statement.

Using only the standard information was not regarded because writing the standard is not clear and usually involves a limited number of subject matter experts. In this research, I decided to widen the context and involve triangulation of the sources: information from the standard, data from the PfM vacancies on different job websites, and the professional opinion of experts worldwide.

I chose this approach guided by the purposes of the research: first, clarify the competency model of PfM by triangulating three sources: literature, job descriptions, and opinions of the professionals in the PPM area; second, offer a competency model for PfM based on the triangulation. Together with the research questions, these purposes highlighted the study methods – different for data collection and data analysis. Corpus analysis implemented using a programming language is the unique advantage of the research in human resource development: the method was extremely helpful in identifying competency indicators in the vast corpora of textual information.

Answering RQ1 about possible competency indicators for the PfM competency model was used topic modelling – one of the tools in corpus analysis. Every competency element was represented by the ten topics with a limited number of stems in each topic. By using cluster analysis and content analysis, topics were merged into competency indicators. Hence, five competency elements were described by six to eight indicators presented in Table 4.11.

However, according to Washington and Griffiths (2015), the final model should be validated with the help of experts. After the validation procedure, RQ2 was answered. The final international intersectoral competency model was unveiled (see Table 4.14). The structure of the model reflects the approaches of competency modelling by Dessler (2020) and Filipowicz (2016), while the content was based on the international standard, job descriptions from various countries and industry sectors, as well as from the experts all over the world with diverse work experience in PPM area. Hence, the purposes of the research were reached.

The model reflects a triangulation approach built on the three data sets from the international standard, job vacancy descriptions, and PPM experts' opinions. The final model contained six competencies: business focus, diverse expertise, expedient communications, process stewardship, self-management, and transformational demeanour. The study results depict that the proposed research framework for competency modelling should be considered to receive practical, functional, and valuable outputs.

Implications

With the development of project management and with the increasing of the project's complexity in the organization's portfolio, expectations for the PfM profession is rising – it is an emerging trend toward rethinking competencies in project, program and portfolio management (Ribeiro et al., 2021; Wen & Qiang, 2019).

Back to the purposes of the study, the research clarified and offered a competency model for PfM. On the other hand, corpus analysis and triangulation were used together during the research. The output of this approach in competency modelling was valid and practical, which makes the study framework useful in academic and practical implications.

Firstly, for academic researchers, this study could be a provider of analytical information of PfM role and competencies. Secondly, this research used a combination of corpus analysis and content analysis, which is new for the human resource development sphere. By relying on these two aspects, the research will help understand the PfM performance in a company, give a base for future studies of this role, and give the instruments for unveiling competencies of other positions in a company.

As to the practice, the research results will give a base for developing PPM professionals. From the position of human resource specialists, designed competency model will be a valuable source of information for creating an adopted model of competence in the organization or using the proposed model as a decision-making tool in different human resource areas such as recruitment, employee performance evaluation, high potential employee identification, training design etc.

On the other side, the competency model offered in the study could be used as a career framework or as a personal job development guide. It would be easier to plan future careers, widen personal competencies, and discover new possible professional paths of the PfM role if you have a model which shows you observable indicators useful in PPM performance.

Limitations

The research was devoted to triangulation hence containing validity a priori. At the same time, some limitations should be taken into account.

The variety of data, shown in the section Data Representativeness of Chapter IV, unveils one of the main limitations – the English language as a base. On the other hand, the English language is commonly used in the international context, and even ICB, the international standard

for PPM, was written in English. Hence, this limitation should be considered in adapting the competency model for a non-English speaking country.

It should also be noted that despite the variety of involved participants and job descriptions, corpora were limited to the language abilities of the participants as well as the authors of job descriptions: not all of them were native English speakers hence had a limited vocabulary. This also may lead to a lower response rate among professionals in PPM. Broader sampling in the future or precise adaptation of the competency model could help neglect this limitation.

Finally, the influence of the researcher should be taken into consideration. The study was qualitative and used content analysis to interpret the results. Moreover, interpretation was related to stems, not the words. Hence, the author's previous work experience influences the content analysis and interpretation results. This influence was mitigated by experts' validation of the competency model. By involving additional interpretators in the process could lower mentioned influence.

Suggestions for Future Study

This study searched various sources to clarify the competency model and offer competency indicators. But experts (see Table 4.13) also mentioned that some indicators were not discovered while these indicators are used and could be critical to PfM. For example, knowledge of business strategy and standards projects prioritization, knowledge and ability to use capacity constraints of an organization, etc. Hence, the first suggestion for the future is to do a precise search for the unique, related to PPM and PfM role competencies and competency indicators.

The second suggestion is to use other approaches to verify the data. In this research, I used experts to validate the competency model. Since the competencies should reflect the performance, other approaches to prove the competency model, such as longitudinal studies, performance appraisal ratings, or actual business results, could be considered. In future studies, for example, the proposed competency model might be implemented in a company and examined in the empirical context of a day-to-day performance of a PfM.

And one more suggestion is to use a proposed research framework in developing competency models for other types of job roles. This research offers a competency model for PfM, but the approach is unified. Hence, it could be used to develop the competency model for project managers or administrative workers, for example. Corpus analysis and content analysis could help create valuable and representative competency indicators.

REFERENCES

- Aaker, D. A., & Joachimsthaler, E. (2000). The brand relationship spectrum: The key to the brand architecture challenge. *California Management Review*, 42(4), 8-23.
<https://doi.org/10.2307/41166051>
- Arifin, M. H. (2021). Development of electronic portfolios and self-assessment based on high order thinking skills in Pancasila and citizenship learning at students of Al-Islam Bandung Polytechnic. *Journal of Physics: Conference Series*, 1764(1), 012144.
<https://doi.org/10.1088/1742-6596/1764/1/012144>
- Ashour, M. L. (2018). Triangulation as a powerful methodological research technique in technology-based services. *Business & Management Studies: An International Journal*, 6(1), 193-208. <https://doi.org/10.15295/bmij.v6i1.209>
- Aston, B. (2021). *Beginner's guide to project portfolio management – Critical steps, tools, benefits*. The Digital Project Manager. <https://thedigitalprojectmanager.com/project-portfolio-management-guide/>
- Australian Institute of Project Management. (2021). *AIPM professional competency standards for project management. Part F – certified practicing portfolio executive (CPPE)*.
https://www.aipm.com.au/documents/aipm-key-documents/aipm_portfolio_executive_professional_competency_s.aspx
- Autor, D. H., & Handel, M. J. (2013). Putting tasks to the test: Human capital, job tasks, and wages. *Journal of Labor Economics*, 31(S1), 59–96. doi:10.1086/669332
- AXELOS. (2011). *Management of portfolios*. TSO.
- Babkina, L., Skotarenko, O., & Vasiliev, N. (2020). Managing a project portfolio in construction. *E3S Web of Conferences*, 220, 01045. <https://doi.org/10.1051/e3sconf/202022001045>
- Baker, P. (2021). Analysing representations of obesity in the daily mail via corpus and down-sampling methods. In J. Egbert & P. Baker (Eds.). *Using corpus methods to triangulate linguistic analysis* (1st ed., pp. 85–108). Routledge.
- Baker, T. (2015). *The end of the job description: Shifting from a job-focus to a performance-focus* (1st ed.). Palgrave Macmillan.
- Balbás, A., Balbás, B., & Balbás, R. (2021). Omega ratio optimization with actuarial and financial applications. *European Journal of Operational Research*, 292(1), 376–387.
<https://doi.org/10.1016/j.ejor.2020.10.023>
- Banihashemi, S., Hosseini, M. R., Golizadeh, H., & Sankaran, S. (2017). Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries. *International Journal of Project Management*, 35(6), 1103–1119.
<https://doi.org/10.1016/j.ijproman.2017.01.014>

- Baran, M., & Kłos, M. (2014). Competency models and the generational diversity of a company workforce. *Economics & Sociology*, 7(2), 209–217. <https://doi.org/10.14254/2071-789x.2014/7-2/17>
- Barbosa, I., Freire, C., & Santos, M. P. (2018). The transferable skills development programme of a Portuguese economics and management faculty: The perceptions of graduate students. In C. Machado (Ed.). *Competencies and (global) talent* (Softcover reprint of the original 1st ed., pp. 25–49). Springer.
- Barbosa, M. W., & de Ávila Rodrigues, C. (2020). Project portfolio management teaching: Contributions of a gamified approach. *The International Journal of Management Education*, 18(2), 100388. <https://doi.org/10.1016/j.ijme.2020.100388>
- Baron, A., Rayson, P., & Archer, D. (2009). Word frequency and key word statistics in corpus linguistics. *Anglistik*, 20(1), 41–67.
- Bartram, D. (2005). The great eight competencies: A criterion-centric approach to validation. *Journal of Applied Psychology*, 90(6), 1185–1203. <https://doi.org/10.1037/0021-9010.90.6.1185>
- Bathallath, S., Smedberg, S., & Kjellin, H. (2016). Project interdependency management in IT/IS project portfolios: From a systems perspective. *Procedia Computer Science*, 100, 928–934. <https://doi.org/10.1016/j.procs.2016.09.250>
- Bekhet, A. K., & Zauszniewski, J. A. (2012). Methodological triangulation: An approach to understanding data. *Nurse Researcher*, 20(2), 40–43. doi:10.7748/nr2012.11.20.2.40.c9442
- Blei, D.M., Ng, A.Y., & Jordan, M.I. (2003). Latent Dirichlet allocation. *The Journal of Machine Learning Research*, 3, 993–1022.
- Blomquist, T. & Müller, R. (2004, July). *Program and portfolio managers: Analysis of roles and responsibilities*. Paper presented at PMI® Research Conference: Innovations, London, England. Newtown Square, PA: Project Management Institute.
<https://www.pmi.org/learning/library/program-portfolio-managers-analysis-roles-responsibilities-8315>
- Blomquist, T., & Müller, R. (2006). Practices, roles, and responsibilities of middle managers in program and portfolio management. *Project Management Journal*, 37(1), 52–66. <https://doi.org/10.1177/875697280603700105>
- Bolzan De Rezende, L., Blackwell, P., Denicol, J., & Guillaumon, S. (2021). Main competencies to manage complex defence projects. *Project Leadership and Society*, 2, 100014. <https://doi.org/10.1016/j.plas.2021.100014>
- Brunner, C. B., & Baum, M. (2020). The impact of brand portfolios on organizational attractiveness. *Journal of Business Research*, 106, 182–195. <https://doi.org/10.1016/j.jbusres.2019.09.014>

- Burgoyne, J.G. & R. Stuart (1976). The nature, use and acquisition of managerial skills and other attributes. *Personnel Review*, 5(4), 19–29.
- Butler, S. (2018). Basic concepts and definitions of portfolio management. In: Lock, D., & Wagner, R. (Eds.). *The handbook of project portfolio* (1st ed., pp. 3–8). Routledge.
- Campion, M. A., Fink, A. A., Ruggeberg, B. J., Carr, L., Phillips, G. M., & Odman, R. B. (2011). Doing competencies well: Best practices in competency modeling. *Personnel Psychology*, 64(1), 225–262. <https://doi.org/10.1111/j.1744-6570.2010.01207.x>
- Chen, T., Fu, M., Liu, R., Xu, X., Zhou, S., & Liu, B. (2019). How do project management competencies change within the project management career model in large Chinese construction companies? *International Journal of Project Management*, 37(3), 485–500. <https://doi.org/10.1016/j.ijproman.2018.12.002>
- Chouhan, V. S., & Srivastava, S. (2014). Understanding competencies and competency modeling – A literature survey. *IOSR Journal of Business and Management*, 16(1), 14–22. <https://doi.org/10.9790/487x-16111422>
- Clegg, S., Killen, C. P., Biesenthal, C., & Sankaran, S. (2018). Practices, projects and portfolios: Current research trends and new directions. *International Journal of Project Management*, 36(5), 762–772. <https://doi.org/10.1016/j.ijproman.2018.03.008>
- Crawford, L. (2005). Senior management perceptions of project management competence. *International Journal of Project Management*, 23(1), 7–16. <https://doi.org/10.1016/j.ijproman.2004.06.005>
- Creswell, J. W., & Creswell, D. J. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th edition). SAGE Publications, Inc.
- De Boeck, G., Meyers, C., & Dries, N. (2018). Employee reactions to talent management: Assumptions versus evidence. *Journal of Organisational Behaviour*, 39 (2), 199–213.
- Denzin, N. K. (2012). Triangulation 2.0. *Journal of Mixed Methods Research*, 6(2), 80–88. doi:10.1177/1558689812437186
- Dessler, G. (2020). *Human resource management* (16th ed.). Pearson Education
- Deutsch, H. P., & Beinker, M. W. (2019). *Derivatives and internal models*. Springer Publishing.
- Doorasamy, M. (2017). Product portfolio management best practices for new product development: A review of models. *Foundations of Management*, 9(1), 139–148. <https://doi.org/10.1515/fman-2017-0011>
- Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of Management Review*, 32(4), 1155–1179.

- Ekrot, B., Kock, A., & Gemünden, H. G. (2016). Retaining project management competence – Antecedents and consequences. *International Journal of Project Management*, 34(2), 145–157. <https://doi.org/10.1016/j.ijproman.2015.10.010>
- Ellis, P., & Abbott, J. (2011). Managing difficult people: Competence vs competency. *Journal of Renal Nursing*, 3(2), 88–92. doi:10.12968/jorn.2011.3.2.89
- Esponda, G. M., Ryan, G. K., Estrin, G. L., Usmani, S., Lee, L., Murphy, J., Qureshi, O., Endale, T., Regan, M., Eaton, J., & De Silva, M. (2021). Lessons from a theory of change-driven evaluation of a global mental health funding portfolio. *International Journal of Mental Health Systems*, 15(1). <https://doi.org/10.1186/s13033-021-00442-6>
- Farkas, C., Álvarez, C., Cuellar, M. D. P., Avello, E., Gómez, D. M., & Pereira, P. (2020). Mothers' competence profiles and their relation to language and socioemotional development in Chilean children at 12 and 30 months. *Infant Behavior and Development*, 59, 101443. <https://doi.org/10.1016/j.infbeh.2020.101443>
- Fedushko, S., Peráček, T., Syerov, Y., & Trach, O. (2021). Development of methods for the strategic management of web projects. *Sustainability*, 13(2), 1–8. <https://doi.org/10.3390/su13020742>
- Filipowicz, G. (2016). *Zarządzanie kompetencjami. Perspektywa firmowa i osobista* [Competence management. The company and personal perspective]. Wolters Kluwer.
- Filippov, S., van der Weg, R., van Ogtrop, F., Beelen, P., & Mooi, H. (2014). Exploring the project portfolio manager's role: Between a data manager and a strategic advisor. *Procedia – Social and Behavioral Sciences*, 119, 95–104. <https://doi.org/10.1016/j.sbspro.2014.03.013>
- Flick, U. (2007). *Designing qualitative research*. SAGE.
- Foroudi, P., Hafeez, K., & Nguyen, B. (2019). An integrated core competence evaluation framework for portfolio management in the oil industry. *International Journal of Management and Decision Making*, 18(1), 1. <https://doi.org/10.1504/ijmdm.2019.10014615>
- French Jr., J. R. P., & Raven, B. H. (1959). The bases of social power. In D. Cartwright (Ed.). *Studies in social power* (pp. 150–167). Institute for Social Research.
- Gareis, R. (2000, September). *Program management and project portfolio management: new competences of project-oriented organizations*. Paper presented at Project Management Institute Annual Seminars & Symposium, Houston, TX. Project Management Institute.
- Gerencer, T. C. (2021, March 3). 30+ best job search engines & boards for finding a job 2021. Zety. <https://zety.com/blog/best-job-search-sites>
- Gibson, C. B. (2016). Elaboration, generalization, triangulation, and interpretation. *Organizational Research Methods*, 20(2), 193–223. doi:10.1177/1094428116639133

- Given, L. M. (Ed.). (2008). *The SAGE encyclopedia of qualitative research methods* (Vols. 1 & 2). SAGE Publications, Inc.
- Givron, H., & Desseilles, M. (2021). The role of emotional competencies in predicting medical students' attitudes towards communication skills training. *Patient Education and Counseling*, 104(10), 2505–2511. <https://doi.org/10.1016/j.pec.2021.03.015>
- Gruszka, J., & Szwabiński, J. (2020). Best portfolio management strategies for synthetic and real assets. *Physica A: Statistical Mechanics and Its Applications*, 539, 122938. <https://doi.org/10.1016/j.physa.2019.122938>
- Guerrero, D., & De los Ríos, I. (2012). Learning model and competences certification in the project management scope: An empirical application in a sustainable development context. *Procedia – Social and Behavioral Sciences*, 46, 1297–1305.
- Hansell, G., Kotzen, J., Olsen, E., & Farag, H. (2016). The role of portfolio management in value creation. In BCG report. *Creating value through active portfolio management: The 2016 value creators report*. <https://www.bcg.com/publications/2016/value-creation-strategy-corporate-development-creating-value-active-portfolio-management>
- Hejase, H. J., Hejase, A. J., Mikdashi, G., & Bazeih, Z. F. (2016). Talent management challenges: An exploratory assessment from Lebanon. *International Journal of Business Management and Economic Research*, 7 (1), 504–520.
- Hesarsorkh, A. H., Ashayeri, J., & Naeini, A. B. (2021). Pharmaceutical R&D project portfolio selection and scheduling under uncertainty: A robust possibilistic optimization approach. *Computers & Industrial Engineering*, 155, 107114. <https://doi.org/10.1016/j.cie.2021.107114>
- Hoffmann, D., Ahlemann, F., & Reining, S. (2020). Reconciling alignment, efficiency, and agility in IT project portfolio management: Recommendations based on a revelatory case study. *International Journal of Project Management*, 38(2), 124–136. <https://doi.org/10.1016/j.ijproman.2020.01.004>
- Hoge, M. A., Tondora, J., & Marrelli, A. F. (2005). The fundamentals of workforce competency: Implications for behavioral health. *Administration and Policy in Mental Health and Mental Health Services Research*, 32(5/6), 509–531.
- Iio, J., & Wakabayashi, S. (2020). Dialogbook: a proposal for simple e-portfolio system for international communication learning. *International Journal of Web Information Systems*, 16(5), 611–622. <https://doi.org/10.1108/IJWIS-09-2020-0059>
- Indeed Career Guide (2021). *What does job function mean?* Indeed. <https://www.indeed.com/career-advice/finding-a-job/job-function>
- International Organization for Standardization. (2015). *Project, programme and portfolio management – Guidance on portfolio management*. ISO Standard No. 21504:2015.

- International Organization for Standardization. (2021). *Project, programme and portfolio management – Context and concepts*. ISO Standard No. 21500:2021.
- International Project Management Association. (2015). *Individual competence baseline for portfolio management* (Version 4.0.1). IPMA.
- Irfan, M., Khan, S. Z., Hassan, N., Hassan, M., Habib, M., Khan, S., & Khan, H. H. (2021). Role of project planning and project manager competencies on public sector project success. *Sustainability*, 13(3), 1421. <http://dx.doi.org/10.3390/su13031421>
- Jason, L. A., & Glenwick, D. S. (2016). *Handbook of methodological approaches to community-based research: Qualitative, quantitative, and mixed methods* (1st ed.). Oxford University Press.
- Jimenez-Carvelo, A. M., & Cuadros-Rodríguez, L. (2021). Data mining/machine learning methods in foodomics. *Current Opinion in Food Science*, 37, 76–82. <https://doi.org/10.1016/j.cofs.2020.09.008>
- Jonas, D. (2010). Empowering project portfolio managers: How management involvement impacts project portfolio management performance. *International Journal of Project Management*, 28(8), 818–831. doi:10.1016/j.ijproman.2010.07.002
- Kachersky, L., & Carnevale, M. (2015). Effects of pronoun brand name perspective and positioning on brand attitude. *Journal of Product & Brand Management*, 24(2), 157–164. <https://doi.org/10.1108/jpbm-02-2014-0495>
- Keller, K. L., & Swaminathan, V. (2019). *Strategic brand management: Building, measuring, and managing brand equity, global edition* (5th ed.). Pearson.
- Kendall, G., & Rollins, S. (2003). *Advanced project portfolio management and the PMO: multiplying ROI at warp speed*. J. Ross Publishing.
- Killen, C. P., Geraldi, J., & Kock, A. (2020). The role of decision makers' use of visualizations in project portfolio decision making. *International Journal of Project Management*, 38(5), 267–277. <https://doi.org/10.1016/j.ijproman.2020.04.002>
- Killen, C.P., Hunt, R.A., Kleinschmidt, E.J. (2008). Project portfolio management for product innovation. *International Journal of Quality and Reliability Management*, 25(1), 24–38.
- Kiparsky, P. (n.d.). Morphological units: Stems. In: *Oxford research encyclopedia of linguistics*. Retrieved December 25, 2021, from <https://web.stanford.edu/~kiparsky/Papers/stems.pdf>
- Kissi, J., Dainty, A., & Tuuli, M. (2013). Examining the role of transformational leadership of portfolio managers in project performance. *International Journal of Project Management*, 31(4), 485–497. <https://doi.org/10.1016/j.ijproman.2012.09.004>
- Klimberg, R., & McCullough, B. D. (2017). *Fundamentals of predictive analytics with JMP* (2nd edition). SAS Institute.

- Kopmann, J., Kock, A., & Killen, C. P. (2017). Project portfolio management: The linchpin in strategy processes. In S. Sankaran, R. Müller, & N. Drouin (Eds.). *Cambridge handbook of organizational project management* (pp. 92–105). Cambridge University Press. <https://doi.org/10.1017/9781316662243.011>
- Kopmann, J., Kock, A., Killen, C. P., & Gemünden, H. G. (2017). The role of project portfolio management in fostering both deliberate and emergent strategy. *International Journal of Project Management*, 35(4), 557–570. <https://doi.org/10.1016/j.ijproman.2017.02.011>
- Kral, P., Janoskova, K., & Durana, P. (2019). Linear model for brand portfolio optimization. *Economics and Culture*, 16(1), 32–39. <https://doi.org/10.2478/jec-2019-0004>
- LaFlair, G. T., Shelley, S., & Xun, Y. (2021). Connecting corpus linguistics and assessment. In J. Egbert & P. Baker (Eds.). *Using corpus methods to triangulate linguistic analysis* (1st ed., pp. 109–140). Routledge
- Lassance, N., & Vrans, F. (2019). Minimum Rényi entropy portfolios. *Annals of Operations Research*, 299(1–2), 23–46. <https://doi.org/10.1007/s10479-019-03364-2>
- Lima, A., Fernandes, G., & Machado, R. J. (2016). *Project and program management implications in the portfolio management of IT projects in applied R&D organizations*. 2016 10th International Conference on the Quality of Information and Communications Technology (QUATIC). doi:10.1109/quatic.2016.056
- Lindgren, S. (2018). A ghost in the machine: Tracing the role of “the digital” in discursive processes of cybervictimisation. *Discourse & Communication*, 12(5), 517–534. doi:10.1177/1750481318766936
- Lloyd-Walker, B., Crawford, L., & French E. (2018). Uncertainty as opportunity: The challenge of project based careers. *International Journal of Managing Projects in Business*, 11(4), 886–900, doi:10.1108/IJMPB-04-2017-0044
- Longman Dictionary of Contemporary English. (n.d.). Stem in linguistics. In *Longman dictionary of contemporary English online*. Retrieved December 25, 2021, from <https://www.ldoceonline.com/Linguistics-topic/stem>
- Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77–91. <https://doi.org/10.2307/2975974>
- Martinsuo, M. (2013). Project portfolio management in practice and in context. *International Journal of Project Management*, 31(6), 794–803. doi:10.1016/j.ijproman.2012.10.013
- Martinsuo, M., & Geraldi, J. (2020). Management of project portfolios: Relationships of project portfolios with their contexts. *International Journal of Project Management*, 38(7), 441–453. <https://doi.org/10.1016/j.ijproman.2020.02.002>

- Martinsuo, M., & Hoverfält, P. (2018). Change program management: Toward a capability for managing value-oriented, integrated multi-project change in its context. *International Journal of Project Management*, 36(1), 134–146. doi:10.1016/j.ijproman.2017.04.018
- Martinsuo, M., & Lehtonen, P. (2007). Role of single-project management in achieving portfolio management efficiency. *International Journal of Project Management*, 25(1), 56–65. <https://doi.org/10.1016/j.ijproman.2006.04.002>
- McClelland, D. C. (1973). Testing for competence rather than for “intelligence.” *American Psychologist*, 28(1), 1–14. <https://doi.org/10.1037/h0034092>
- McEntire, L. E., Dailey, L. R., Osburn, H. K., & Mumford, M. D. (2006). Innovations in job analysis: Development and application of metrics to analyze job data. *Human Resource Management Review*, 16(3), 310–323. doi:10.1016/j.hrmr.2006.05.004
- McKenny, A. F., Aguinis, H., Short, J. C., & Anglin, A. H. (2016). What doesn’t get measured does exist: Improving the accuracy of computer-aided text analysis. *Journal of Management*, 44(7), 2909–2933. <https://doi.org/10.1177/0149206316657594>
- McLagan, P. (1980) Competency models. *Training and Development Journal*, 34, 12–23.
- Merriam-Webster. (n.d.-a). Competence. In *Merriam-Webster.com dictionary*. Retrieved July 1, 2021, from <https://www.merriam-webster.com/dictionary/competence>
- Merriam-Webster. (n.d.-b). Competency. In *Merriam-Webster.com dictionary*. Retrieved July 1, 2021, from <https://www.merriam-webster.com/dictionary/competency>
- Meskendahl, S. (2010). The influence of business strategy on project portfolio management and its success – A conceptual framework. *International Journal of Project Management*, 28(8), 807–817. <https://doi.org/10.1016/j.ijproman.2010.06.007>
- Moghabghab, R., Tong, A., Hallaran, A., & Anderson, J. (2018). The difference between competency and competence: A regulatory perspective. *Journal of Nursing Regulation*, 9(2), 54–59. doi:10.1016/s2155-8256(18)30118-2
- Mohagheghi, V., Mousavi, S. M., Mojtahedi, M., & Newton, S. (2020). Evaluating large, high-technology project portfolios using a novel interval-valued Pythagorean fuzzy set framework: An automated crane project case study. *Expert Systems with Applications*, 162, 113007. <https://doi.org/10.1016/j.eswa.2019.113007>
- Moore, D. S., McCabe, G. P., & Craig, B. A. (2016). *Introduction to the practice of statistics* (9th ed.). W. H. Freeman.
- Moradi, S., Kähkönen, K., & Aaltonen, K. (2020). Project managers’ competencies in collaborative construction projects. *Buildings*, 10(3), 50. <https://doi.org/10.3390/buildings10030050>

- Morethe, S. L. M., Swarts, I., & Schultz, C. (2020). Talent development practices predict the employee engagement of human resource professionals. *Southern African Business Review*, 24. <https://doi.org/10.25159/1998-8125/6398>
- Morgeson, F. P., Brannick, M. T., & Levine, E. L. (2019). *Job and work analysis: Methods, research, and applications for human resource management* (3rd ed.). SAGE Publications, Inc.
- Mulder, M. (2015). *Professional competence in context: A conceptual study*. Paper presented at the meeting of American Educational Research Association (AERA) Annual Meeting April 16–20, Chicago, IL. <https://www.mmulder.nl/downloads/>
- Müller, R., Martinsuo, M., & Blomquist, T. (2008). Project portfolio control and portfolio management performance in different contexts. *Project Management Journal*, 39(3), 28–42. doi:10.1002/pmj.20053
- Nijhuis, S., Vrijhoef, R., & Kessels, J. (2018). Tackling project management competence research. *Project Management Journal*, 49(3), 62–81. <https://doi.org/10.1177/8756972818770591>
- Nousiainen, T., Kangas, M., Rikala, J., & Vesisenaho, M. (2018). Teacher competencies in game-based pedagogy. *Teaching and Teacher Education*, 74, 85–97. <https://doi.org/10.1016/j.tate.2018.04.012>
- O*NET OnLine. (n.d.-a). *O*NET online help: online overview*. O*NET OnLine. <https://www.onetonline.org/help/online/>
- O*NET OnLine. (n.d.-b). *Summary report for: 11-3031.03 – Investment fund managers*. O*NET OnLine. <https://www.onetonline.org/link/summary/11-3031.03>
- Obradovic, V., Jovanovic, P., Petrovic, D., Mihic, M., & Bjelica, D. (2014). Web-based project management influence on project portfolio managers' technical competencies. *Procedia – Social and Behavioral Sciences*, 119, 387–396. <https://doi.org/10.1016/j.sbspro.2014.03.044>
- Oliveira, J. C., & Rabechini R., Jr. (2021). Green IT and the right portfolio of sustainable projects. *Base - Revista de Administração e Contabilidade Da Unisinos*, 18(1), 106–125. <https://doi.org/10.4013/base.2021.181.05>
- Ostapchuk, T., & Pashchenko, O. (2021). Brand portfolio strategy and brand architecture. *Eastern Europe: Economy, Business and Management*, 1(28), 32–36. <https://doi.org/10.32782/easterneurope.28-6>
- Palmatier, R. W., Houston, M. B., & Hulland, J. (2017). Review articles: purpose, process, and structure. *Journal of the Academy of Marketing Science*, 46(1), 1–5. doi:10.1007/s11747-017-0563-4
- Pandremmenou, H., Sirakoulis, K., & Blanas, N. (2013). Success factors in the management of investment projects: A case study in the region of Thessaly. *Procedia – Social and Behavioral Sciences*, 74, 438–447. <https://doi.org/10.1016/j.sbspro.2013.03.032>

- Pariafsai, F., & Behzadan, A. H. (2021). Core competencies for construction project management: Literature review and content analysis. *Journal of Civil Engineering Education*, 147(4), 04021010. [https://doi.org/10.1061/\(asce\)ei.2643-9115.0000051](https://doi.org/10.1061/(asce)ei.2643-9115.0000051)
- Park, C. (2016). Project ecosystem competency model. *Procedia – Social and Behavioral Sciences*, 226, 116–123. <https://doi.org/10.1016/j.sbspro.2016.06.169>
- Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). SAGE Publications, Inc.
- Paulson, F. L., Paulson, P. R., & Meyer, C. A. (1991). What makes a portfolio? *Educational Leadership*, 48(5), 60–63.
- Podgórska, M., & Pichlak, M. (2019). Analysis of project managers' leadership competencies. *International Journal of Managing Projects in Business*, 12(4), 869–887. <https://doi.org/10.1108/ijmpb-08-2018-0149>
- Portman, H. (2015). *PoMoP portfolio management organization*. Henny Portman's Blog. <https://hennyportman.files.wordpress.com/2015/04/mop-practice-organization-150422-v0-1.pdf>
- Prahalad, C. K., & Hamel, G. (1990, May/June). The core competence of the corporation. *Harvard Business Review*, 68(3), 79–91.
- Prien, E. P., Goodstein, L. D., Goodstein, J., & Gamble, L. G., Jr. (2009). *A practical guide to job analysis* (1st ed.). Pfeiffer.
- Project Management Institute. (2017a). *Project manager competency development framework* (3rd edition). Project Management Institute.
- Project Management Institute. (2017b). *The standard for portfolio management* (4th edition). Project Management Institute Inc.
- Ratushnyi, R. (2019). System approach to structuring portfolio of projects for the development of territorial fire-reliable formations. *Bulletin of Lviv State University of Life Safety*, 19, 44–50. <https://doi.org/10.32447/20784643.19.2019.04>
- Redmond, E. (2013). Competency models at work: The value of perceived relevance and fair rewards for employee outcomes. *Human Resource Management*, 52(5), 771–792. doi:10.1002/hrm.21560
- Ribeiro, A., Amaral, A., & Barros, T. (2021). Project manager competencies in the context of the Industry 4.0. *Procedia Computer Science*, 181, 803–810. <https://doi.org/10.1016/j.procs.2021.01.233>
- Robinson, M. D., Penzel, I. B., & Persich, M. R. (2020). What if your partner...? A situated decision-making approach to romantic competence in young adulthood. *Journal of Research in Personality*, 88, 104012. <https://doi.org/10.1016/j.jrp.2020.104012>

- Rydell, M. (2018). Being ‘a competent language user’ in a world of others – Adult migrants’ perceptions and constructions of communicative competence. *Linguistics and Education*, 45, 101–109. <https://doi.org/10.1016/j.linged.2018.04.004>
- Saidoun, A. (2016). Successful project management in North Africa with intercultural competence. *Procedia - Social and Behavioral Sciences*, 226, 218–225. <https://doi.org/10.1016/j.sbspro.2016.06.182>
- Sanchez, J. I., & Levine, E. L. (2009). What is (or should be) the difference between competency modeling and traditional job analysis? *Human Resource Management Review*, 19(2), 53–63.
- Sanchez, J. I., & Levine, E. L. (2012). The rise and fall of job analysis and the future of work analysis. *Annual Review of Psychology*, 63(1), 397–425. <https://doi.org/10.1146/annurev-psych-120710-100401>
- Sarkar, J. G. (2019). Managing brand strength in a brand portfolio: A conceptual analysis. *Journal of Administrative and Business Studies*, 5(4), 219–227 <https://doi.org/10.20474/jabs-5.4.3>
- Seuring, S., & Gold, S. (2012). Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management: An International Journal*, 17(5), 544–555. <https://doi.org/10.1108/13598541211258609>
- Sevel, L., Abratt, R., & Kleyn, N. (2018). Managing across a corporate and product brand portfolio: evidence from a large South African service organization. *Journal of Product & Brand Management*, 27(1), 18–28. <https://doi.org/10.1108/jpbm-05-2016-1182>
- Silge, J., & Robinson, D. (2017). Text mining with R: A tidy approach (1st ed.). O’Reilly Media.
- Silverman, D. (2018). *Doing qualitative research* (5th ed.). SAGE Publications Ltd.
- Song, B. K. (2020). E-portfolio implementation: Examining learners’ perception of usefulness, self-directed learning process and value of learning. *Australasian Journal of Educational Technology*, 37(1), 68–81. <https://doi.org/10.14742/ajet.6126>
- Sousa Santos, C.E., Jr (2018). Brand portfolio strategy and brand architecture: A comparative study. *Cogent Business & Management*, 5(1), 1483465. <https://doi.org/10.1080/23311975.2018.1483465>
- Spencer, L. M., Jr., & Spencer, S. M. (1993). *Competence at work: Models for superior performance* (1st ed.). Wiley.
- Springer, M. L. (2019). *Project and program management: A competency-based approach* (4th ed.). Purdue University Press.
- Stefanowitsch, A. (2020). *Corpus linguistics: A guide to the methodology*. Language Science Press.

- Stratton, M. M. (2011). *Portfolio management: Perceptions of the project manager* (Publication No. 3460932) [Doctoral dissertation Capella University]. ProQuest Dissertations and Theses Global.
- Struyven, K., Blicek, Y., & De Roeck, V. (2014). The electronic portfolio as a tool to develop and assess pre-service student teaching competences: Challenges for quality. *Studies in Educational Evaluation*, 43, 40–54. <https://doi.org/10.1016/j.stueduc.2014.06.001>
- Suifan, T., Daraba', A., A, N., Sukkari, L., Alhyari, S., & Sweis, R. J. (2021). The relationship between the competency level and the efficiency of a project manager: self-perspective vs subordinates' perspective. *International Journal of Productivity and Quality Management*, 33(1), 57. <https://doi.org/10.1504/ijpqm.2021.115260>
- Takey, S. M., & Carvalho, M. M. D. (2015). Competency mapping in project management: An action research study in an engineering company. *International Journal of Project Management*, 33(4), 784–796. <https://doi.org/10.1016/j.ijproman.2014.10.013>
- Taylor, F. W. (2020). *The principles of scientific management*. Ocean of Minds Media House Ltd. (Original work published 1911)
- Thunnisen, M., & Van Arensbergen, P. (2015). A multi-dimensional approach to talent. *Personnel Review* 44 (2), 182–199. <http://dx.doi.org/10.1108/pR-10-2013-0190>.
- Tolonen, A., Shahmarichatghieh, M., Harkonen, J., & Haapasalo, H. (2015). Product portfolio management – Targets and key performance indicators for product portfolio renewal over life cycle. *International Journal of Production Economics*, 170, 468–477. <https://doi.org/10.1016/j.ijpe.2015.05.034>
- Trentim, M. (2013, October 01). Embedding portfolio management through effective communications. *Voices on Project Management Blog*. <https://www.projectmanagement.com/blog-post/7990/Embedding-Portfolio-Management-Through-Effective-Communications>
- Unger, B. N., Gemünden, H. G., & Aubry, M. (2012). The three roles of a project portfolio management office: Their impact on portfolio management execution and success. *International Journal of Project Management*, 30(5), 608–620. <https://doi.org/10.1016/j.ijproman.2012.01.015>
- Vinell, L., Fischerstrom, J., & Nilsson, M. (2021). *Efficient portfolio management: Classical and modern approaches*. Norstedts Juridik AB.
- Walker, D., & Lloyd-Walker, B. (2019). The future of the management of projects in the 2030s. *International Journal of Managing Projects in Business*, 12(2), 242–266. <https://doi.org/10.1108/ijmpb-02-2018-0034>
- Washington, E., & Griffiths, B. (2015). *Competencies at Work: Providing a Common Language for Talent Management*. Business Expert Press.

- Weigand, R. A. (2014). *Applied equity analysis and portfolio management + online video course: Tools to analyze and manage your stock portfolio* (1st ed.). Wiley.
- Wen, Q., & Qiang, M. (2019). Project managers' competences in managing project closing. *Project Management Journal*, 50(3), 361–375. <https://doi.org/10.1177/8756972819832783>
- Werner, J. M. (2021). *Human resource development: Talent development* (8th ed.). Cengage Learning.
- White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review*, 66(5), 297–333. <https://doi.org/10.1037/h0040934>
- Young, M., & Conboy, K. (2013). Contemporary project portfolio management: Reflections on the development of an Australian Competency Standard for Project Portfolio Management. *International Journal of Project Management*, 31(8), 1089–1100. <https://doi.org/10.1016/j.ijproman.2013.03.005>
- Yun, H., Lee, M., Kang, Y. S., & Seok, J. (2020). Portfolio management via two-stage deep learning with a joint cost. *Expert Systems with Applications*, 143, 113041. <https://doi.org/10.1016/j.eswa.2019.113041>
- Zhang, C., Zhao, Y., Li, T., & Zhang, X. (2020). A post mining method for extracting value from massive amounts of building operation data. *Energy and Buildings*, 223, 110096. <https://doi.org/10.1016/j.enbuild.2020.110096>
- Zhang, X., Fang, L., Hipel, K. W., Ding, S., & Tan, Y. (2020). A hybrid project portfolio selection procedure with historical performance consideration. *Expert Systems with Applications*, 142, 113003. <https://doi.org/10.1016/j.eswa.2019.113003>
- Zheng, Y. (2021). Design of a blockchain-based e-portfolio evaluation system to assess the education and teaching process. *International Journal of Emerging Technologies in Learning (IJET)*, 16(05), 261–280. <https://doi.org/10.3991/ijet.v16i05.21081>
- Zia, M. N. (2020). A review paper on identification of critical success factors (CSFs) for successful project management of construction projects. *Journal of Management Practices, Humanities and Social Sciences*, 4(2), 29–36. <https://doi.org/10.33152/jmphss-4.2.2>
- Zulfikar, Z. (2017). Benefits of web-based or electronic portfolio assessment in ESL classroom. *Englisia Journal*, 4(1), 1–9. <https://doi.org/10.22373/ej.v4i1.752>

APPENDIX A: ONLINE SURVEY QUESTIONNAIRE

Preface (instruction)

Hello dear participant!

Thank you for your readiness to participate in the international research on the topic of project portfolio management competencies. Below you will see three general questions, helping me to know more about you, and five open-ended questions devoted to the various parts of competencies. I am kindly asking you to share your professional opinion on these questions.

Questions

1. The country you represent
2. Years of experience in project portfolio management
3. Industry in which you have the most working experience as a project portfolio manager
4. Knowledge areas essential for a project portfolio manager (e.g. risks, strategy, organizational policy etc.)
5. Abilities essential for a project portfolio manager (e.g., portfolio prioritization, status reporting, presentation skills etc.)
6. Essential qualifications needed to perform project portfolio manager job functions (e.g., years of experience, fluency in languages, certifications etc.)
7. Essential personality characteristics needed for a project portfolio manager (e.g., reliability, result orientation, flexibility etc.)
8. Essential values for a project portfolio manager (e.g., be transparent, connect organisational priorities with the portfolio, improve ongoing performance etc.)

Afterword (final question)

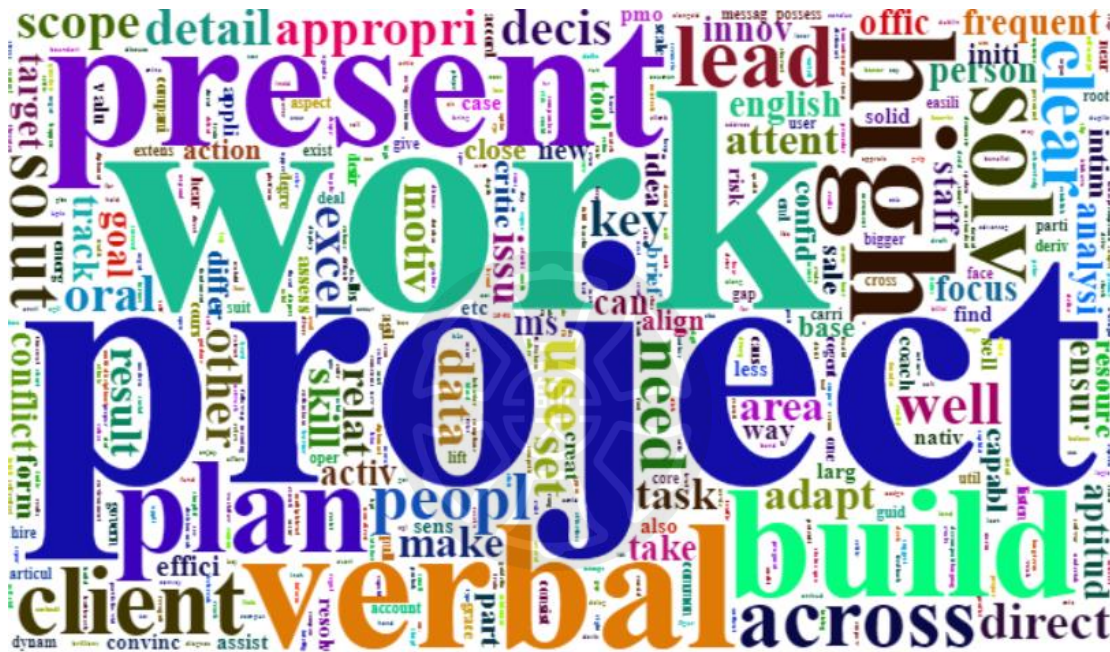
9. My final goal is to build a competency model for a project portfolio manager. Your answers are important information to achieve this goal. If you want to take part in the second stage – validation of the competency model – please, write your e-mail (it is optional).

APPENDIX B: WORD CLOUDS

According to the word frequencies, described in the section “Frequently used stems in the descriptions of competency elements” of chapter IV, this appendix contains word clouds of each competency element data set (Figures B1-B.4). Competency element for knowledge was presented in the abovementioned section of the thesis report (Figure 4.3).

Figure B1

Frequently Used Stems for The Description of Abilities



Frequently Used Stems for The Description of Behavior



Frequently Used Stems for The Description of Attitude



Frequently Used Stems for The Description of Qualification



APPENDIX C: DENDROGRAMS FOR LDA TOPIC MODELS

According to the topic modelling, described in the section “topic modelling results” of chapter IV, this appendix contains dendrograms for LDA topic modelling of each competency element (Figures C.1-C.4). Dendrogram for LDA topic modelling of knowledge was presented in the abovementioned section of the thesis report (Figure 4.4).

Figure C1

Dendrogram for LDA Topic Modelling of the Competency Element Abilities

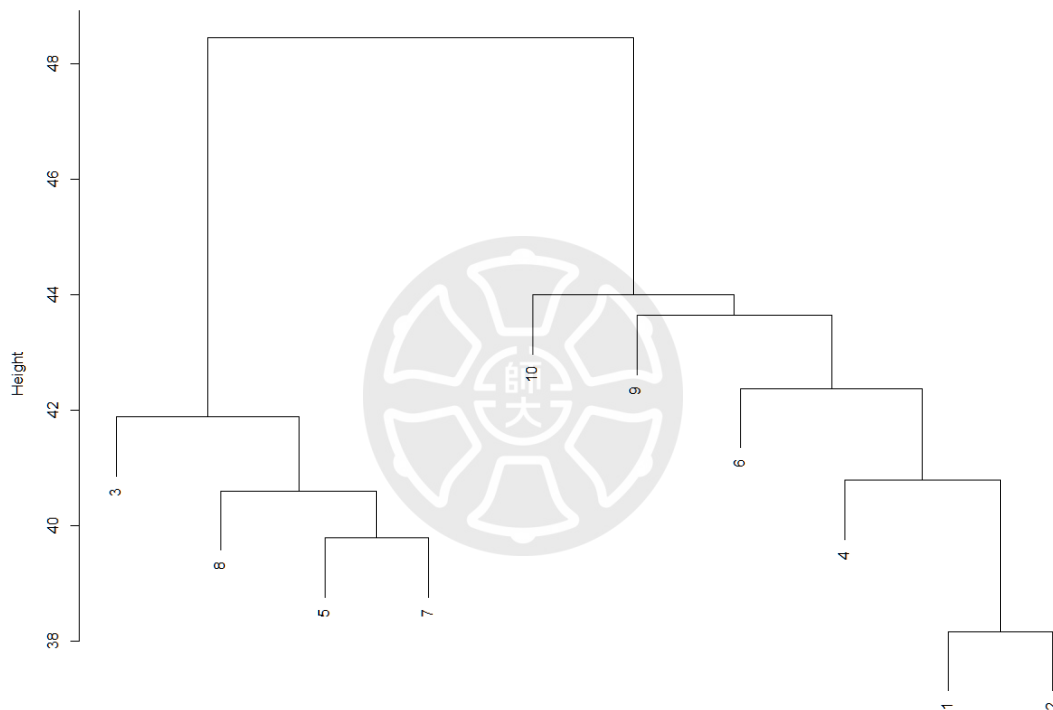


Figure C2

Dendrogram for LDA Topic Modelling of the Competency Element Behaviour

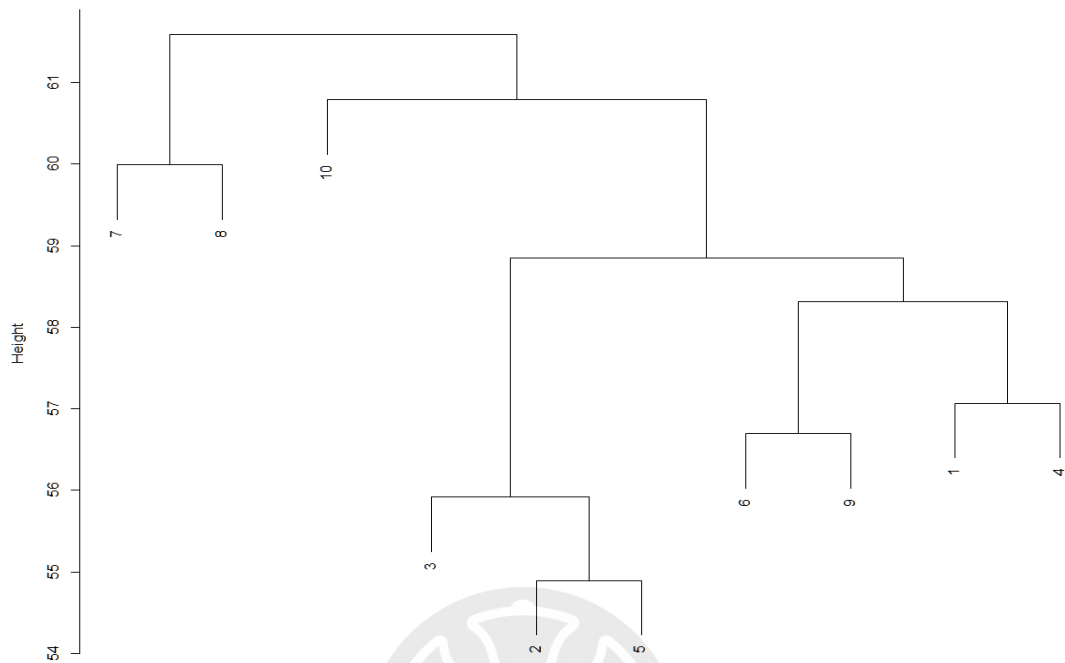


Figure C3

Dendrogram for LDA Topic Modelling of the Competency Element Attitude

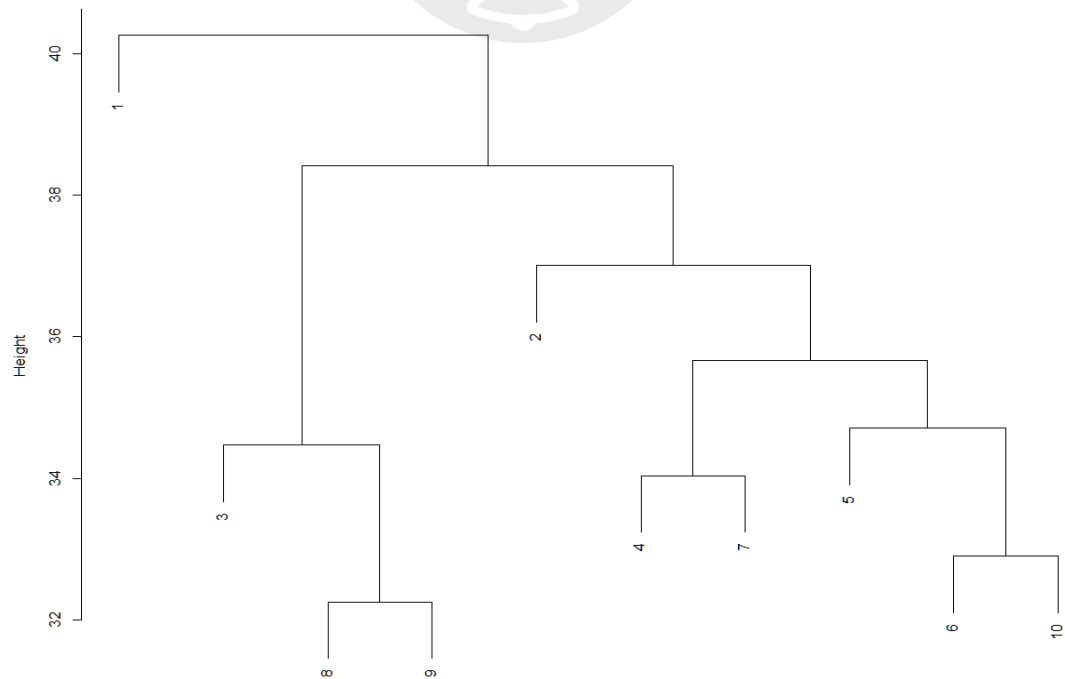
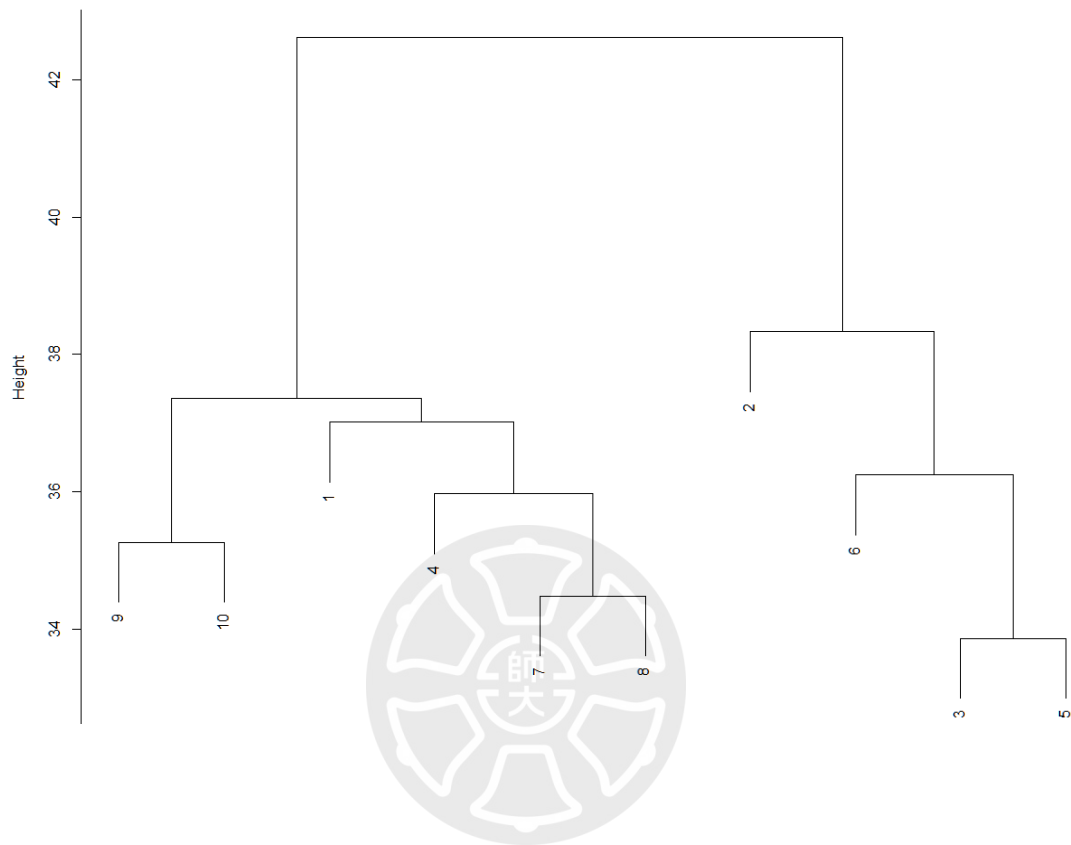


Figure C4

Dendrogram for LDA Topic Modelling of the Competency Element Qualification



APPENDIX D: TRANSITIONAL DATA FOR PFM COMPETENCY MODELLING

Table D1

Competency Model for a PFM With the Levels of Mastery

Competency element	Level	Indicator number	Competency indicator
Attitude	Critical	atd.3	transparency and connection to time
		atd.4	attitude to improvement teams' and stakeholders' communications and work environment
		atd.5	result-orientation focus
	Desirable	atd.1	analytical attention to the details
		atd.2	attitude to problems as valuable changes
		atd.6	attitude to commercialisation of work delivery for stakeholders within the organization
		atd.7	enable individual performance in project portfolio management

(continued)

Table D1*Final Competency Model for a PfM (continued)*

Competency element	Level	Indicator number	Competency indicator
Ability	Critical	abl.3	ability to write and deliver analytical presentations on the portfolio process
		abl.4	leadership in effective presentations and verbal, written, and interpersonal communications with stakeholders on all levels
		abl.5	ability to execute change plans and problem-solving thinking in priority of the strategy
		abl.6	ability to build business relationships across work and use them for solving problems
		abl.7	ability to prioritize work for multiply stakeholders
		abl.8	ability to use benchmarking informational solutions for projects
	Desirable	abl.1	ability to attentively assess details in complex plans for leaded projects and products to identify opportunities for the organizations
Knowledge	Critical	knl.2	understanding of principles and systems of reporting in project portfolio management
		knl.4	knowledge of managing risks and opportunities in agile and waterfall methodologies
		knl.6	knowledge of standard methods for cost estimation
	Desirable	knl.1	knowledge of techniques and methods of strategical and transformational thinking
		knl.3	knowledge of steps in the resource management business process
		knl.5	knowledge of regulatory practices, information and negotiation strategies for managing project risks

(continued)

Table D1*Final Competency Model for a PfM (continued)*

Competency element	Level	Indicator number	Competency indicator
Qualification	Critical	qlf.3	mastering level in relevant stakeholder management techniques with preferable professional certification (e.g., PMP®, PfMP®)
		qlf.5	diverse experience on analytical or leading roles in projects
		qlf.6	experience in managing a portfolio in agile and waterfall environments
	Desirable	qlf.1	inclusion in leading technologies for teamwork
		qlf.2	bachelor degree or operations in a related field
		qlf.4	certificates of participation in strategical or leadership international programs
		qlf.7	experience in dealing with various business processes within an industry

(continued)

Table D1*Final Competency Model for a PfM (continued)*

Competency element	Level	Indicator number	Competency indicator
Behaviour	Critical	bhv.1	ensure plans and executed according to the business strategy and support management teams of the projects, programs, and products included into a portfolio
		bhv.2	develop a portfolio management plan and a process to support the delivery of the projects and products according to the business strategy
		bhv.3	develop strategy and performance management process for the strategical projects
	Desirable	bhv.5	manage the process of portfolio reporting by ensuring the project team makes required goals and business needs
		bhv.4	ensure project and program teams identify works, manage and improve resources according to the business of the organization
		bhv.6	plan and develop the portfolio according to the performance of the project management teams

Note. Indicator numbers were formed using the competency element name abbreviated with the first letter plus two more unique consonant letters and the position number in the competency model, which was obtained before validation (Table 4.11).

Table D2*Comparison of the Obtained PFM Competency Model With the Standard ICB*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Attitude	Critical	atd.3	transparency and connection to time	Personal integrity and reliability
		atd.4	attitude to improvement teams' and stakeholders' communications and work environment	Teamwork, Personal communication
		atd.5	result-orientation focus	Results orientation
	Desirable	atd.1	analytical attention to the details	Results orientation, all competencies from Practice domain
		atd.2	attitude to problems as valuable changes	Change and transformation, Risk and opportunity
		atd.6	attitude to commercialisation of work delivery for stakeholders within the organization	Benefits, Power and interests
		atd.7	enable individual performance in project portfolio management	Self-reflection and self-management, Culture and values

(continued)

Table D2*Comparison of the Obtained PFM Competency Model With the Standard ICB (continued)*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Ability	Critical	abl.3	ability to write and deliver analytical presentations on the portfolio process	Personal communication, Plan and control, Organisation and information
		abl.4	leadership in effective presentations and verbal, written, and interpersonal communications with stakeholders on all levels	Personal communication, Leadership, Power and interests
		abl.5	ability to execute change plans and problem-solving thinking in priority of the strategy	Strategy, Resourcefulness, Conflict and crisis
		abl.6	ability to build business relationships across work and use them for solving problems	Relationships and engagement, Personal communication
		abl.7	ability to prioritize work for multiply stakeholders	Result-orientation, Benefits
		abl.8	ability to use benchmarking informational solutions for projects	Compliance, standards and regulations

(continued)

Table D2*Comparison of the Obtained PFM Competency Model With the Standard ICB (continued)*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Ability	Desirable	abl.1	ability to attentively assess details in complex plans for leaded projects and products to identify opportunities for the organizations	Plan and control, Benefits, Select and balance
Knowledge	Critical	kn1.2	understanding of principles and systems of reporting in project portfolio management	Compliance, standards and regulations, Plan and control, Governance, structures and processes
		kn1.4	knowledge of managing risks and opportunities in agile and waterfall methodologies	Risk and opportunity
		kn1.6	knowledge of standard methods for cost estimation	Finance
	Desirable	kn1.1	knowledge of techniques and methods of strategical and transformational thinking	Strategy, Change and transformation, Resourcefulness
		kn1.3	knowledge of steps in the resource management business process	Governance, structures and processes, Resources

(continued)

Table D2*Comparison of the Obtained PfM Competency Model With the Standard ICB (continued)*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Knowledge		knf.5	knowledge of regulatory practices, information and negotiation strategies for managing project risks	Change and transformation, Risk and opportunity
Qualification	Critical	qlf.3	mastering level in relevant stakeholder management technics with preferable professional certification (e.g., PMP®, PfMP®)	Stakeholders, Compliance, standards and regulations
		qlf.5	diverse experience on analytical or leading roles in projects	n/a
		qlf.6	experience in managing a portfolio in agile and waterfall environments	n/a
	Desirable	qlf.1	inclusion in leading technologies for teamwork	Teamwork, Personal communication, Compliance, standards and regulations
		qlf.2	bachelor degree or operations in a related field	n/a
		qlf.4	certificates of participation in strategical or leadership international programs	n/a

(continued)

Table D2*Comparison of the Obtained PFM Competency Model With the Standard ICB (continued)*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Qualification		qlf.7	experience in dealing with various business processes within an industry	Compliance, standards and regulations, Governance, structures and processes
Behaviour	Critical	bhv.1	ensure plans and executed according to the business strategy and support management teams of the projects, programs, and products included into a portfolio	Strategy, Plan and control, Leadership
		bhv.2	develop a portfolio management plan and a process to support the delivery of the projects and products according to the business strategy	Portfolio design, Select and balance, Strategy
		bhv.3	develop strategy and performance management process for the strategical projects	Strategy, Quality, Benefits
		bhv.5	manage the process of portfolio reporting by ensuring the project team makes required goals and business needs	Teamwork, Plan and control, Quality

(continued)

Table D2*Comparison of the Obtained PfM Competency Model With the Standard ICB (continued)*

Competency element	Level	Indicator number	Competency indicator	Fitted competencies in ICB
Behaviour	Desirable	bhv.4	ensure project and program teams identify works, manage and improve resources according to the business of the organization	Resources, Teamwork, Benefits
		bhv.6	plan and develop the portfolio according to the performance of the project management teams	Portfolio design, Scope

Note. Competency names in the column “Fitted competencies in ICB” are all had taken from the international standard by IPMA, 2015, *Individual Competence Baseline for Portfolio Management*, pp. 39-172. Copyright 2015 International Project Management Association (IPMA®).