JOÃO WALTER SAUNDERS PACHECO DO VALE

EXPLORING THE RELATIONSHIP AMONG PERSONAL COMPETENCE, RESILIENCE AND RESPONSE AGILITY: THE MEDIATE EFFECT OF PERSONAL STRENGTH

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JOÃO WALTER SAUNDERS PACHECO DO VALE

Exploring the relationship among personal competence, resilience and response agility: the mediate effect of personal strength

Versão Corrigida

Thesis submitted at the Polytechnic School of University of São Paulo (USP) for the degree of Doctor of Science.

Supervisor: Full Professor Dra. Marly Monteiro de Carvalho

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JOÃO WALTER SAUNDERS PACHECO DO VALE

Explorando a relação entre competência pessoal, resiliência e agilidade de resposta: o efeito mediador da força pessoal

Versão Corrigida

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Assinatura do orientador: _____

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sempre.

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ABSTRACT

Identifying the most suitable project manager to lead a project is a necessity in many organizations.The purpose of this thesis was to analyze the relationship between resilience and the personal Competences of project managers. This thesis was developed in the thesis model by scientific articles, more precisely, four articles were developed, 1 published, 2 submitted and one in the submission phase. The research methods used were systematic literature review, content analysis of employment opportunities, multi-case study and survey, so qualitative and quantitative approachs were used. The systematic literature reviews allowed the definition of the theme, the identification of the main variables and supported the construction of the theoretical-conceptual model of this thesis. The case study made it possible to explore the process of selecting project managers and developing their competences, this stage involved both semi-structured interviews and documentary analysis. Finally, a model was developed based on the understanding of resilience and personal competence treated in the literature reviews and the confirmatory stage was carried out through a survey. The survey was answered by 136 experienced professionals in the area of project management. The data collection instrument was a questionnaire, and the results of this collection were treated using the structural equation model (SEM - Structural Equation Model), with the estimation of partial least squares (PLS - Partial Least Square), for that the Sotware Smart PLS v3.0 was necessary. The Resilience construct was split into two elements, Resilience Personal Strength and Resilience Response Agility and 3 hypotheses were confirmed, Resilience Personal Strength and Resilience Response Agility have a positive influence on Personal Competences and Resilience Personal Strength has a positive influence on Resilience Response Agility that results an indirect influence also on Personal Competences.

Palavras-chave: Project management, Project manager, competence, resilience

RESUMO

Identificar o gerente de projetos mais adequado para conduzir um projeto é uma necessidade em inúmerasorganizações. A presente tese teve como objetido analisar a relação entre a resiliência e as competências pessoais dos gerentes de projetos. Essa tese foi desenvolvida no modelo de tese por artigos científicos, mais precisamente, quatro artigos foram desenvolvidos, 1 publicado, 2 submetidos e 1 em fase de submissão. Os métodos de pesquisa utilizados foram revisão sistemática da literatura, análise de conteúdo de vagas de emprego, estudo de múltiplos casos e survey. Foram mescladas abordagens qualitativas e quantitativas. As revisões sistemáticas de literatura permitiram a definição do tema, a identificação das principais variáveis e apoiaram na construção do modelo teórico-conceitual dessa tese. O estudo de caso permitiu explorar o processo de seleção de gerentes de projetos e o desenvolvimento de suas competências, essa etapa envolveu tanto entrevistas semiestruturadas como também análise documental. Por último, foi elaborado um modelo baseado na compreensão de resiliência e competência pessoal tratados nas revisões de literatura e foi ralizada a etapa confirmatória por meio de um survey. O survey obteve resposta de 136 profissionais experientes na área de gestão de projetos. O instrumento de coleta de dados foi um questionário e os resultados dessa coleta foram tratados utilizado o modelo de equações estruturais (SEM – Structural Equation Model), com a estimação dos mínimos quadrados parciais (PLS – Partial Least Square), o uso do Software Smart PLS v3.0 se fez necessário nessa etapa. O constructo de Resiliência foi desdobrada em dois elementos, Resilience Personal Strength (Resiliência-Força Pessoal) e Resilience Response Agility (Resiliência-Agilidade de Resposta) e 3 hipóteses foram confirmadas, a Resilience Personal Strength e Resilience Response Agility possuem influência positiva nas Competências Pessoais e e Resilience Personal Strength tem influência positiva na Resilience Responsee Agility que resulta em uma influência indireta também nas Competências Pessoais

Palavras-chave: Gestão de projeto, gerente de projeto, competência, resiliência

FIGURES

TABLES

ABREVIATIONS

AIPM	Australian Institute of Project Management
APM	Association for Project Management
GO	General Objective
HR	Human Resource
HRM	Human Resource Management
IPMA	International Project Management Association
ISI	International Scientific Information
PBO	Project Based Organizations
PM	Project Management
PMBOK	Project Management Body of Knowledge
PMCD	Project Management Competency Development
PMI	Project Management Institute
RRA	Resilience Response Agility
RRS	Resilience Personal Strength
SLR	Systematic Literature Review
SO	Specific Objective

SUMMARY

1 Introduction

Organizations use their resources (human, physical or material) to carry out the planning and execution of their projects in order to ensure the success of projects in pursuit of achieving the success of their organizational goals. In this thinking, organizations seek to select project managers with the appropriate skills so that they can efficiently and effectively manage the projects that are dedicated to them. In this context, the human resources sector has the responsibility of selecting the best people as a way to try to ensure the success of the projects, hire the project manager and / or adequately capit it is paramount.

In general, projects are used as a tool to achieve the strategic objectives of organizations and project managers are responsible for the leadership of these projects. (Müller & Turner, 2010; PMI, 2017a)

In its study, Creasy & Anantatmula (2013) point out that a vast literature on project management is focused on the skills and technical skills of project managers, also called hard-skills, however there is a shift in focus from the studies to the interpersonal side of managers, also called soft-skills.

On the selection of project managers, Ahsan, Ho, & Khan (2013) point out that the selection of project managers is a major challenge for organizations, as well as hiring project managers, Sadeghi, Mousakhani, Yazdani, & Delavari, (2014) report that the proper choice of the project manager is a critical success factor for projects.

Talent attraction and retention are key strategic points predicted by high performance organizational culture (Kontoghiorghes, 2016). Also in Project Management (PM) context, investing in key people by providing Human Resource Management (HRM) practices affect project fulfillment (Popaitoon & Siengthai, 2014).

González, Casas, & Coronado (2013) indicate that there is a growing need for industries to identify key competencies that directly relate to the success of the project so that the project manager can acquire or grasp those competencies in order to fulfill their role adequately in the project.

Chipulu, Neoh, & Williams (2013) indicates that different organizations require different characteristics (competencies) of project managers.

Despite Project Management - PM guides have been elaborated to consolidate the PM competences considered as "essential" for the selection of a professional capable of achieving success in projects (APM, 2015; IPMA, 2015; PMI, 2017b), skepticism about competences is still a constant (Chipulu et al., 2013), since different projects demand different skills. (EL-Sabaa, 1999). In light of this, recent studies have sought to identify which competencies are required by organizations to hire their project managers (do Vale, Nunes, & de Carvalho, 2018).

Studies have been carried out with the purpose of identifying the individual impacts of each competency, such as leadership, emotional intelligence, communication, in the success of projects. (Clarke & Kingdom, 2010; Henderson, 2008; Müller & Turner, 2010).

Management in a scenario of increasing complexity leads researchers and practitioners to seek new approaches to managing project management in complex and changing environments where risk and uncertainty are high. (Small & Walker, 2010; Thomas & Mengel, 2008; Williams, 2017)

In general terms, for an organization it’s important to have its project managers ready to deal with complexity, and for that to happen its important that he Project Manager develop more its soft skills rather than its hard skills (Pant & Baroudi, 2008; Ramazani & Jergeas, 2015; Stevenson & Starkweather, 2010; Thomas & Mengel, 2008)

In the midst of diverse approaches to handle complexity management like bricolage, improvisation, adaptability and flexibility, comes the term “resilience”. (Joslin & Müller, 2015; Klein, Biesenthal, & Dehlin, 2015; Leybourne, 2010)

Several studies about the direction/trends of project management, points out that studies torwards dealing with complexity are important, and for that it is important to study about reflective practioners whom are able to adapt and deal with complex situations. (Crawford, Morris, Thomas, & Winter, 2006; Winter, Smith, Morris, & Cicmil, 2006)

As pointed out by Martens & Carvalho (2017) and Thomé, Scavarda, Scavarda, & Thomé, (2016) there is a lack of research of “resilience” into the Project Management context.

This study fits in this wide context, with the purpose of filling this gap and understanding of the relevance of the project manager's competences, with special emphasys on personal competenteces and resilience. With all the attention that is given to the achievement of success in the projects and their consequence of organizational success, the research to be presented contribute in practice to the process of identifying and developing those competences in an organization in the theoretical field in increasing the knowledge of resilience in the context of project management.

1.1 Research Objectives

Previous researches pointed out gaps in resilience in the project management field as mentioned, although there is a vast literature of the term resilience in terms of sectors and contexts, in the field of Project Management is still insipid. To the extent that some texts cite the term of resilience as competence linked to the emotional part (Ahmed, Philbin e Cheema, 2020), others relate to creative ability and problem-solving ability in the face of adversity.

In the aspects related to the competences, this research seeks to fill the literature gap on key competences by comparing the project manager competences from the perspective of the literature and the competences according to the labor market. Not only that, but this thesis also seeks to narrow the gap in the process of understanding how organizations, especially the HR – Human Resource sector, carry out the selection and development process of their project managers.

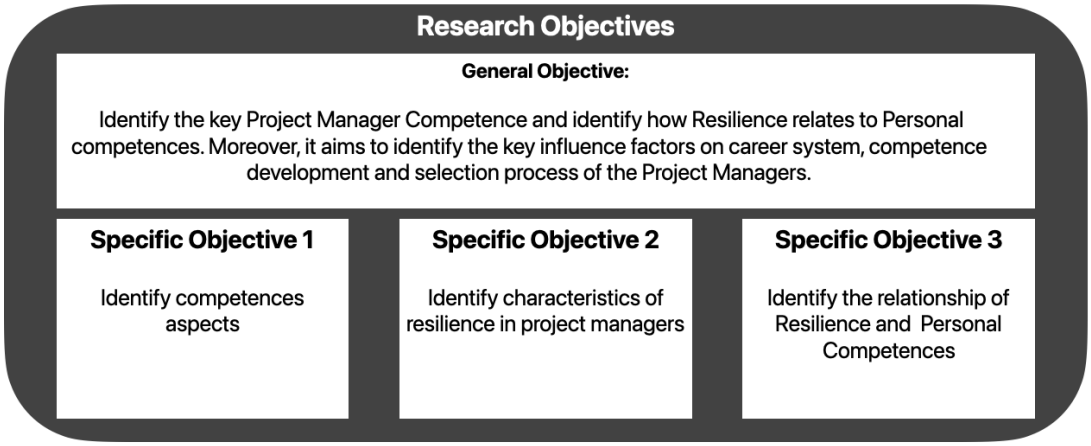
Finally, this study will aim to broaden the understanding of the relationship of the resilience into the project manager's personal competences.

In view of these divergences, the present thesis has as a research question: "How does the resilience influence personal competences of the project manager?". To answer this question, the General Objective (GO) of this thesis is to identify the key Project Manager Competence and identify how Resilience

relates to to Personal competenteces. Moreover, it aims to identify the key influence factors on career system, competence development and selection process of the Project Managers.

The GO is deployed into the following specific objectives (SO): SO1 Identify competences aspects; SO2 identify characteristics of resilience in project managers; and SO3 identify the relationship of PMer competences and resilience skills. Figure 1 synthesize the GO with the SOs.

Figure 1 - Research general and specific objectives.

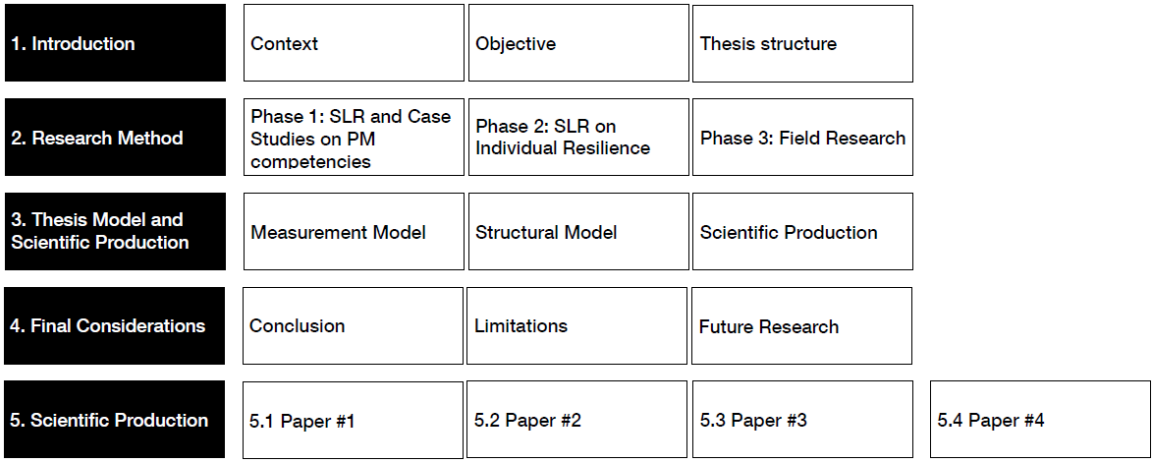


1.2 Thesis Structure

This is an article-based thesis format accepted at the Production Engineering Department of USP. It was divided into five chapters, as shown in Figure 2.

This first chapter brings the context of the research, research objectives and structure of the present document. Following, Chapter 2 presents the overall research approach and the main methods used in the PhD thesis. The research used systematic literature review, case study and survey as research methods. Chapter 3 presents the structural model, the measurement model, the research hypotheses and the list of scientific production. Section 4 contains the main conclusions, limitations and suggestions for future research. At last, Chapter 5 presents the four selected articles produced during the PhD, which content is being discussed in the synthesis covered in the four previous chapters.

Figure 2 - Thesis Structure

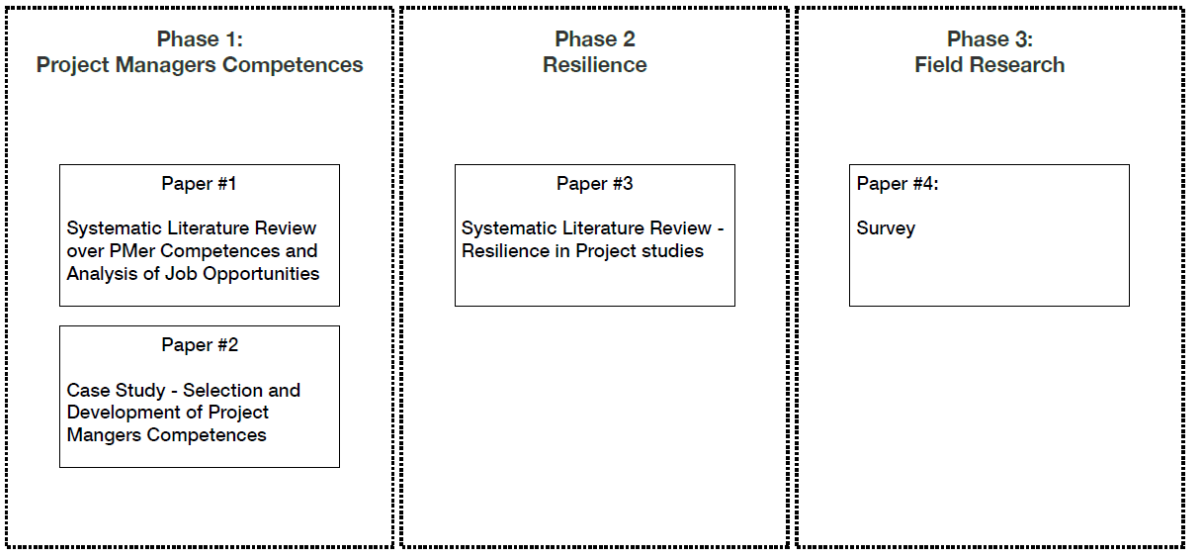


2 Research Method

Throughout this chapter, the methodologies used to develop this thesis are presented. This thesis was structured based on the thesis model for the production of scientific articles. In this format, the objective of the research presented in Chapter 1 is achieved over phases and the articles generated, submitted, and published make up the results of these phases.

Four articles were developed and throughout this process a combined approach was used, that is, it involved both qualitative and quantitative approaches. The main factor that justifies the use of a mixed approach is to obtain complementary evidence that would be difficult to find if only one approach was used (Amaratunga et al., 2002; Bryman, 2007). The Figure 3 presents the phases and articles developed throughout each phase.

Figure 3 - Thesis Phases



This thesis was composed of 3 phases (Figure 3). The first, Phase 1, was researched on the theme of the Competences of project managers, identification of research gaps and was carried out based on the methods: Systematic Literature Review with analysis of Job Vacancies and Case Study, this phase allowed the development of Paper #1 and #2. Phase 2 focused on research on Individual Resilience in the context of projects, this phase allowed a greater understanding of the theme and, for the development of it, the Systematic Review method was used of supported Literature combined with

content analysis and bibliometrics, this phase allowed the elaboration of Paper #3. Finally, Phase 3, focused on the development of the conceptual model of research through the literature review and the quantitative approach through the survey method applying structural equation modeling, this phase was concluded with the development of Paper #4.

The Table 1 below presents the list of articles, the corresponding phase, the contribution to the objective of the thesis and the methods used.

Table 1 – List of articles by method, phase and contribution to the research objective

Paper	Title	Objective	Methods	Research Phase
1	Project Managers' Competences: What Do Job Advertisements and the Academic Literature Say?	GO,SO1	Systematic Literature Review and Analysis of Job Opportunities	1
2	How do companies select project managers and develop their competences?	GO, SO1	Case Study	1
3	Learning from the turbulent and adverse environment to shape future Project Management (PM) professionals: A review on individual resilience in project studies	GO, SO2	Systematic Literature Review	2
4	Exploring the relationship among personal competence, resilience, and response agility: the mediate effect of personal strength	GO, SO3	*Survey*	3

2.1.1 Phase 1 - Project Managers Competences

The first phase of the research was composed of two moments, in the first moment a Systematic Literature Review - SLR was carried out, mixing bibliometrics and content analysis. This first moment was dedicated to understanding the main concepts in the literature about the competences of project managers. Even in this first moment, a content analysis of the websites that offer job advertisements for project managers was carried out, through which it was possible to identify which are the competencies identified as necessary for the candidate's job as a project manager and to carry out a comparison between the literature and what the Ads offered.

The systematic literature review (SLR) has been devoted to understanding the key literature concepts as they relate to project managers competences. Replicable and transparent procedures were adopted as suggested in the literature (Littel, Corcoran, & Pillai, 2008). The SLR performed combinations of bibliometric techniques and content analysis, in order to mitigate the weakness of either of these two methods when applied alone (Carvalho, Patah, & de Souza Bido, 2015).The SLR followed this four steps:

1. Sampling phase: searching protocol (database selection, search terms definition and filters selection);
2. Bibliometrics: sample demographics, citation analysis, network analysis, using UCINET and NetDraw;
3. Immersion: in-depth analysis of the articles and group discussion;
4. Content analysis: codification and tabulation of the areas and research methods (NVivo), and counting of the terms linked to the project managers competences (NVivo).

To perform the content analysis of job advertisements, a spreadsheet was designed to facilitate the organization of the data.

Five employment websites that operate in the recruitment market and selection of employees were used as the source of data.

To finish, a methodological triangulation was performed (Joslin & Muller 2016). Data analysis began using a within-methods analysis, exploring first the results of the literature review, then the results of the job ads, followed by a cross-methods analysis. This research resulted in **Paper #1**.

In the second moment of Phase 1, a multi-case research was conducted to understand the issues related to the selection of project managers based on their competences and the process of developing those.

A case study approach is aligned with the exploratory “how” nature of these RQ research questions (Yin, 2006). This method allows the researcher to analyze significant characteristics of events as organizational changes and managerial processes (Yin, 2006).

Conducting a multi-case study reduces the chance of researcher bias and it enhances external validation (Voss et al., 2002). In addition, using multiples cases provides results that are more robust, generalizable and testable (Eisenhardt and Graebner, 2007). It is considered appropriate to have between four to ten cases.

The case selection criteria used for theoretical sampling were as follows. First, the company was required to have PMer job positions. Second, the company must have a project management office (PMO). Third, the researchers must be allowed access to key stakeholders from different areas related to the research

scope. Fourth, the researchers should be allowed access to key documents, when not restricted, and site observation. Based on these criteria, eight organizations were selected in which to conduct the cases

The research protocol for selecting the interviewees demanded an executive or managerial position in the areas of the research scope, and the interviewee was required to have spent at least 12 months in the company; this was a prerequisite to qualify for the interview.

The case study method consists of understanding the present dynamics of a context and combines several sources of evidence such as: documents, interviews, questionnaires and direct observation (Eisenhardt, 1989). In this research, semi-structured interviews were conducted with professionals who were directly involved in the selection and development process of PMers. In general, the profile of the interviewees was different in each organization, either a member of the human resources department, a member of the PMO, or the manager of the Department. It was a prerequisite of the study that all interviewees had spent at least one year in the company and had already worked for more than one year in the area of PM.

Data was gathered in several ways to allow further triangulation (Voss et al., 2002; Eisenhardt and Graebner, 2007); in particular, interviews and document analysis were used. Prior to the interviews, information was gathered in from documents, reports, through the organizations' website and job posting sites where organizations advertised their job opportunities for project managers. In some cases, if the organization allowed it, the project manager's career plan documentation was also analyzed.

To conduct the interviews, a support script was prepared, containing four blocks of open questions aligned with the literature review presented in Section 2. The script, first, explored the organizational context and the interviewee's overall perception. Second, the key PMer competences required by the organization were explored. Third, questions relating to the PMer selection process were investigated. Finally, the PM career and competence development pathways were explored.

In all the interviews, annotations were made to facilitate the subsequent analysis. All the interviews took place in Brazil, they were recorded, except in one instance where the interviewee asked not to be recorded. The interviews were transcribed and validated with the interviewee.

Content analysis of both the interviews and documents was performed and reports were generated (Duriau et al., 2007), applying a computer-aided approach performed using the software NVivo 12.

The nodes used by NVivo emerged both from the studied literature and from the analysis of the content of the interviews. Nodes were used both in relation to selection and in the development of competences. To point out some, in the selection, nodes related to the sector responsible for the selection, such as: PMO, Area Manager and HR, as well as the most relevant competence group, such as: behavioral, technical, managerial and contextual were used. In the development part, several nodes related to the items in the groupings of the form of learning, such as: group training, on-the-job training, classroom training were used.

An in-depth report of each case was created followed by a cross-case analysis, based on the core topics of each script block. The result of phase 1 was the elaboration of Paper #2.

After a long research on the competences of project managers, Phase 2 was initiated, where research on the topic of Resilience was carried out.

2.1.2 Phase 2 – Resilience

To investigate individual resilience in the context of projects a literature review was conducted based on bibliometrics and content analysis (Littel, Corcoran, & Pillai, 2008). While bibliometry is the study of the quantitative aspects of the production, dissemination and use of the recorded information (Tague-Sutcliffe, 1992), content analysis uses quantitative and qualitative approaches in a set of communication analysis techniques (Bardin, 2010).

The sampling procedures comprised searches in the ISI Web of Science Core Collection (WoS) database and the journals of project management that figure in the Journal Citation Report (JCR). Both sampling strategies were combined

because the ISI Web of Science (WoS) has a higher quality (Chadegani et al., 2013) and the PM journals on JCR due to the robust peer-reviewed literature (Morioka and Carvalho, 2016). Furthermore, these sampling strategies fit the research questions that explore the intersection between resilience and project studies. The searches in the databases were updated until December 2019 that brings some articles published in 2020.

The search strings adopted were "resilience" AND "project* manag*" as topics in all ISI Web of Science databases to guarantee the fit with the research aim at looking in the intersection (AND logic operator) of resilience and Project Management. The asterisk character (*) contained in the searches was used as a wildcard representing any other character. The result presented 68 documents. In the sequence, the results were filtered according to the document type choosing only articles, reviews and early access, reducing the sample to 48 documents.

Then, a screening process was executed based on the following inclusion/exclusion criteria: (i) the need to address the individual level of analysis for resilience, (ii) the need to target both individual resilience and project thematics, (iii) the core theme of the study is resilience. For instance, articles related to environmental disasters and city resilience were excluded. At the end of the screening process, 22 documents remain in the sample.

The other stream of the searching process was in PM journals available in JCR. Hence, these three journals were selected: International Journal of Project Management (IJPM), Project Management Journal (PMJ), and International Journal of Managing Project in Business (IJMPB). In that search, only the term related to resilience (resilience and resilient) was used since the journals' scope already guarantees the PM fit. After the searches, the screening process was run again looking at the same inclusion/exclusion criteria. This search stream led to a further 35 articles of the IJPM, 25 articles of the PMJ, and 16 of the IJMPB, which were added to the Web of Science list. Thus, the total sample is composed of 98 papers. The total sample was used and the metadata in the WOS were extracted.

Finally, a backward snowballing procedure was adopted to capture the core references in the previous sample, looking to capture the intellectual roots of this research topic (Fink, 1995a; 1995b; Wohlin, 2014). The snowballing sampling proved necessary just as the individual resilience concept has over decades of research in different disciplines. This literature strongly influences the emerging conceptual trends on PM.

Firstly, the data analysis was performed with bibliometric analysis to trace the publications' profile on resilience in project studies. The study allowed identifying all the research on the intersection between resilience and the PM context. It was also possible to delineate sample demographics as the prominent authors, the leading journals, the main topics and the most relevant references, as suggested by the literature (Bellis, 2009; Ramos-Rodríguez & Ruíz-Navarro, 2004). The bibliometric analysis was carried out with the aid of VosViewer (Van Eck & Waltman, 2010) and Bibliometrix software (Aria & Cuccurullo, 2017). Then, the trend topics were identified, and the relationship among keywords, authors, and references was drawn through network analysis, applying VosViewer and Bibliometrix.

After that, thematic mapping and thematic evolution analysis were used to understand the conceptual structure, allowing understanding the research theme associations within the sample and selected time slices. To understand the intellectual structure, a historiographic analysis was used to create a chronological perspective, measuring the influence of a paper within a specific research stream. Both analyses of the conceptual structure and the intellectual structure were developed applying Bibliometrix software (Aria & Cuccurullo, 2017).

The content analysis was performed manually in parallel with the coding schema development. For the qualitative content analysis, the most recent published articles and the ones with average citations greater or equaled 2 were selected Those articles represent 86% of the volume of citations. The inductive and deductive coding approach was combined through cycling back and forth between data and theory (Skjott Linneberg & Korsgaard, 2019). Therefore, the first list of codes emerged from the literature screening (inductive coding) and were gradually refined as new codes emerging from the surveyed papers.

In the final step of the analysis, the relationship between codes through cross-tabulation and network analysis was investigated. IBM SPSS software was used for the code cross-tabulation, which was the input for the network analysis performed in the UCINET6 and Netdraw software (Borgatti et al., 2002).

The results of this phase are presented in Paper #3

After the end of Phase 2, it started the Phase 3 the Field Research.

2.1.3 Phase 3 – Field Research

Phase 3 of this research constituted the development of the theoretical model and its validation.

During this Phase, Resilience was understood by having two elements: RPS - Resilience Personal Strength, focused on the part of emotional regulation, optimism, self-efficacy and life structure and the RPA – Resilience Response Agility composed by elements focused on problem-solving based on 3 elements: social resources, knowledge of your self-ability and ability to seek support through connections and relationships (reaching out). The Table 2 illustrates the resilience factors.

Table 2 – Resilience factors

	Resilience Personal Strength				Resilience Response Agility		
Source	**ER - Emotional Regulation**	**OP-Optimism**	**Perception of Self**	**Structured Style**	**Self-Efficacy**	**Reaching Out**	**Social Resources**
Waller (2001)	• Emotional regulation	• Active, easy, outgoing temperament • Positive responsiveness to others • Sense of humor • Hopefulness • Recognized talent accomplishments	• Self-worth • Self-confidence • Reflectiveness	• Competence in normative roles • High intelligence	• Self-efficacy • Problem-solving skills	• Verbal communication skills • Realistic appraisal of the environment • Sense of direction • Educational aspiration school commitment	• Trust in people as resources • Social skills • Appealing to adults • Strong, positive ethnic identity • Faith religious affiliation • Religious participation • Empathy
Alliger et. al (2015)	• Internal sense of control • Emotional Toughness	• Positive attitude	• Realism		• Courage to face fear	• Cognitive flexibility	• Ability to forgive.
Boin and Lagadec (2001)						• Improvisation • Flexibility • Ingenuity	
Reivich and Shatte (2002)	• Impulse control • Emotional Regulation	• Optimism			• Self-efficacy • Causal analysis	• Reaching-out	• Empathy
Berg & Karlsen (2013)		• Hope • Optimism			• Self-efficacy		
Friborg (2005)		• Perception of Future	• Perception of Self	• Structured Style		• Social Competence	• Family Cohesion • Social Resources

From another perspective of project managers, are the competences of these professionals. For personal competences, these were grouped into 4 elements as illustrated on Table 3

Table 3 – Personal competences

Source	Leadership	Communication	Emotional Intelligence	Professionalism
(PMI, 2017b)	• Leading • Managing	• Communicating	• Cognitive Ability	• Professionalism • Effectiveness
(IPMA, 1999)	• Leadership abilities	• Ability to communicate • Ability to get in contact, open-ness	• Initiative, engagement, enthusiasm, ability of motivation • sensibility, self- control, ability of value appreciation, readiness for responsibility, personal integrity • Conflict solving, argumentation culture, fairness.	• Ability to find solutions, holistic thinking. • Loyalty, solidarity, readiness for helping
(IPMA, 2006)	• Leadership • Ethics	• Engagement & motivation • Consultation • Negotatiation	• Self-control • Relaxation • Reliability • Value appreciation • Assertiveness • Openness	• Results Orientation • Creativity • Efficiency • Conflict & Crisis
(IPMA, 2015)	• Leadership	• Personal Communication • Negotiation	• Relationships and engagement • Self-reflection and self-management • Personal integrity and reliability • Teamwork	• Conflict and crisis • Results orientation • Resourcefulness

Resilience has already been identified in several fields as a positive factor in dealing with adversities in the work environment, such as overwork, poor working conditions and lack of autonomy (Eley et al., 2013; Jackson et al., 2007), when it comes to work in the project area, where there are several stressors (Richmond & Skitmore, 2006), it is important not only to identify how resilience is developed, but also what is its effects on the competences of the project manager, in special the personal competenteces which are more relevant to deal with complexity (Pant & Baroudi, 2008; Ramazani & Jergeas, 2015; Stevenson & Starkweather, 2010; Thomas & Mengel, 2008)

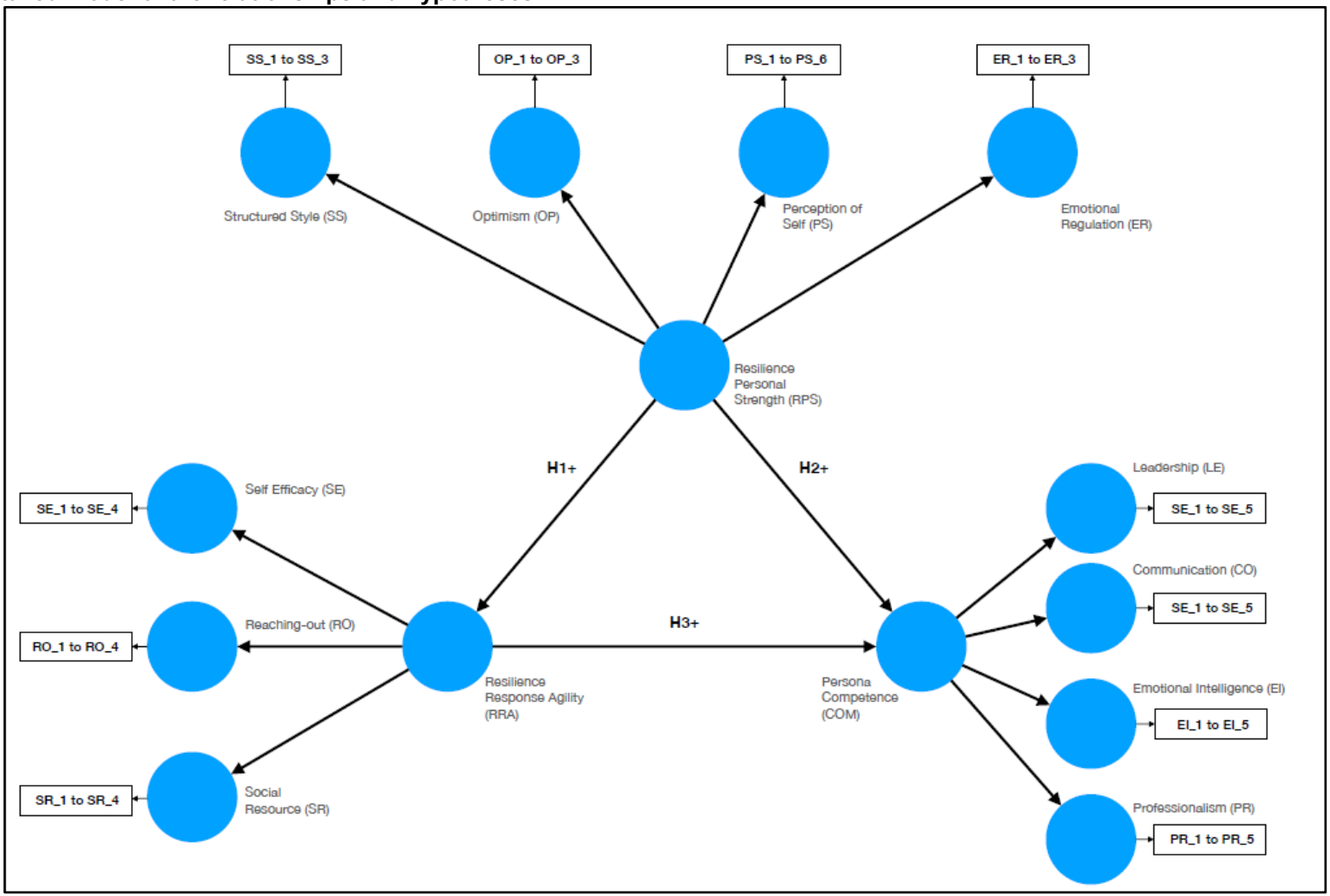
The proposed associations among Resilience Personal Strength and Resilience Response Agility and Personal Competences are presented in Figure 4. Therefore, the following Hypothesis were proposed:

H1: Resilience Personal Strength is directly and positively related with the Resilience Response Agility.

H2: Resilience Personal Strength is directly and positively related with Personal Competences.

H3: Resilience Response Agility is directly and positively related with Personal Competences.

Figure 4– Detailed model of the relationships and hypotheses.



To evaluate the model, a survey-based research was conducted for empirical validation, following the literature guidelines (Flynn et al., 1990; Forza, 2002).

The minimum sample size required was calculated by applying G*Power 3.0 software (Faul, Erdfelder, Lang, & Buchner, 2007), considering the statistical significance level of 5%, power level of 95%, effect size of 20% and number of predictors of 4 (Hair et al., 2005), which resulted in an expected sample size of 89 elements.

The research questionnaire was divided into two blocks, one related to the personal characteristics of the respondent composed of 11 questions and the second block composed of 47 closed questions, applying a 7-point Likert-type scale. A pre-test was performed with 2 specialists to adjust and revise the protocol for data collection.

Finally, A Structural equation modelling (Hair et al., 2013) was constructed to validate the research model and to check the research hypotheses.The analysis was performed using the Smart PLS version 3 software (Ringle et al., 2015) and included both the evaluation of the global model and the structural model (Henseler, Hubona, & Ray, 2016).

The results are presented in Paper #4 as well as in the next chapter.

3 Thesis Model and Scientific Production

The statistical analysis of the model took place by extracting the data from Google Forms, preparing the data and importing the data in SmartPLS 3 (Ringle et al., 2015) to evaluate the structural model and the hypotheses.

3.1 Thesis Model

In this study, all first-order variables are reflective, and just a single round of calculations was needed to validate the measurement model. All reflective LVs show significant loading factors and higher than 0.6, which result in an AVE higher than the minimum value of 0.5 (Fornell & Larcker, 1981), with Cronbach’s alpha and the CR higher than 0.7 (Chin and Newsted, 1999; Henseler et al., 2009; Tenenhaus et al., 2005), as shown in Table 4.

Table 4 – First order latent variables – measurement model validation

	CO	EI	ER	LE	OP	PR	PS	RO	SE	SR	SS	
Communicatio CO	0.742											
Emotional Intelligence EI	0.687	0.731										
Emotional Regulation ER	0.212	0.264	0.781									
Leadership LE	0.507	0.633	0.206	0.791								
Optimism OP	0.513	0.439	0.243	0.293	0.725							
Professionalism PR	0.615	0.610	0.178	0.467	0.367	0.751						
Perception of self PS	0.570	0.549	0.352	0.435	0.611	0.544	0.733					
Reaching out RO	0.444	0.473	0.167	0.392	0.441	0.439	0.479	0.736				
Self efficacy SE	0.511	0.505	0.286	0.400	0.516	0.433	0.565	0.345	0.774			
Social resources SR	0.393	0.345	0.160	0.208	0.353	0.435	0.395	0.213	0.368	0.751		
Structured style SS	0.333	0.299	0.229	0.136	0.346	0.342	0.406	0.166	0.219	0.190	0.810	
Composite Reliability (CR)	0.786	0.851	0.823	0.834	0.765	0.837	0.853	0.822	0.817	0.837	0.851	>0.7
Average Variance Extracted (AVE)	0.551	0.534	0.610	0.626	0.525	0.563	0.538	0.541	0.599	0.565	0.656	>0.5

Note 1: The diagonal contains the AVE square root which is higher than the correlation among variables

Note 2: All correlations are significant at the 1% level

Table 5 - Second order latent variables – measurement model validation

	COM	RPS	RRA	
COM	0,830			
RPS	0.632	0,724		
RRA	0.683	0.661	0,734	
Composite Reliability (CR)	0,898	0,810	0,778	>0.7
Average Variance Extracted (AVE)	0,689	0,525	0,539	>0.5

Note 1: The diagonal contains the AVE square root which is higher than the correlation among variable

Note 2: All correlations are significant at the 1% level

It can be observed that for all the reflective latent variables, the square root of the AVE is higher than the correlation among them, as the discriminant validity criterion was adopted (Henseler et al., 2009; Tenenhaus et al., 2005). For the indicators' reliability, the indicators' loading factor for their respective LV was also analysed (loading factors >=0.6); moreover, for the discriminant validation, it was observed that the correlation must be higher than in any other latent variable, which was also verified.

3.2 Evaluation of the structural model: hypothesis testing

3.3 Exploring the direct effects

The research hypothesis and structural model were tested (see Figure 4) on SmartPLS 3.0 software (Ringle et al., 2015), applying bootstrapping simulation for the nomological validity based on the effect size. Table 6 and Figure 5 show the results of the structural model validation.

Table 6 - Structural model validation

	Hypothesis	VIF	f^2	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	R Square	R Square Adjusted
RPS -> RRA	H1	1.000	0.776	0.661	0.063	10.466	**0.000**	0.437	0.433
RPS -> COM	H2	1.776	0.122	0.321	0.091	3.524	**0.000**	0.525	0.518
RRA -> COM	H3	1.776	0.263	0.471	0.083	5.706	**0.000**		

Hypothesis 1 (**H1**), which states that there is a significant and positive relationship between Resilience Personal Strength and Resilience Response Agility, was confirmed (T *student* = 10466 and p-value = 0,000) as shown in Table 6. About Hypothesis 2 (**H2**) of the present work, which indicates that it indicates that there is a positive and direct relationship between Resilience Personal Strength and Personal Competence (T *student* 3524 and p-value 0,000). Regarding Hypothesis 3 (**H3**), which confirms that there is a positive and direct relationship between Resilience Response Agility and Personal Competence (T *student* = 5706 and p-value 0,000). The Figure 5 presents the validated model.

3.3.1.1.1 Exploring the indirect effects

To better understand the indirect effect is important to analyse the Importance-Performance Map. As mentioned by ("SmartPLS: IPMA - Importance-Performance Map Analysis," 2021): "The resulting importance-performance map permits the identification of determinants with a relatively high importance and relatively low performance. These become major and high priority improvement areas with the goal to in turn increase the performance of the selected key target construct in the PLS path model". As mentioned by Ringle & Sarstedt (2016) IPMA allows you to prioritize the construct to improve the target construct. In this way, it facilitates the identification of areas to carry out the actions.

Thus, it is essential in the research model to perform the importance-performance map (Figure 6) and by the analysis of Table 7, it is possible to identify that for each point expanded in RPS - Resilience Personal Strength is increased by 0,632 in Personal Competences.

Table 7 – Indirect effects evaluation

Effects		Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Direct	RPS -> COM	0.321	0.091	3524	**0.000**
Indirect	RPS -> RRA -> COM	0.311	0.062	5058	**0.000**
Total	RPS -> COM	0.632	0.067	9400	**0.000**

Figure 5 – Structural model validation

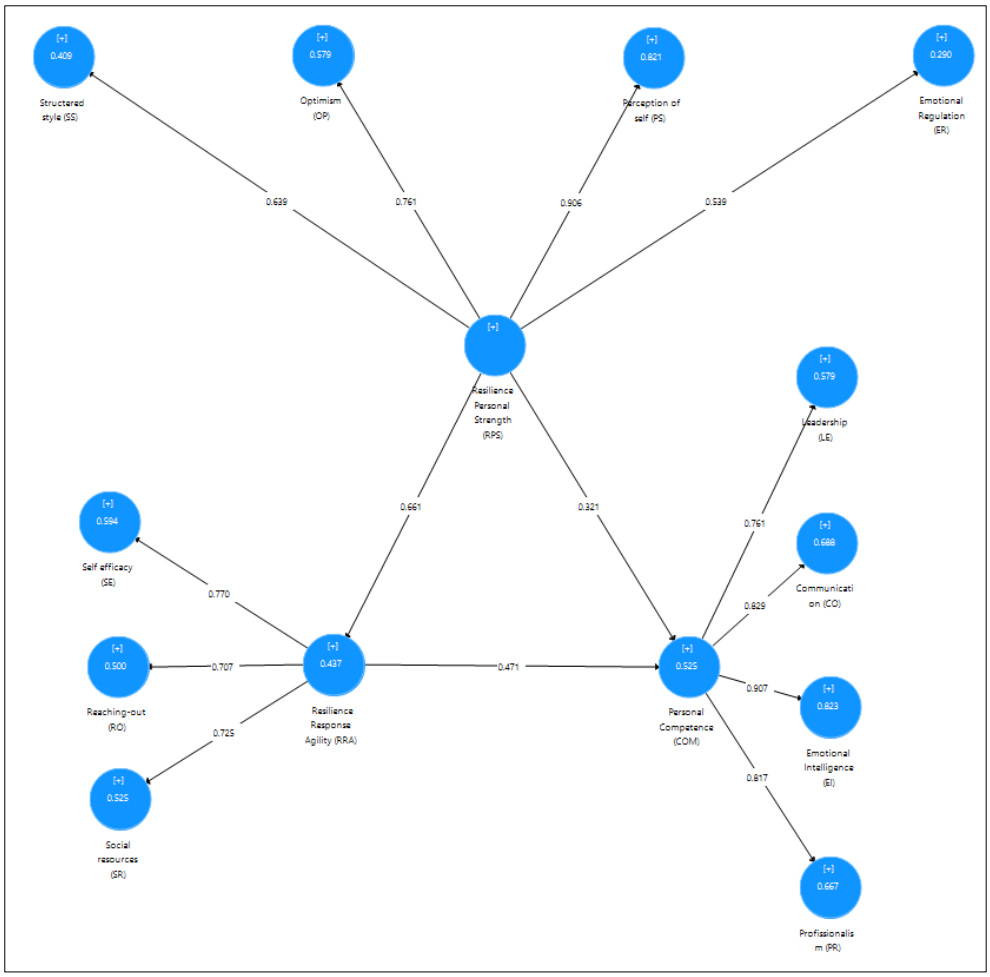
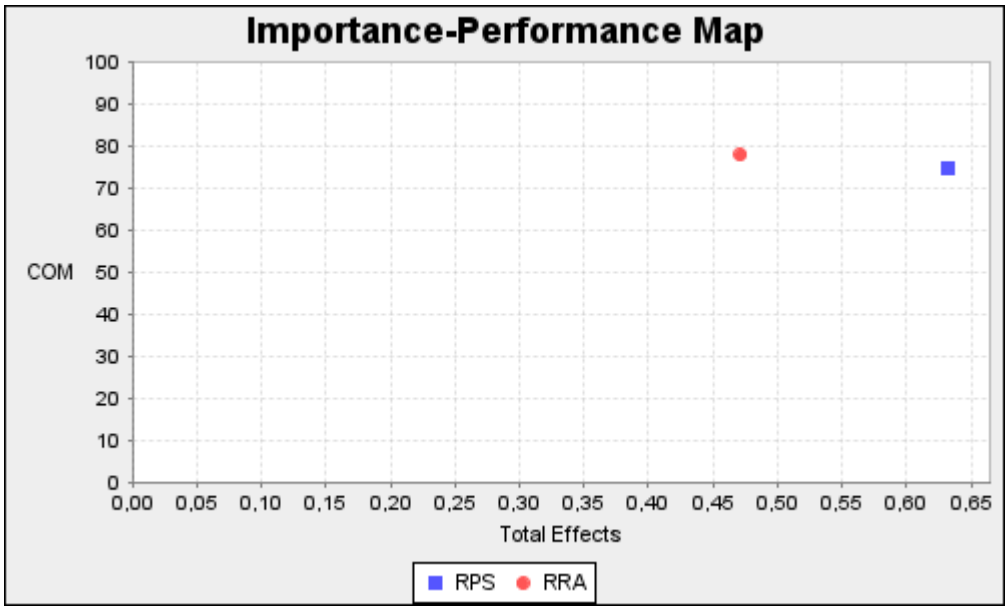


Figure 6 – Importance-Performance map



3.4 Scientific Production

This thesis was structured in the thesis format by scientific articles. The following table (Table 8) presents the list of articles and the information related to each one.

Table 8 – Scientific production

Paper	Section	Title	Journal	Qualis Engenharia III	Objetivo	Método de Pesquisa	Status
#1	5.1	Project Managers' Competences: What Do Job Advertisements and the Academic Literature Say?	Project Management Journal	A2	Compare the competences of project managers with job Ads	Systematic Literature Review and Job Ads Analysis	Published
#2	5.2	How do companies select project managers and develop their competences?	Production Journal	B3	Identify how companies select project managers and develop their competences	Case study	Submitted
#3	5.3	Learning from the turbulent and adverse environment to shape future Project Management (PM) professionals: A review on individual resilience in project studies	Project Management Journal	A2		Systematic Literature Review	Submitted
#4	5.4	Exploring the relationship among personal competence, resilience, and response agility: the mediate effect of personal strength	International Journal of Project Management	A1	Identify the relationship between Resilience and Personal Competences	*Survey*	Submission Phase

4 Final Considerations

This thesis aimed to identify the relationship between resilience and personal competences. To achieve this goal, 4 articles were written over 3 phases.

The relationship between resilience and personal competence proved to be a relevant topic not only in the context of academics, but also from a practical point of view and in terms of training the project manager.

This thesis has several contributions, the first of which is in the fulfillment of Specific Objective 1 (SO1) where it was possible to identify various aspects of the competences of project managers, from the point of view of literature, from the point of view of job opportunities, but also from the point of view of selecting the project manager and developing his competences.

The second contribution happened in the identification of the characteristics and elements of individual resilience in the context of projects (SO2), it was possible to identify the elements that structure this construct based on the different works pointed out in the literature.

Finally, it was possible to assess the relationship between Resilience and Personal Competences (SO3; GO), it was possible to identify that there is a positive relationship between the two elements of resilience: Resilience Personal Strength and Resiliense Response Agility with Personal Competences and that there is a positive relationship between Resilience Personal Strength in Resilience Response Agility that results in an indirect positive relationship also in personal Competences.

This study fits the purpose of filling the gap of lack of resilience studies in project management context as well as understanding of the relevance of the resilience in project manager's personal competences.

This research contributes to the theory because it presents, in a structured way, the relationship of Resilience in the personal Competences of project managers. The result may support the structuring of training curricula for project managers as well as support the agenda on resilience research in project management.

In practical terms, this thesis presents how some organizations are selecting their project managers and developing their competences, in this development process it also shows that the development of their project managers' resilience may result in the

development of their personal Competences, that is, in competencies that are identified as most relevant to the training of this professional.

4.1 Limitations and indications for future work

Regarding articles that involved a systematic literature review (Paper # 1 and # 3), the literature review only used the ISI Web of Science database that, despite the relevance for the academic community, represents just part of the available research, which may have caused the lack of important articles on the topics researched. In the perspective of Paper # 3, this problem was mitigated by the “snowball” approach in the references.

Still in Paper #1, on the issue of job advertisements, the research was limited only to information from a few job ads sites in Brazil. The search could have been expanded to other websites.

About the Paper #2, the work did not seek to identify and/or confirm with PMers the effectiveness of any training provided for the development of PMers Competences.

Lastly in relation to the survey of Paper # 4, the main limitation of this study was the fact that the sample is mainly concentrated in Brazilian respondents, as it was not possible to identify an analysis in relation to the time of experience and/or type of project.

For future research, it suggests the identification of the Impact of Resilience in other competencies such as management as well as the evolution of the agenda on training project managers in resilience.

References

Ahsan, K., Ho, M., & Khan, S. (2013). Recruiting Project Managers: A Comparative Analysis of Competencies and Recruitment Signals from Job Advertisements. Project Management Journal, 44(5), 36–54. http://doi.org/10.1002/pmj.21366

Al, S. (2005). The Resiliency Advantage: Master Change, Thrive Under Pressure, and Bounce Back from Setbacks: Easyread Super Large (5th ed.).

Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. Organizational Dynamics, 44(3), 176–184. http://doi.org/10.1016/j.orgdyn.2015.05.003

Amaratunga, D. et al. (2002). Quantitative and qualitative research in the built environment: application of “mixed” research approach. **Work Study,** v. 51, n. 1, p. 17-31.

APM. (2015). APM Competence Framework.

Aria, M. & Cuccurullo, C. (2017). *bibliometrix*: An R-tool for comprehensive science mapping analysis, *Journal of Informetrics*, 11(4), pp 959-975, Elsevier, DOI: 10.1016/j.joi.2017.08.007 (https://doi.org/10.1016/j.joi.2017.08.007).

Bardin, L. (2010). Análise de conteúdo (5a. Ed.). Lisboa, Portugal.

Berg, M. E., & Karlsen, J. T. (2013). Managing stress in projects using coaching leadership tools. EMJ - Engineering Management Journal, 25(4), 52–61. http://doi.org/10.1080/10429247.2013.11431995

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: The concept, a literature review and future directions. International Journal of Production Research, 49(18), 5375–5393. http://doi.org/10.1080/00207543.2011.563826

Boin, A., & Lagadec, P. (2000). Preparing for the Future: Critical Challenges in Crisis Management. Journal of Contingencies and Crisis Management, 8(4), 185–191. http://doi.org/10.1111/1468-5973.00138

BORGATTI, S., EVERETT, M. & FREEMAN, L. (2002). Ucinet 6 for Windows: software for social network analyzes. Analytic Technologies.

Brill, J. M., Bishop, M. J., & Walker, A. E. (2006). The competencies and characteristic required of an effective project manager: a web-based delphi study. Educational Technology, Research and Development, 54(2), 115–140. http://doi.org/10.1007/s11423-006-8251-y

Bryman, A. (2007). Barriers to Integrating Quantitative and Qualitative Research. Journal of Mixed Methods Research, v. 1, n. 1, p. 8-22.

Carvalho, M. M., Patah, L. A., & de Souza Bido, D. (2015). Project management and its effects on project success: Cross-country and cross-industry comparisons. International Journal of Project Management, 33(7), 1509–1522. http://doi.org/10.1016/j.ijproman.2015.04.004

Chadegani, A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., Farhadi, M., & Ale Ebrahim, N. (2013). A comparison between two main academic literature collections: Web of Science and Scopus databases. Asian social science, 9(5), 18-26.

Chapman, R. J. (2016). A framework for examining the dimensions and characteristics of complexity inherent within rail megaprojects. International Journal of Project Management, 34(6), 937–956. http://doi.org/10.1016/j.ijproman.2016.05.001

Chen, Z., Li, H., Ren, H., Xu, Q., & Hong, J. (2011). A total environmental risk assessment model for international hub airports. International Journal of Project Management, 29(7), 856–866. http://doi.org/10.1016/j.ijproman.2011.03.004

Chin, W. W., & Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares. In R. H. Hoyle (Ed.), Statistical strategies for small sample research (pp. 307-341). Thousand Oaks: CA: Sage Publications.

Chipulu, M., Neoh, J. G., & Williams, T. (2013). Manager Competences, 60(3), 506–517.

Clarke, N. (2010). Emotional Intelligence and Its Relationship to Transformational Leadership and Key Project Manager Competences. Project Management Journal, 41(2), 5–20. http://doi.org/10.1002/pmj.20162

Clarke, N., & Kingdom, U. (2010). Emotional Intelligence and Its Leadership and Key Project Manager, 41(2), 5–20. http://doi.org/10.1002/pmj

Crawford, L. (2000). Profiling the Competent Project Manager. Management, (August), 3–15. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.102.3969&rep=rep1&type=pdf

Crawford, L. (2005). Senior management perceptions of project management competence. International Journal of Project Management, 23(1), 7–16. http://doi.org/10.1016/j.ijproman.2004.06.005

Crawford, L., Morris, P., Thomas, J., & Winter, M. (2006). Practitioner development: From trained technicians to reflective practitioners. International Journal of Project Management, 24(8), 722–733. http://doi.org/10.1016/j.ijproman.2006.09.010

Creasy, T., & Anantatmula, V. S. (2013). From Every Direction—How Personality Traits and Dimensions of Project Managers Can Conceptually Affect Project Success. Project Management Journal, 44(6), 36–51.

Dalcher, D. (2016). Rethinking project practice: emerging insights from a series of books for practitioners. International Journal of Managing Projects in Business, 9(4), 798–821. http://doi.org/10.1108/IJMPB-03-2016-0027

De Rezende, L. B., Blackwell, P., & Pessanha Gonçalves, M. D. (2018). Research Focuses, Trends, and Major Findings on Project Complexity: A Bibliometric Network Analysis of 50 Years of Project Complexity Research. Project Management Journal, 49(1), 42–56. http://doi.org/10.1177/875697281804900104

Deng, X., Pheng, L. S., & Zhao, X. (2014). Project System Vulnerability to Political Risks in International Construction Projects: The Case of Chinese Contractors. Project Management Journal, 45(2), 20–33. http://doi.org/10.1002/pmj.21397

Duriau, V. J., Reger, R. K., & Pfarrer, M. D. (2007). A Content Analysis of the Content Analysis Literature in Organization Studies: Research Themes, Data Sources, and Methodological Refinements. Organizational Research Methods, 10(1), 5–34. http://doi.org/10.1177/1094428106289252

do Vale, J. W. S. P., Nunes, B., & de Carvalho, M. M. (2018). Project Managers' Competences. Project Management Journal, 49(3), 82–97. http://doi.org/10.1177/8756972818770884

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. Academy of Management Review, 14, 532–550. http://doi.org/10.5465/AMR.1989.4308385

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal*, *50*(1), 25-32.

Eley, D. S., Robert Cloninger, C., Walters, L., Laurence, C., Synnott, R., & Wilkinson, D. (2013). The relationship between resilience and personality traits in doctors: Implications for enhancing well being. PeerJ, 2013(1), 1–16. https://doi.org/10.7717/peerj.216

EL-Sabaa, S. (1999). The skills and career path of an effctive project manager. International Journal of Project Management, 19, 1–7. http://doi.org/10.1016/S0263-7863(99)00034-4

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2), 175–191. https://doi.org/10.3758/BF03193146

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research, 18(1), 39. https://doi.org/10.2307/3151312

Forza, C. (2002). Survey research in operations management: a process-based perspective. International journal of operations & production management.

Fink A. (1995a) How to Sample in Surveys, Sage Publications, London

Fink A. (1995b) The Survey Handbook Sage Publications, London

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates, K. A., & Flynn, E. J. (1990). Empirical research methods in operations management. Journal of operations management, 9(2), 250-284.

Friborg, O., Barlaug, D., Martinussen, M., Rosenvinge, J. H., & Hjemdal, O. (2005). Resilience in relation to personality and intelligence. International Journal of Methods in Psychiatric Research, 14(1), 29–42. https://doi.org/10.1002/mpr.15

Geoghegan, L., & Dulewicz, V. (2008). Do Project Managers' Leadership Competencies Contribute to Project Success? Project Management Journal, 39(4), 58–67. http://doi.org/10.1002/pmj.20084

González, G. E. G., Casas, G. H. P., & Coronado, C. A. L. (2013). Project Manager Profile Characterization in the Construction Sector in Bogotá, Colombia. Project Management Journal, 44(6), 68–93. http://doi.org/10.1002/pmj.21381

Hair, J. F., Anderson, R. E., TATHAM, R. B., & BLACK, R. (2005). WC Análise multivariada de dados. Tradução de AS Sant'anna e A. Cloves Neto, 5.

Han, W. M. (2014). Validating differential relationships between risk categories and project performance as perceived by managers. Empirical Software Engineering, 19(6), 1956–1966. http://doi.org/10.1007/s10664-013-9270-z

Hauschildt, J. J., Keim, G., & Medcof, J. (2000). Realistic Criteria for Project Manager Selection and Development. Project Management Journal, 31(3), 23–32. http://doi.org/10.1177/875697280003100304

Henderson, L. S. (2008). The Impact of Project Managers' Communication Competencies: Validation and Extension of a Research Model for Virtuality, Satisfaction, and Productivity on Project Teams. Project Management Journal, 39(2), 48–59. http://doi.org/10.1002/pmj.20044

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In New challenges to international marketing. Emerald Group Publishing Limited.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. Industrial Management and Data Systems, 116(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Huemann, M., Keegan, A., & Turner, J. R. (2007). Human resource management in the project-oriented company: A review. International Journal of Project Management, 25(3), 315–323. http://doi.org/10.1016/j.ijproman.2006.10.001

IPMA. (1999). ICB - IPMA Competence Baseline v2.0. In Management.

IPMA. (2006). IPMA Competence Baseline Version 3.0.

IPMA. (2015). Individual Competence Baseline for Project, Programme & Portfolio Management (4.0). Zurich.

Jackson, D., Firtko, A., & Edenborough, M. (2007). Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: A literature review. Journal of Advanced Nursing, 60(1), 1–9. https://doi.org/10.1111/j.1365-2648.2007.04412.x

Joslin, R., & Müller, R. (2015). New Insights into Project Management Research: A Natural Sciences Comparative. Project Management Journal, 46(2), 73–89. http://doi.org/10.1002/pmj.21472

Joslin, R., & Müller, R. (2016). Identifying interesting project phenomena using philosophical and methodological triangulation. International Journal of Project Management, 34(6), 1043-1056

Klein, L., Biesenthal, C., & Dehlin, E. (2015). Improvisation in project management: A praxeology. International Journal of Project Management, 33(2), 267–277. http://doi.org/10.1016/j.ijproman.2014.01.011

Kontoghiorghes, C. (2016). Linking high performance organizational culture and talent management: satisfaction/motivation and organizational commitment as mediators. International Journal of Human Resource Management, 27(16), 1833–1853. http://doi.org/10.1080/09585192.2015.1075572

Leybourne, S. (2010). Project Management and High-Value Superyacht Projects: An Improvisational and Temporal Perspective. Project Management Journal, 41(1), 17–27. http://doi.org/10.1002/pmj.20140

Lin, Y., Kelemen, M., & Kiyomiya, T. (2017). The role of community leadership in disaster recovery projects: Tsunami lessons from Japan. International Journal of Project Management, 35(5), 913–924. http://doi.org/10.1016/j.ijproman.2016.09.005

Littel, J. ., Corcoran, J., & Pillai, V. (2008). Systematic Reviews and Meta-Analysis. Oxford University Press, New York.

Lloyd-Walker, B., & Walker, D. (2011). Authentic leadership for 21st century project delivery. International Journal of Project Management, 29(4), 383–395. http://doi.org/10.1016/j.ijproman.2011.02.004

Loufrani-Fedida, S., & Missonier, S. (2015). The project manager cannot be a hero anymore! Understanding critical competencies in project-based organizations from a multilevel approach. International Journal of Project Management, 33(6), 1220–1235. http://doi.org/10.1016/j.ijproman.2015.02.010

Lundy, V., & Morin, P. P. (2013). Project leadership influences resistance to change: The case of the Canadian Public Service. Project Management Journal, 44(4), 45–64. http://doi.org/10.1002/pmj.21355

Luthans, F., Vogelgesang, G. R., & Lester, P. B. (2006). Developing the Psychological Capital of Resiliency. Human Resource Development Review, 5(1), 25–44. http://doi.org/10.1177/1534484305285335

MacAskill, K., & Guthrie, P. (2017). Organisational complexity in infrastructure reconstruction – A case study of recovering land drainage functions in Christchurch. International Journal of Project Management, 35(5), 864–874. http://doi.org/10.1016/j.ijproman.2017.02.013

Marsh, S. J., & Stock, G. N. (2003). Building Dynamic Capabilities in New Product Development through Intertemporal Integration, (815), 136–148.

Martens, M. L., & Carvalho, M. M. (2017). Key factors of sustainability in project management context: A survey exploring the project managers' perspective. International Journal of Project Management, 35(6), 1084–1102. http://doi.org/10.1016/j.ijproman.2016.04.004

Morioka, S. N., & de Carvalho, M. M. (2016). A systematic literature review towards a conceptual framework for integrating sustainability performance into business. *Journal of Cleaner Production*, *136*, 134-146.

Mu, R., & Turner, J. R. (2010). Attitudes and leadership competences for project success, 5(3), 307–329. http://doi.org/10.1108/17465261011079730

Müller, R., & Turner, R. (2010). Leadership competency profiles of successful project managers. International Journal of Project Management, 28(5), 437–448. http://doi.org/10.1016/j.ijproman.2009.09.003

Musca, G. N., Mellet, C., Simoni, G., Sitri, F., & de Vogüé, S. (2014). "Drop your boat!": The discursive co-construction of project renewal. The case of the Darwin mountaineering expedition in Patagonia.

International Journal of Project Management, 32(7), 1157–1169. http://doi.org/10.1016/j.ijproman.2014.02.006

Novi, F. (2018). Bayesian networks as a resilience tool for decision-making processes in uncertainty conditions. Techne, 15, 341–347. http://doi.org/10.13128/Techne-22100

Pant, I., & Baroudi, B. (2008). Project management education: The human skills imperative. International Journal of Project Management, 26(2), 124–128. http://doi.org/10.1016/j.ijproman.2007.05.010

Pinto, A., De Matheus Cota, M. F., & Levin, D. G. (2010). The PMO Maturity Cube, a Project management iffice maturity model. PMI Research and Education Congress 2010, Washington D.C., USA, (February), 1–56.

PMI. (2017a). Project Management Body of Knowledge - PMBOK.

PMI. (2017b). Project Management Competency Development Framework - 3 Ed (Third edit). Pennsylvania: PMI Publications.

Popaitoon, S., & Siengthai, S. (2014). The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. International Journal of Project Management, 32(6), 908–920. http://doi.org/10.1016/j.ijproman.2013.12.002

Qazi, A., Quigley, J., Dickson, A., & Kirytopoulos, K. (2016). Project Complexity and Risk Management (ProCRiM): Towards modelling project complexity driven risk paths in construction projects. International Journal of Project Management, 34(7), 1183–1198. http://doi.org/10.1016/j.ijproman.2016.05.008

Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. International Journal of Project Management, 33(1), 41–52. http://doi.org/10.1016/j.ijproman.2014.03.012

Ramos-Rodríguez, A. R., & Ruíz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. Strategic management journal, 25(10), 981–1004.

Reivich, K., & Shatté, A. (2002). The resilience factor: 7 essential skills for overcoming life's inevitable obstacles. New York.

Richmond, A., & Skitmore, M. (2006). Stress and Coping: A Study of Project Managers in a Large ICT Organization. Project Management Journal, 37(5), 5–16. https://doi.org/10.1177/875697280603700502

Ringle, C. M., & Sarstedt, M. (2016). Gain more insight from your PLS-SEM results the importance-performance map analysis. Industrial Management and Data Systems, 116(9), 1865–1886. https://doi.org/10.1108/IMDS-10-2015-0449

Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Sadeghi, H., Mousakhani, M., Yazdani, M., & Delavari, M. (2014). Evaluating Project Managers by an Interval Decision-Making Method Based on a New Project Manager Competency Model. Arabian Journal for Science and Engineering, 39(2), 1417–1430. http://doi.org/10.1007/s13369-013-0631-0

Sadiqi, Z., Trigunarsyah, B., & Coffey, V. (2017). A framework for community participation in post-disaster housing reconstruction projects: A case of Afghanistan. International Journal of Project Management, 35(5), 900–912. http://doi.org/10.1016/j.ijproman.2016.11.008

Schildt, H. (2002). Sitkis: Software for Bibliometric Data Management and Analysis. Helsinki: Institute of Strategy and International Business. Helsinki: Institute of Strategy and International Business.

Shao, J. (2018). The moderating effect of program context on the relationship between program managers' leadership competences and program success. International Journal of Project Management, 36(1), 108–120. http://doi.org/10.1016/j.ijproman.2017.05.004

Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. In Qualitative Research Journal (Vol. 19, Issue 3, pp. 259–270). Emerald Group Publishing Ltd. https://doi.org/10.1108/QRJ-12-2018-0012

Skulmoski, G. J., Dhabi, A., Emirates, U. A., & Hartman, F. T. (2010). Information Systems Project Manager Soft Competencies: A Project-Phase Investigation, 41(1), 61–80. http://doi.org/10.1002/pmj

Small, J., & Walker, D. (2010). The emergent realities of project praxis in socially complex project environments. International Journal of Managing Projects in Business, 3(1), 147–156. http://doi.org/10.1108/17538371011014071

Stevenson, D. H., & Starkweather, J. A. (2010). PM critical competency index : IT execs prefer soft skills. International Journal of Project Management, 28(7), 663–671. http://doi.org/10.1016/j.ijproman.2009.11.008

Tague-Sutcliffe, J. (1992). An introduction to informetrics. *Information processing & management*, *28*(1), 1-3.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS path modeling. Computational statistics & data analysis, 48(1), 159-205.

Thomas, J., & Mengel, T. (2008). Preparing project managers to deal with complexity - Advanced project management education. International Journal of Project Management, 26(3), 304–315. http://doi.org/10.1016/j.ijproman.2008.01.001

Thomé, A. M. T., Scavarda, L. F., Scavarda, A., & Thomé, F. E. S. de S. (2016). Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects. International Journal of Project Management, 34(7), 1328–1346. http://doi.org/10.1016/j.ijproman.2015.10.012

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics, 84(2), 523–538. http://doi.org/10.1007/s11192-009-0146-3

Voss, C., Tsikriktsis, N., & Frohlich, M. (2002). Case research in operations management. International Journal of Operations & Production Management, 22(2), 195–219. http://doi.org/10.1108/01443570210414329

Walker, B., de Vries, H. P., & Nilakant, V. (2017). Managing legitimacy: The Christchurch post-disaster reconstruction. International Journal of Project Management, 35(5), 853–863. http://doi.org/10.1016/j.ijproman.2016.07.007

Waller, M. A. (2001). Resilience in {Ecosystemic} {Context}: {Evolution} of the {Concept}. American Journal of Orthopsychiatry, 71(3), 290–297.

Wang, C. M., Xu, B. B., Zhang, S. J., & Chen, Y. Q. (2016). Influence of personality and risk propensity on risk perception of Chinese construction project managers. International Journal of Project Management, 34(7), 1294–1304. http://doi.org/10.1016/j.ijproman.2016.07.004

Williams, T. (2017). The Nature of Risk in Complex Projects. Project Management Journal, 48(4), 55–66. http://doi.org/10.1177/875697281704800405

Winter, M., Smith, C., Morris, P., & Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government-funded research network. International Journal of Project Management, 24(8), 638–649. http://doi.org/10.1016/j.ijproman.2006.08.009

Wohlin, C. (2014), “Guidelines for snowballing in systematic literature studies and a replication in software engineering”, Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering - EASE ’14, ACM Press, New York, New York, USA, pp. 1–10.

Wong, P. S. P., Cheung, S. O., Yiu, R. L. Y., & Hardie, M. (2012). The unlearning dimension of organizational learning in construction projects. International Journal of Project Management, 30(1), 94–104. http://doi.org/10.1016/j.ijproman.2011.04.001

Yin, R. K. (2006). Case Study Reserach - Design and Methods. Clinical Research, 2, 8–13. http://doi.org/10.1016/j.jada.2010.09.005

Zhong, Y., & Pheng Low, S. (2009). Managing crisis response communication in construction projects – from a complexity perspective. Disaster Prevention and Management: An International Journal, 18(3), 270–282. http://doi.org/10.1108/09653560910965637

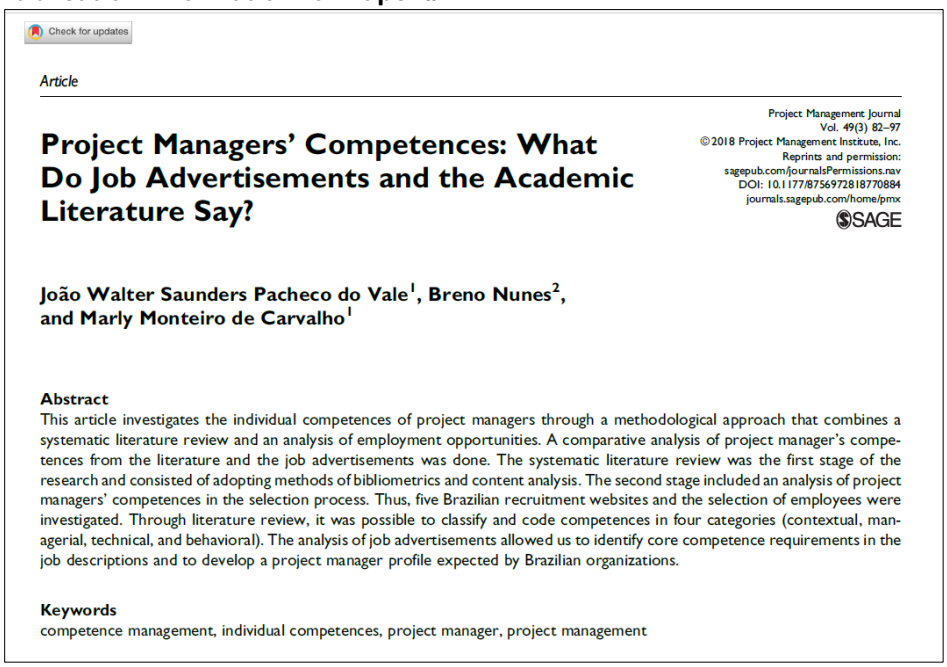
5 Scientific Production

In this section, the 4 articles used in this thesis are presented.

5.1 Paper #1 - Project Managers' Competences: What Do Job Advertisements and the Academic Literature Say?

Status: Article published.

Figure 7 - Publication information for Paper # 1



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Article

Project Managers' Competences: What Do Job Advertisements and the Academic Literature Say?

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João Walter Saunders Pacheco do Vale[1], Breno Nunes[2], and Marly Monteiro de Carvalho[1]

Abstract
This article investigates the individual competences of project managers through a methodological approach that combines a systematic literature review and an analysis of employment opportunities. A comparative analysis of project manager's competences from the literature and the job advertisements was done. The systematic literature review was the first stage of the research and consisted of adopting methods of bibliometrics and content analysis. The second stage included an analysis of project managers' competences in the selection process. Thus, five Brazilian recruitment websites and the selection of employees were investigated. Through literature review, it was possible to classify and code competences in four categories (contextual, managerial, technical, and behavioral). The analysis of job advertisements allowed us to identify core competence requirements in the job descriptions and to develop a project manager profile expected by Brazilian organizations.

Keywords
competence management, individual competences, project manager, project management

Abstract

This article investigates the individual competences of project managers through a methodological approach that combines a systematic literature review and an analysis of employment opportunities. A comparative analysis of project manager's competences from the literature and the job advertisements was done. The systematic literature review was the first stage of the research and consisted of adopting methods of bibliometrics and content analysis. The second stage included an analysis of project managers' competences in the selection process. Thus, five Brazilian recruitment websites and the selection of employees were investigated. Through literature review, it was possible to classify and code competences in four categories (contextual, managerial, technical, and behavioral). The analysis of job advertisements allowed us to identify core competence requirements in the job descriptions and to develop a project manager profile expected by Brazilian organizations.

Keywords
competence management, individual competences, project manager, project management

5.1.1 Introduction

Projects are intended to assist organizations by helping them implement strategic changes required by a dynamic marketplace. Because projects are undertaken as a tool for achieving the strategic goals of organizations, project managers are also responsible for taking leadership roles (Müller & Turner, 2010a). Giraldo González, Pulido Casas, & Leal Coronado (2013) indicate that there are numerous studies that show that the project manager competences are vital to the success of the projects. Similarly, Crawford (2005) reports that project management competences have a major impact on project performance and, as a result, the whole organization performance can also be affected. Nevertheless, the relationship between the project manager and the success still requires further study. (Berssaneti & Carvalho, 2015).

According to PMI (2013), the project manager is responsible for achieving the project objectives. However, the vast literature on the subject also points out that the project management is dependent upon the hard (basic) skills of project managers. Nevertheless, there is a change in the focus of studies towards the interpersonal side of the managers – the so-called 'soft-skills'. Carvalho & Rabechini Junior (2015) go further and suggest that the soft side indeed has a significant effect on project success.

The selection of project managers is a major challenge for organizations (Ahsan, Ho & Khan 2013) and it is a critical success factor for the project (Sadeghi et al. 2013). The ability to be able to select the most appropriate project manager demonstrates organizational maturity in project management and is still a challenge for organizations (Kerzner 2013). It is worthwhile to point out that different organizations (Chipulu, Neoh, & Williams, 2013) and different types of projects (Takey & Carvalho, 2015) require different competences of project managers. In this context, there is a growing interest from scholars and organizations to identify key competences required in each unique situation needed for the selection of a successful project manager (Giraldo González et al., 2013). Because the context may change the profile of the competences required (Takey & Carvalho, 2015), the project manager may need to acquire or learn these competences in order to successfully fulfill his or her role in the project.

In order to identify the competences and point out the guidelines for developing the necessary competences to manage projects, various project management institutions have created guides. Some examples of these institutions are: PMI (Project Management Institute) with PMCD (Project Management Competency Development),

IPMA (International Project Management Association) that created the ICB – Individual Competence Baseline for Project Programme and Portfolio management and APM (Association for Project Management) developed the ACF (APM Competence Framework) and AIPM (Australian Institute of Project Management) with PCSPM (Professional Competency Standards for Project Management) (AIPM, 2010a, 2010b; APM, 2015; IPMA, 2015; PMI, 2007).

Despite the existence of these guidelines, there is some skepticism created by the absence of a definitive empirical basis for its preparation (Chipulu et al., 2013).

In addition to these traditional guidelines, the concept has also attracted interest from scholars in search of the key competences of the project managers, as in recent studies by Medina & Medina (2014) and Takey & Carvalho (2015).

Given the relevance and theme of the importance of project manager competences, this study seeks to fill the literature gap on key competences by comparing the project manager competences according to the literature vision and the competences according to the labor market. To address this objective the research design is based on a systematic literature review and a survey of the job advertisements seeking project managers.

Our aim is to answer the following research question:

What are the key competences for project managers?

This article is structured as follows: the next section will present a review of the main frameworks for Project manager competences. After that, a section on methodology is provided. Then, the results of a systematic literature review and analysis of job advertisements on various websites are presented. The closing sections of the paper are conclusions, implications, and limitations of the research.

5.1.2 Literature Review

For this work, the concept of competence is an assimilation of the concepts identified by PMI (2007), IPMA (2015), AIPM (2010a) and APM (2015). Thus, it is defined here as: knowledge, personal attitude, and the ability or relevant experience that allows performing one or more activities to realize an expected level of performance. Consequently, the concept of core competences can be defined as a set of competences that are considered essential for a person to be accepted as appropriate

for project management. The key competences are usually fundamental to work in project management. (AIPM, 2010a, 2010b; APM, 2015; IPMA, 2015; PMI, 2007).

The guidelines created by those institutes and project management associations bring a comprehensive view of the main competences that a project manager should seek to effectively manage a project. Table 9 presents a synthesis that aims at facilitating an understanding of the competences cited by competence models.

Table 9– Comparative analysis of Project Manager Competences Frameworks

Proposed Competency Model	PMCD ***Project Manager Competency Development Framework* (PMI, 2007)**	ICB **IPMA *Competence Baseline* (IPMA, 2015)**	APM *Competence Framework* **(APM, 2015)**
Behavioral: competences related to personal and social capacities of project manager	**Personal competences:** six personal and social competences that na individual needs.	**People competences:** ten personal and social competences that na individual needs.	Among the 27 competences stablished there are a mix of behavioral, management and contextual competences. For instance, leadership is one of the APM competences.
Technical or specific: related to the activity in which the project manager is inserted	Technical competences are considered "other competences" and the PMCD does not address industry specific competences.	Technical competences elements will be specified, implemented and managed.	Technical competences are related to the integration of design work and production of project deliverables.
Management Competences: PM competences related core activities of project management	**Knowledge:** project manager knowledge about in PM knowledge areas and PM processes **Performance:** project manager performance on PM knowledge areas and PM processes.	**Practical competences:** fourteen competences related to project, programme and portfolio knowledge areas and PM processes.	Among the 27 competences stablished there are a mix of behavioral, management and contextual competences. Several of APM competences are related to PM Knowledge areas and PM processes such as procurement, schedule and risk management.
Contextual Competences: competences related to the context and the company's business	Contextual competences are considerd "other competences" that PMCD does not address; however, it recognizes that organizational context and maturity importance.	**Perspective competences:** five competences related to project context - strategy, governance, structure and processes; compliance, standards and regulation; power and interest; and culture and values.	Among the 27 competences stablished there are a mix of behavioral, management and contextual competences. For instance, governance arrangements is one of the APM competences.

A comparative analysis of three of these models (PMCD, ICB, and PCSPM) was performed by (Takey & Carvalho, 2015), wherein it was indicated that there are similarities between their structures and these methodological approaches.

5.1.3 Research Design

Aligned with the research question of identifying the key project manager competence, by analyzing the scholars perspective and the labor market perspective, a multi-method approach was applied, merging Systematic Literature Review (SLR) and a survey of job advertisements for project managers in job search websites.

5.1.3.1 Systematic Literature Review

The systematic literature review (SLR) has been devoted to understanding the key literature concepts as they relate to project managers competences. Replicable and transparent procedures were adopted as suggested in the literature (Littel, Corcoran, & Pillai, 2008).

The SLR performed combinations of bibliometric techniques and content analysis, in order to mitigate the weakness of either of these two methods when applied alone (Carvalho, Patah, & de Souza Bido, 2015).The SLR followed this four steps:

5. Sampling phase: searching protocol (database selection, search terms definition and filters selection);
6. Bibliometrics: sample demographics, citation analysis, network analysis, using UCINET and NetDraw;
7. Immersion: in-depth analysis of the articles and group discussion;
8. Content analysis: codification and tabulation of the areas and research methods (NVivo), and counting of the terms linked to the project managers competences (NVivo).

First, the bibliometric analysis was aimed at tracing the profile of publications on the subject. The study identified the core competences of managers, classified them into categories, and created a network coding for competences. To obtain an overview of the literature on the subject, the database ISI Web of Knowledge, particularly the ISI Web of Science (WoS) was selected. Searching in WoS, one can find all articles published in journals with an impact factor calculated in a Journal Citation Report (JCR), including journals of other bases such as Scopus and ProQuest Wiley.

The process of collecting articles began with the search terms in the ISI Web of Science database. Then, it adopted the following filters: type of documents (article) and adherence to the theme of the research. Searches in the databases were made in November 2014 and the following search terms were used in the search: "competenc*" and "project manager*" in all the databases on the ISI Web of Science (The asterisk character (*) contained in the surveys was used as a wildcard that can represent any other character, which was quite interesting, as the term may have different spellings for British or American English.). The result showed 178 papers.

During the first screening, we filtered by document type (Articles), resulting in 97 papers, and also filtered by language (English). As a result one article in was excluded (96 articles remained). We did not use an area or temporal filter. Finally, an analysis of the articles was performed to verify if all of them were aligned with the study scope. As a result, another article was excluded from the analysis, making the final sample one composed of 95 articles.

The samples were all published during the period 1997-2014. The analysis from the sample showed that in the last 5 years of the period analyzed, there have been 58 articles, which is more than all previous years combined (37 articles). In our sample, only two journals published more than 10 articles on the topic. International Journal of Project Management had 18 published articles and Project Management Journal published 14 articles. The other 31 journals published only one article. One can notice a big part was comprised of articles by the United States (25.6%), followed by the UK (13.68%) and Australia (11.58%). It is concluded that together these three countries have published more than 50% of the articles on the subject of the competences of project managers.

A computer-aided approach was applied to data analysis. The sample metadata of these articles are taken from the ISI Web of Science base and the data analysis was performed with the help of the following software: Sitkis 2.0 (Schildt, 2002), Ucinet for Windows – version 6.289 (Borgatti, S., Everett, M. & Freeman, 2002), Netdraw, Mendeley, and NVIVO.

The Mendeley software was applied for the articles' archiving and managing. Sitkis, Ucinet, and Netdraw were used in the bibliometrics analysis, dealing with the metadata

and designing the networks. It was used for the analysis of three forms of networks: co-citation, article for references and keywords.

A content analysis, as previously mentioned (step 4), and suggested by Duriau, Reger, & Pfarrer (2007), included the project managers' competence encoding based on extant literature and categories identified, frequency counts on categories, cross-tabulations, and interpretation of results. NVIVO was applied in the content analysis to structure and enumerate logically a collection of qualitative data (Dean & Sharp, 2006). For the competences, the coding tree was complex, whose summary of the results is in Table 3, the frequency analyzes were made in NVivo. In the counting action of the terms related to the project manager's competences, the articles of the sample were loaded on NVivo software version 10. Then, using the software, one can count the terms found in the loaded items. For this step, the terms must first be identified so that the search can be performed on the articles.

5.1.3.2 Survey of job advertisements for project managers in employment websites

Chipulo et al. (2013) mentions that when an organization announces a job vacancy, they should not only provide the key features of the company, but also should specify the requirements that are likely to lead to the success of the project. The authors state that the analysis of job openings is one of the most efficient ways to identify both the competences that have lead the company to success and the strategic objectives it needs to remain successful into the future.

To perform the content analysis of job advertisements, a spreadsheet was designed to facilitate the organization of the data.

Five employment websites that operate in the recruitment market and selection of employees were used as the source of data. The first two sites selected boast the largest number of visits and time spent on their website by persons accessing job offers sites; they are among the best job search sites in Brazil (Castro, 2014; Guedes, 2014). The other three sites are proficient and well-known are considered to provide better, more detailed job descriptions.

According to Castro (2014), Internet users who accessed the job sites spend more than 40% of their time at the Infojobs site; the Monster site was second most popular

with 23.2%. Insofar as the number of visits to job sites, 29.2% access the Infojobs and 24.3% access the website Catho.

For each surveyed job site, a specific search parameter was used to perform the analysis. The parameters for each site are shown below in Table 10.

Table 10 – Websites search parameters

ID	*Website*	Term Searched	Filters	Notes
1	www.catho.com.br	Project manager	Only at job title Exactly term	Founded in 1996, Catho in 2013 identified more than 184,000 hires through the website. (Catho, 2014)
2	www.infojobs.com.br		Job position: Project manager	Implemented in Brazil in 2004, Infojobs receives around 10 million visits per month; with that number is the site of most visited jobs in Brazil. (Infojobs, 2014)
3	www.hays.com.br		Searched by function title	Hays has professional working in over 240 offices in 33 countries, with that she get to be the leader in specialist recruitment. (Hays, 2014)
4	www.pagepersonnel.com.br		No filter applied	The Page Personnel was founded in 1994. It is currently present in 22 countries with more than 20 000 interviews and more than 500 group activities per year. (Page Personnel, 2014)
5	www.michaelpage.com.br		No filter applied	Founded in 1976 in England, Michael Page specializes in executive recruitment for middle and top management. The company is a leader and pioneer in Brazil and throughout Latin America. It operates in 36 countries and 5 continents. (Michael Page, 2014)

Data from websites were collected for the period October 2014 to December 2014. Those data were inserted in the content analysis of the spreadsheet, which was supported by NVivo software version 10.

The content analysis of job openings resulted in the identification of the project manager's profile based on the descriptions found within the vacancy ads.

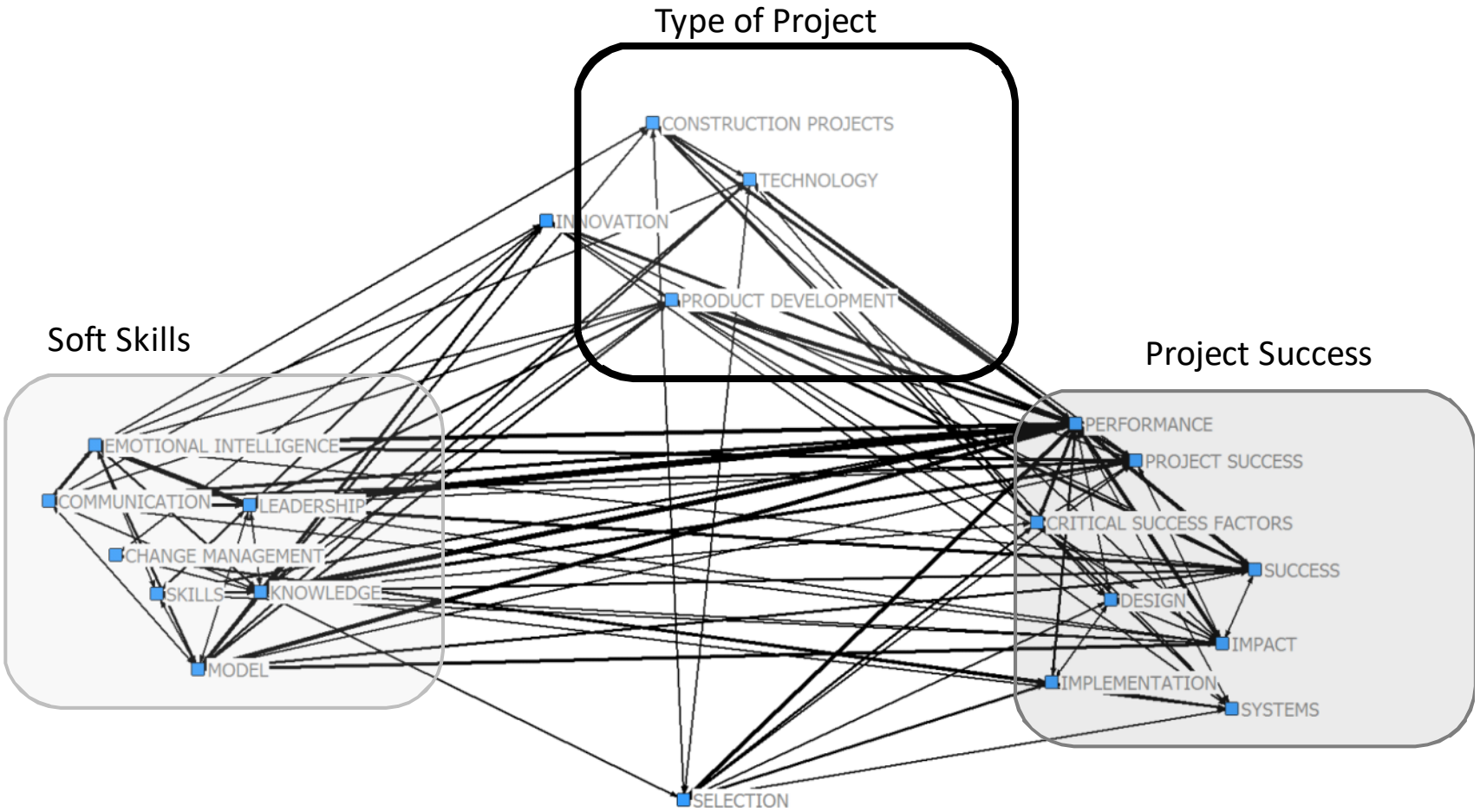
5.1.3.3 Methodological triangulation between literature review and job ads survey

For addressing the research question, a methodological triangulation was performed (Joslin & Muller 2016). Data analysis began using a within-methods analysis, exploring first the results of the literature review, then the results of the job ads, followed by a cross-methods analysis. The cross analysis explores similarities and differences across methods towards theoretical generalizations and/or future research agenda.

5.1.4 Project manager competences: results

The analysis of the project manager's competences considering the analysis of keywords revealed an emphasis on soft skills and focus on the project's success as shown in Figure 8.

Figure 8 - Keywords network.



Note: This network was created with Ucinet and Netdraw softwares using data that was imported using Sitkis software. The strength of ties corresponds to the relationship intensities.

For the development of this network, it has been used as a cut criteria the co-citation of the keyword at least four times. By organizing words into common themes using the diagram technique of affinity or KJ (Kawakita Jiro) method (Carvalho & Paladini, 2012) it was possible to identify three clusters on the network.

In the top of the keyword network, there is a cluster called the “type of projects” that shows the importance of type as a contingent variable. The articles discussed the profile of the project manager's competences, according to the type of projects such as innovation projects and construction projects. In the cluster of competences, on the left corner of Figure 8, one can see an emphasis on soft skills such as leadership (ex: (Muller, Geraldi, & Turner, 2012; Müller & Turner, 2007, 2010b), communication (ex: (Carvalho, 2014; Henderson, 2008)), emotional intelligence (ex: (Clarke & Kingdom, 2010; Lee, Park, & Lee, 2013)), change management (ex: (Crawford & Nahmias, 2010; Harison & Boonstra, 2009)) and knowledge (ex: (Chipulu et al., 2013; Palacios-Marqués, Cortés-Grao, & Lobato Carral, 2013)).

Table 11 summarizes the words most frequently cited using the clustering process. The "selecting" keyword occurs quite frequently and is well-connected with the three clusters, showing its influence in the selection process of project manager.

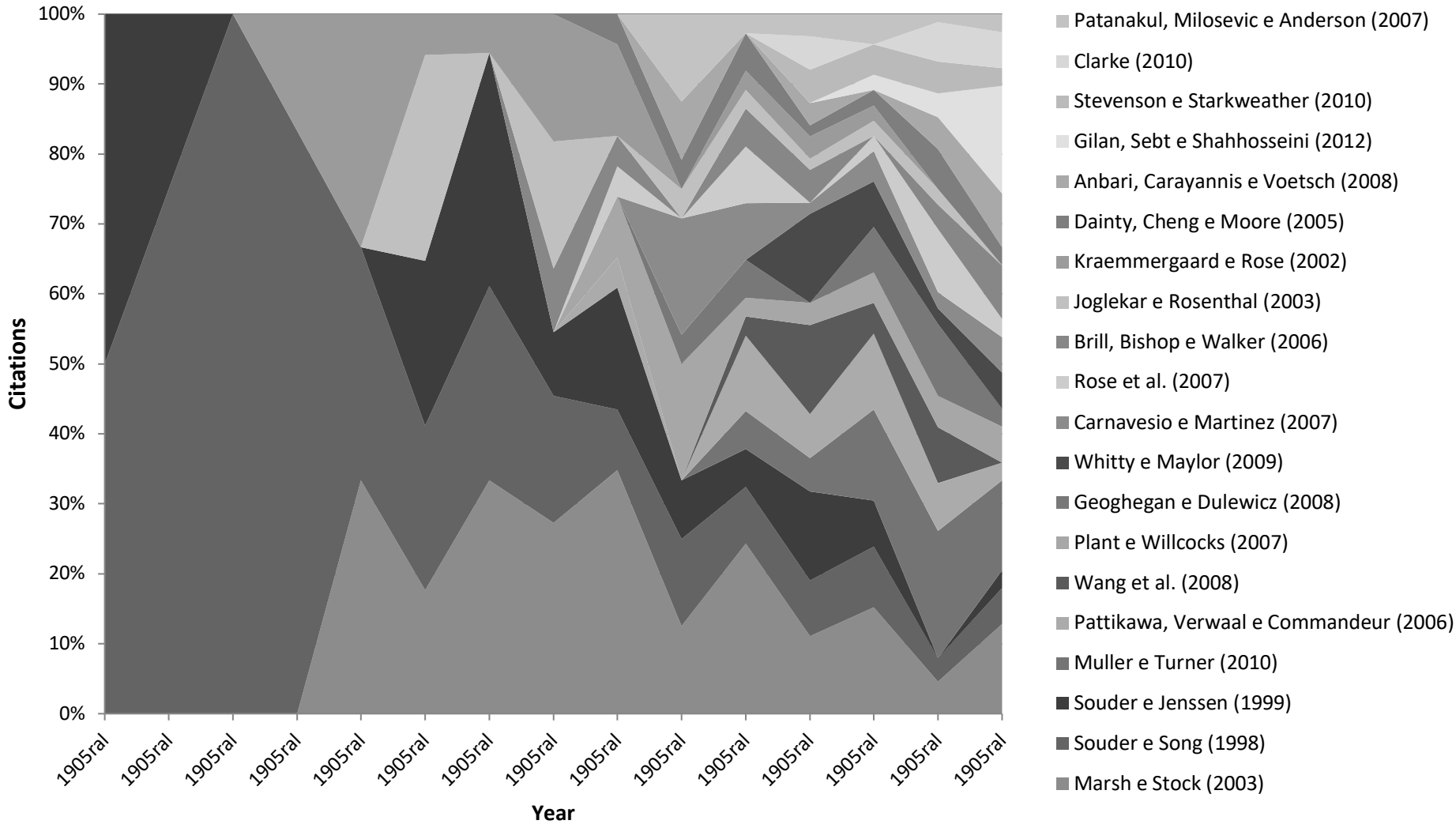
Table 11 – Code structure: Construct, Keyword and Key references

Cluster	Keywords	Occurrence	References
Competences	Emotional Intelligence	*8*	(Lee, Park, & Lee, 2013) (Muller, Geraldi, & Turner, 2012), (Davis, 2011) (Clarke, 2010) (Müller & Turner, 2010a), (Müller & Turner, 2010b), (Clarke & Kingdom, 2010) (Geoghegan & Dulewicz, 2008)
	Change management	*4*	(Crawford & Nahmias, 2010), (Harison & Boonstra, 2009), (Kræmmergaard & Rose, 2002), (Witt, Alabart, Giralt, & Herrero, 2006)
	Communication	*2*	(Henderson & Stackman, 2010) (Henderson, 2008)
	Leadership	*7*	(Lee et al., 2013) (Geoghegan & Dulewicz, 2008) (Clarke, 2010) (Muller et al., 2012) (Müller & Turner, 2010b) (Müller & Turner, 2010a) (Verburg, Bosch-Sijtsema, & Vartiainen, 2013)
	Knowledge	*7*	(Najafi & Afrazeh, 2011) (Vanessa Darrell, David Baccarini, & Peter E. D. Love, 2010) (Anbari, Carayannis, & Voetsch, 2008) (Belkadi, Bonjour, & Dulmet, 2007) (Hwang & Ng, 2013) (Palacios-Marqués, Cortés-Grao, & Lobato Carral, 2013) (Garro, Palopoli, & Ricca, 2006)
Type of Project	Construction Projects	3	(Zhang, Zuo, & Zillante, 2013) (Gudienė, Banaitis, & Banaitienė, 2013) (Jha & Iyer, 2006)
	Technology	2	(Henderson, 2008) (Henderson & Stackman, 2010)
	Product development	2	(Williams van Rooij, 2011) (Pattikawa, Verwaal, & Commandeur, 2006)
Project Success	Performance	5	(Lee et al., 2013) (Patanakul, 2013) (Marques, Gourc, & Lauras, 2011) (Jha & Iyer, 2006) (Pattikawa et al., 2006)
	Project Success	6	(Gudienė, Banaitis, Podvezko, & Banaitienė, 2014) (Creasy & Anantatmula, 2013) (Muller et al., 2012) (Geoghegan & Dulewicz, 2008) (Anbari et al., 2008)
	Critical Success Factors	3	(Mazur, Pisarski, Chang, & Ashkanasy, 2014) (Gudienė et al., 2013, 2014) (Plant & Willcocks, 2007)
	Success	2	(Stevenson & Starkweather, 2010), (Thi & Swierczek, 2010) (Williams van Rooij, 2011)
	Design	*5*	(Brill, Bishop, & Walker, 2006) (Seppala, 2001) (Marmier, Filipas Deniaud, & Gourc, 2014)
	Impact	1	(Ahadzie, Proverbs, & Sarkodie-Poku, 2014) (Buganza, Kalchschmidt, Bartezzaghi, & Amabile, 2013)
	Implementation	3	(Thi & Swierczek, 2010) (Wang, Shih, Jiang, & Klein, 2008) (Plant & Willcocks, 2007)
	Systems	7	(Marques et al., 2011) (Skulmoski, Dhabi, Emirates, & Hartman, 2010) (Wang et al., 2008) (Li, Yang, Klein, & Chen, 2011) (Plant & Willcocks, 2007) (Canavesio & Martinez, 2007)

Cluster	Keywords	Occurrence	References
			(Marmier et al., 2014)

In the 95 articles examained, the sum of all citations was 565 during the analyzed period. To identify the most cited paper, it was decided that the cut-off point would be until the twenty most cited paper. The sum of such publications cited was 382 corresponding to 67.6% of all citations. The most cited articles, as well as its relevance over the period, are presented inFigure 9.

Figure 9 - Yearly citation of the top cited articles



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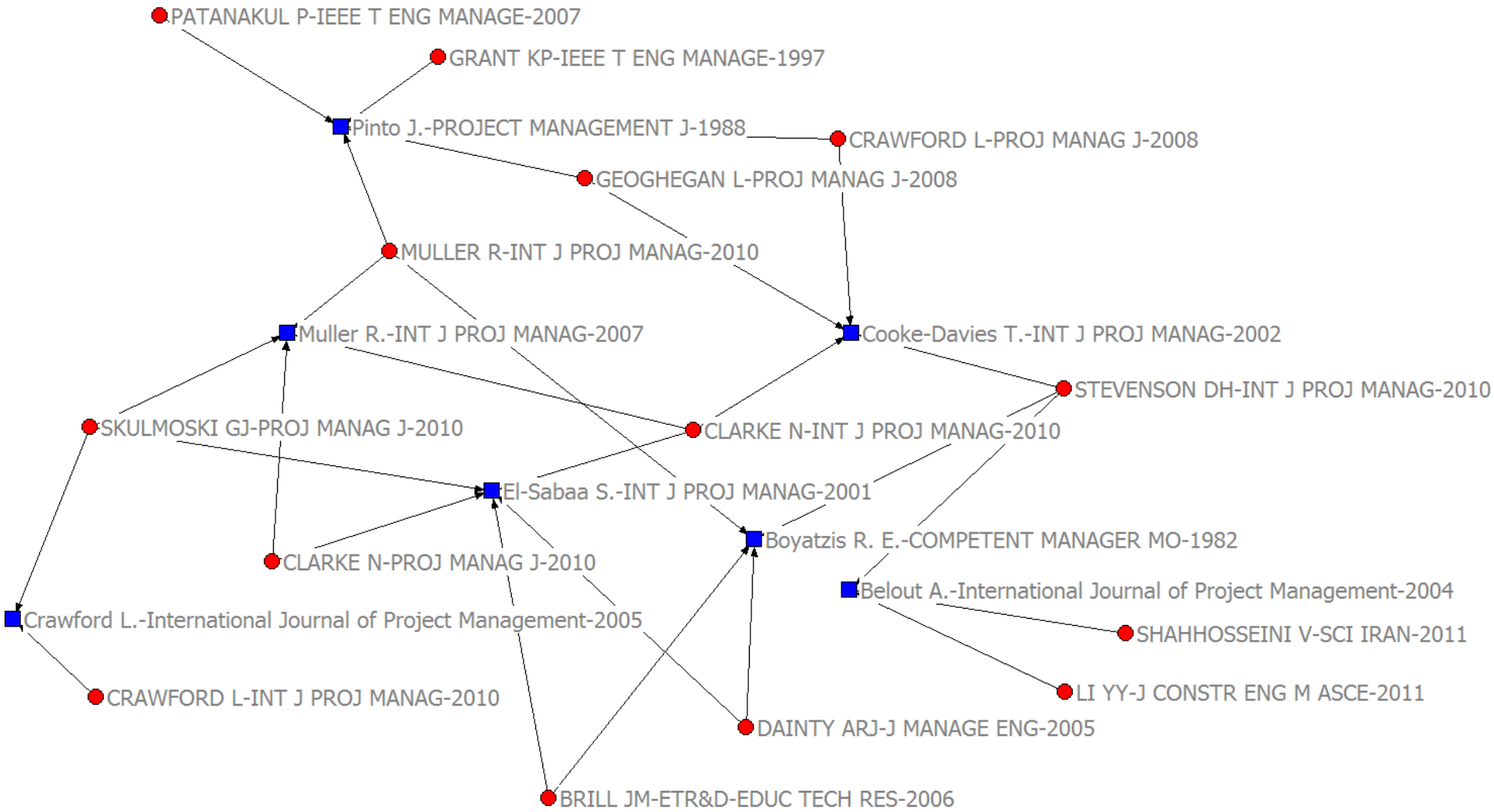
Observing the influence of papers over the period studied, and using the time period cited as a proxy for influence, some papers stood out: (Marsh & Stock, 2003), (W. E. Souder & Jenssen, 1999), (W. Souder & Song, 1998) and (Müller & Turner, 2010b).

The most recent article appearing in the group of the most-cited is Gilan, Sebt & Shahhosseini (2012), whose objective was to present an approach to select the team in construction projects through a computational aid. Other articles in this decade among the most cited were Stevenson & Starkweather (2010), Clarke (2010) and Patanakul, Milosevic & Anderson (2007). Figure 10 shows the article to reference network, which illustrates the most-cited references linked with the most-cited articles in our sample. The circles are the most-cited articles in our sample while the squares are the most-cited references in the articles in the sample.

Figure 10 - Articles x References network.



Two squares in Figure 10 are not direct towards competences, but refer to critical success factors in projects. The article published by Cooke-Davies (2002) is one of the most cited references, which presents 12 critical success factors in projects. However, none of the items includes soft-skills. Therefore, the study concludes that processes or systems do not necessarily enable the project to reach success -- people do. Similarly, Pinto & Slevin (1988) studied the definition of project success and how to measure that success by guaranteeing not only scope, time and cost but also customer usability, performance, effectiveness and customer satisfaction.

The other references (squares) in Figure 10 are more related to competences (Müller & Turner, 2007), in leadership styles for different types of projects, based on the model proposed by (Dulewicz & Higgs, 2003). Crawford (2005) develops an integrated model aligned with the competency standards, which consists of attribute-based inference of competence (knowledge, skills, and personality characteristics) and performance-based inference of competence (demonstrable performance). However, results suggest that there is no statistically significant relationship with performance. Belout & Gauvreau (2004) explored the impact of human resource management on project success but no significant impact was identified. Finally, the book written by Boyatzis (1982) presents a competency model that indicates that the relevant managers from all areas and sectors, not just project managers share a set of common characteristics including leadership, human resource management, direction, expertise, focus on people and an ability to manage actions and objectives.

5.1.4.1 Summary of project managers competences by the literature

After the bibliometric analysis, the sample was categorized in depth from the designed coding system. The content analysis was carried out for 88 articles of the sample (92.6%); the other seven articles (7.4%) were not included for the following reasons:

- Could not find the article on the Internet;
- The item was found, but the University had no access;
- Article was not amenable to character recognition, making it impossible to count the terms using NVivo software.

Based on the number of terms related to competences that were identified, Table 12 was prepared. The NVivio software was used in the analysis of the code frequencies.

Table 12 – Summary of identified competences

Categories	Terms	Number of occurrences	References that influenced the encoding
Behavioral	Leadership	1323	Marsh & Stock (2003); Skulmoski & Hartman (2010); Müller & Turner (2010); Müller, Geraldi, Turner (2012); Clarke (2010); Paajanen et al. (2009); Reza *et al.* (2011); Henderson (2008); APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	Communication	734	
	Emotional Intelligence	426	
	Motivation	189	
	Influence	164	
	Dynamic	121	
	Creative	114	
	Flexibility	114	
	Ethical	94	
	Sensitivity	57	
Technical or specific	Product	908	Grant, Baumgardner & Shane (1997); Rose et al (2007); González, Casas & Coronado (2013); Marsh & Stock (2003); Chipulu, Neoh & Williams (2013); APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	Technical	875	
	Software	868	
	Industry	694	
	Engineering	685	
	Test	269	
Management	Planning	474	Skulmoski & Hartman (2010); Gonzál&z, Casas & Coronado (2013); Ahsan, Ho & Khan (2013); Starkweather & Stevenson (2011); Hwang & NG (2013); Creasy & Anantatmula (2013); Buganza et al. (2013); Crawford & Nahmias (2010) APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	PMP	132	
	Resource Management	124	
	Certification	120	
	Change Management	118	
	Monitoring	99	
	Negotiation	84	
	Risk Management	84	
Contextual	Organization	973	Kraemmergaard & Rose (2002); Paajanen &t al. (2009); Skulmoski & Hartman (2010); Wang et al (2008); Müller & Turner (2010); Anbari, Carayannis & Voetsch (2008); APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	Business	858	
	Relationship	484	
	Environment	477	
	Process	472	
	Marketing	177	
	Influence	164	

The content analysis of the methodological approaches applied in the surveyed literature were mostly qualitative (64%). The method used most often was the survey method (36%), followed by case studies and theoretical (both with 20%). Only 16% were literature review. Just 8% of the surveyed literature used job ads for a data gathering. Concerning the units of analysis the most part of the studies are practitioners (56%), companies (36%), and project (8%). Some of the older articles did not use the methodological approach.

Finally, the related effect of country and industry was analyzed in the literature. Most studies are limited to one country and one industry (Ching et al., 2005, Edum-Fotwe & McCaffer 2000, Hodgson 2002, Takey & Carvalho 2015). Just a few papers explore this issue in multiples countries and industries (Ahshan et al. 2013, Chipulu et al. 2013, Hölzle, 2010). The contingent effect of country and industry remains inconclusive, since no statistically significance differences were verified. however, these three studies provided insights on differences in the rank (order and occurrence frequency) of key competences accordingly country and industry.

5.1.4.2 Project managers competences by ads

The analysis of employment opportunities for the recruitment and selection of project managers in the survey was made using a sample of 543 job vacancies related to project management and 449 job ads. In the sample, the highest number of vacancies was in the Information Technology sector (189 jobs or 58.3% of the exclusive ads).

There was a difference between the number of job vacancies and the number of ads. This happened on the Monster website because the same ad can contain more than one vacancy. The distribution of income by sites is shown in Table 13. Finally, duplicate job offers were excluded (i.e. those which appeared on a particular date and were re-listed again at a later date).

Table 13 - Final distribution of the number of opportunities and job advertisements in project management

ID	*Website*	Jobs	Job ads	Exclusive ads
1	www.catho.com.br	442 positions	348 advertisements	279 advertisements
2	www.infojobs.com.br	25 positions	25 advertisements	25 advertisements
3	www.hays.com.br	7 positions	7 advertisements	7 advertisements
4	www.pagepersonnel.com.br	4 positions	4 advertisements	4 advertisements
5	www.michaelpage.com.br	9 positions	9 advertisements	9 advertisements

Total	487 positions	393 advertisements	324 advertisements

5.1.4.2.1 General Requirements

As far as education requirements, more than 75% of ads explicitly required that the candidate have a university degree. However, this percentage could potentially be higher because some ads may not explicitly indicate the need for higher education level when, in fact, they actually do. For example, some ads do not mention the need for higher education but demand the project manager to carry out specific activities of a higher education, such as conduct a technical follow-up during the construction stages, which is a specific activity of a civil engineer.

In 76 (23.5%) of the vacancies the project manager was required to have a graduate degree in project management and 96, (29.6%) requested that the manager be certified in project management (mostly PMP certification). Insofar as a knowledge of foreign languages, just over a fifth of vacancies (20.7%) pointed out that the candidate needed to know how to communicate in another language, most often in English.

In terms of software competences, 20.4% requested that the applicant have skills in the use of project management software, mostly for schedule preparation using programs such as Microsoft Project. Similarly, 20.1% of the job vacancies required the manager to have the ability to use other specified software.

Finally, only 5.6% of the vacancies required the applicant to be available for travel on a regular basis.

5.1.4.2.2 Experience, Knowledge-Areas and Process Groups

It was identified that more than half of the vacancies (64.2%) require experience in project management.

In terms of project management (PM) knowledge areas, the most prominent area was “time” (38% of ads), followed by “quality” area with 97 appearances (32%) and “cost” area with 30.8%. Of lesser importance are the areas of “procurement” and “human resources”, the terms appeared in only 15 seats (4.63%) each.

The terms related to the PM process groups had less prominence than the knowledge areas. In job advertisements, the planning phase was the one that obtained the highest number of appearances in ads (23.4%), followed by the monitoring and control phases (21.9%) and execution (20.7%). Finally, there were the terms related to the closure

and initiation phases of projects, which were present in 3.1% and 2.2% of the ads, respectively

5.1.4.3 Project managers' competences

Regarding the project managers competences, this research was divided into 4 blocks to facilitate analysis and comparison against the terms identified in the literature. This step was performed using the NVivo software to calculate the number of occurrences for each of the terms.

Regarding behavioral category by the element of vision needed for a job, the aspects of leadership and communication appeared frequently. Both terms together had more than 120 appearances. *"Establishing communication flows between the different working areas"* and *"experience in information technology projects (management / leadership)"* are examples of how those terms are presented in an ad. Terms such as emotional intelligence, ethics and influence are rarely mentioned (only twice, adding all).

The technical competences most frequently found in the ads were related to the terms engineering and software and were widely cited (more than 150 occurrences). In many cases, graduation in engineering was specified or the need for knowledge on a particular software. "Necessary complete graduation in Civil Engineering" and "Technical knowledge of packaging sizing software" are examples of how these terms were cited.

The most frequent term related to management competences were planning and certification needs and they appeared on more than 150 occasions. "…owning updated PMP certification…" and "…monitoring the construction of assembly units, including planning and monitoring the execution of contracts…" are examples of how these terms appeared in the ads. Terms such as negotiation and monitoring appeared moderately (24 times each).

Finally, the contextual competences that occurred most frequently were related to the terms "relationship" and "process"; however, there were few sightings of these terms (only 78 occurrences adding both terms). "Business" and "Organization" were in third and fourth place, respectively, in terms of frequency of occurrence. The terms "environment" and "influence" appeared only one time.

5.1.4.4 Discussion

Most of the ads were related to Information Technology sector, which is strongly supported by Software Development Projects and ERP Implementation. The second-most number of ads related to the engineering sector, which is quite backlogged with construction and electrical projects. Finally, there are the administrative and financial projects supported by CRM projects - Customer Relationship Management (Customer Relationship Management) which relates to the relationship improvement projects of companies with their customers.

As expected, almost all jobs need to have higher education, although the PMP certification can be obtained by those without such training. Almost a third (29.6%) of the vacancies requires certification, somewhat below the number of jobs that require college graduation (23.5%). This could be cause for confusion for a professional seeking employment as to whether they should study for certification or join a postgraduate program (Reis, 2014; M. A. S. Silva, 2008; V. P. Silva, 2011).

Knowledge in project management software should be an important milestone for the professional who plans to enter the labor market, since more than a fifth of the ads identify that requirement. In most cases it is requested that the project manager have knowledge in Microsoft Project software.

Knowledge of other languages has the same prominence as knowledge in software related to project management; just over 20% of the ads indicate the need to be able to communicate in another language. In most cases, knowledge of the English language is requested first, followed by Spanish.

Only 20% of ads explicitly announced the need for knowledge of other software besides the project management applications. Computer-aided Design software, particularly AutoCad, and office tools (e.g. Microsoft Word and Microsoft Excel) are included in this list. Despite this number, it is believed that though a larger number of vacancies could require such expertise, that the requirement may not specifically indicate that office tools are only standard for a project manager.

For recent graduates that are inexperienced in project management, the amount of employment opportunities is lower. Almost 70% of vacancies require that the professional must have previously managed or participated in project management.

In terms of the PM processes, planning, implementation and monitoring and control had greater prominence than initiation and closing. The planning and control phase appeared explicitly in the ads using expressions such as: "Know and use Microsoft Project tool for planning and control of activities." The position announcement that involved running according to plan was expressed as, "Managing large projects, ensuring scope and execution within the budget and schedule." And finally, ads that require monitoring and control actions stated: "To develop the schedule and cost control." Therefore, it is remarkable that organizations expect the hired manager to not only execute plans but also carry out the plans and controls them.

For knowledge competences, the main concern of the organizations was to ensure the success of projects in terms of cost and time. At least, those terms were the ones found most often in the ads. In other words, organizations are generally focused on delivering a result on time and without costs that exceed the baseline and they expect their managers to ensure this. Not far behind in second and third place, are the required knowledge areas and qualities that relate to processes in project development and defining the deliverables requested by customers.

In terms of behavioral competences, the language used in job advertisements that have gained more prominence were "communication," "leadership," and "flexibility" in comparison with the literature that were "leadership", "communication" and " emotional intelligence" just two of the items differs: "emotional intelligence" by the side of literature and "flexibility" on the side of job openings. In summary, you can say that both organizations as literature see the project manager as leadership and ability to communicate.

For technical positions, the three most often used terms were "engineering," "software," and "technical." The literary side frequently use the terms "product," "technical," and "software." In terms of project manager competences, most ads expected a manager to have the ability to use the specific software for the type of project and technical industry. For example, "technical integration of management components" might be listed as a requirement.

For managerial competences, the terms "certification," "planning," "PMP," and "monitoring" were the most prominent requirements found in the ads. Literature highlights included, "planning," "PMP," "Resource Management," and "certification." It

is important to remember that the terms "certification" and "PMP" have similar meanings. In managerial competences, there is a similar priority in 3 of the 4 terms most frequently cited: "PMP," certification," and "planning." In terms of managerial competences, organizations expect employees have the ability to plan, and certification itself serves to confirm that the employee has experience in the field.

Finally, contextual competences that stand out as frequently desired include, "relationship," "processes, "and "business" on the side of employment opportunities and "organization," "business," and "relationship" on the side of literature. Two of the most cited terms were, "relationship" and "business." In other words, what the literature and organizations point out as necessary to the project manager to be selected is to understand the business environment in which the company is inserted and relate to stakeholders to satisfactorily manage the project.

The cross analysis of competencies between what was found in literature and in the advertisements can be visualized in Table 14 .

Table 14 - Methodological triangulation analysis: Literature versus Job Ads

Competences	Terms	Occurrences Literature	Occurrences Job Ads	Literature versus Job Ads
Behavioral	Leadership	1323	46	With regard to behavioral competences the literature, in general, it highlights the importance of soft-skills, for example leadership, communication and even emotional intelligence. In the job ads, some even mention the need for leadership and ability to communicate in the position offered, however terms as emotional intelligence are not seen. One of the possible reasons for not being so evident is that these competences should probably be analyzed in the later stages of a selective process such as group activity and interviews. The fact that some competencies presented in the literature as fundamental for project management are not evident in the advertisements can be an important topic for future research.
	Communication	734	77	
	Emotional Intelligence	426	0	
	Motivation	189	5	
	Influence	164	1	
	Dynamic	121	3	
	Creative	114	3	
	Flexibility	114	10	
	Ethical	94	1	
	Sensitivity	57	0	
	Total	3336	146	
	%	27%	17%	
Technical or specific	Product	908	7	Technical competences are addressed in the literature, however in a more comprehensive and unspecified way as other competences. There is an indication that the manager will need to understand some technical aspects related to the project, but does not go into details on which of these items specifically. For example, it details that technical competences might help the project manager on a specific negotiation. In turn, the ads get to deepen and to explain which softwares, courses and / or trainings will be necessary for the project manager. In the ads it is possible to see in the descriptions items such as: need for knowledge in CAD software (computer aided design) for the ads of project managers in the area of construction projects and items of servers and networks for projects related to the infrastructure (IT area).
	Technical	875	25	
	Software	868	43	
	Industry	694	5	
	Engineering	685	138	
	Test	269	15	
	Total	4299	233	
	%	35%	28%	
Management	Planning	474	87	Management competences are approached in identical ways for both ads and literature. In general, they demand that the manager have the skills needed to plan, execute, monitor and control the project. This means compences to build a schedule or a project budget. Some vacancies even point out the need for the project manager to have the ability to allocate resources efficiently and effectively. One difference is the fact that in the advertisements indicates some
	PMP certification	132	84	
	Resource Management	124	1	
	Other Certification	120	89	
	Change Management	118	8	
	Monitoring	99	24	
	Negotiation	84	24	

Competences	Terms	Occurrences Literature	Occurrences Job Ads	Literature versus Job Ads
	Risk Management	84	6	software for the planning/monitoring phases of a projects, such as: Microsoft Project or Primavera.
	Total	1235	323	
	%	10%	38%	
Contextual	Organization	973	25	The literature on contextual competences indicates the importance of the project manager to know the environment in which the project is located, the sectors and departments of the organization and the people involved, as well as related processes. Job vacancies indicate which specific sectors of the organization the project manager will have to give you, for example, finance department, marketing and Research & Development. In this perspective, another point that also deserves to be highlighted is the fact that in the waves of international projects, knowledge in a foreign language is demanded, a competence that is probably not needed in countries where the language is English.
	Business	858	28	
	Relationship	484	44	
	Environment	477	0	
	Process	472	34	
	Marketing	177	10	
	Total	3441	141	
	%	28%	17%	
	Total	12311	843	
	%	100%	100%	

It can be noted in Table 14 that different categories are highlighted in the literature and in the job ads. While literature pays much more attention to technical and contextual competences as important variables to determine the key competences, the job ads emphasize managerial competences. The rank of terms inside competences categories varies significantly. For instance, among the behavior competences, while the literature highlights leadership, the job ads prioritize communication. Considering the success criteria, the job ads focus on delivering projects on cost and on time, while the literature emphasizes a broader range of success dimensions.

5.1.4.5 Summary of the project manager's profile

In order to synthesize the information about literature and announcements of job openings, Table 15 shows the expected profile and the best characteristics for a professional in order to be selected for a job opening as a project manager.

Table 15 - Expected profile for the project manager and the place with the largest number of vacancies.

Local	South and Southeast, with special emphasis on São Paulo - SP
Sector	Engineering or IT
General Requirements	Higher education Graduate and / or certification Knowledge in foreign languages, especially English
Previous experience	Preferably yes
PM processes	Knowledge in planning processes, implementation and monitoring and project control
Knowledge area	Emphasis on preparation and control schedules Budgeting and project cost control (Time and Cost)
Behavioral competences	Ability to lead teams Ability to communicate and opinion of exposure (Leadership and Communication)
Technical Competences or specific competences	Knowledge in specific software project and / or area Technical knowledge on the specifics of the project (Software and Technical)
Management Competences	Certification aiming to demonstrate experience and expertise in project management issue Ability to carry out plans for the project (Certification and Planning)
Contextual Competences	Ability to relate with stakeholders and influences them Bargaining power with stakeholders (Relationship and Business)

6.1.1 Conclusion

The purpose of this study was to investigate the required competences of project managers by hiring organizations using their job advertisements. From this perspective, the work has achieved its goal by identifying the competences expected according to both the PM literature and labor market.

The competence analysis was driven by four categories: contextual, behavioral, technical, and managerial. These categories further divided into key competences in each category (see Table 15). This allowed the identification of competences in the articles and in the job advertisement using the frequency of the listed competences.

After analyzing employment opportunities, it can be seen that the literature indicates that a lot of competences are seen as essential, though many of these are insignificant or not mentioned in the ads, such as ethics and knowledge in law.

With respect to the core competences of project managers requested in the job advertisements, this study has identified that organizations are more objective in the notes of the competences required for the investiture of the project management office. Companies generally seek also some background requirements as higher education, knowledge of English language and experience in projects.

With regard to its theoretical contribution, the paper presented a classification model of competence based on four groups: behavioral, contextual, managerial, and technical. In the same vein, the work was able to identify the words and terms that are most closely linked to each group of competences.

By analyzing the employment opportunities in Brazil, the largest search for project managements professional is in the South and Southeast, with special emphasis on the state of São Paulo. Going further in the analysis, it was identified that IT is the sector that has the largest number of vacancies.

Generally, this study outline the contents of common job vacancies descriptions and thus allowed us to present the basic requirements for getting the job. These include the ability to communicate in other languages, certification, post-graduate degrees, and job experience.

In practical terms, this work gives guidelines to HR sectors in development of job vacancy descriptions for selection of project managers, as well as, support for

modeling of specific competences for each organization. In addition to the expected competences, other issues such as higher education, knowledge of other (foreign) languages, and previous experience were also identified and considered important, but these requirements can be context specific in Brazil.

The research limitations are related to the research design adopted. The literature review only used the ISI Web of Science database that, despite the relevance for the academic community, represents just part of the available research. On the issue of job advertisements, the research was limited only to information from 5 job ad sites in Brazil. The search could have been expanded to other websites. Thus, as suggested the section describing insights on the literature, the contingent effect of country and industry were not explored in this study and it is an important future research need. Finally, some overlapping among the literature and job ads can be identified because some articles surveyed are based on job ads as research methods.

Opportunities for future work include a comparative study of the job vacancy announcements for project managers in Brazil to the world for the purpose of identifying the similarities and differences of the Brazilian project manager in relation to others. Another possible study would be the investigation of the relationship between organizational performance and project manager competences.

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6.1.2 References of Paper #1

Ahsan, K., Ho, M., & Khan, S. (2013). Recruiting Project Managers: A Comparative Analysis of Competencies and Recruitment Signals From Job Advertisements. *Project Management Journal*, *44*(5), 36–54. http://doi.org/10.1002/pmj.21366

AIPM. (2010a). AIPM Professional Competency Standards for Project Management - PART A – Introduction, (June).

AIPM. (2010b). AIPM Professional Competency Standards for Project Management - PART C – Certified Practising Project Manager (CPPM), (February).

APM. (2015). APM Competence Framework 2nd Ed. *Communications of the ACM.*

Belout, A., & Gauvreau, C. (2004). Factors influencing project success: The impact of human resource management. *International Journal of Project Management*, *22*, 1–11. http://doi.org/10.1016/S0263-7863(03)00003-6

Berssaneti, F. T., & Carvalho, M. M. (2015). Identification of variables that impact project success in Brazilian companies. *International Journal of Project Management*, *33*(3), 638–649. http://doi.org/10.1016/j.ijproman.2014.07.002

Borgatti, S., Everett, M. & Freeman, L. (2002). *Ucinet 6 for Windows: software for social network analyzes*. Analytic Technologies.

Boyatzis, R. E. (1982). *The Competent Manager: A Model for Effective Performance*. Wiley.

Carvalho, M. M., & Paladini, E. P. (2012). *Gestão da Qualidade: Teoria e Casos* (2ª Ed). Rio de Janeiro: Editora Campus.

Carvalho, M. M., & Rabechini Junior, R. (2015). Impact of risk management on project performance: the importance of soft skills. *International Journal of Production Research*, *53*(2), 321–340. http://doi.org/10.1080/00207543.2014.919423

Carvalho, M. M., & Rabechini Junior, R. (2017). Can project sustainability management impact project success? An empirical study applying a contingent approach. *International Journal of Project Management*. 35, 1120–1132.

Carvalho, M. M. (2014). *An investigation of the role of communication in IT projects*. http://doi.org/10.1108/IJOPM-11-2011-0439

Carvalho, M. M., Patah, L. A., & de Souza Bido, D. (2015). Project management and its effects on project success: Cross-country and cross-industry comparisons. *International Journal of Project Management*, *33*(7), 1509–1522. http://doi.org/10.1016/j.ijproman.2015.04.004

Castro, D. G. (2014). InfoJobs Brazil. The keys of a successful case. Retrieved May 11, 2014, from http://www.davidgonzalezcastro.com/en/post/infoJobs-brazil-the-keys-of-a-successful-case.aspx

Ching, M.I. Dainty, A.R.J., & Moore, D.R. (2005) What makes a good project manager? *Human Resource Managent Journal,* 15, 25–37, 2005.

Chipulu, M., Neoh, J.G., Ojiako, U., & Williams, T. (2013) A multidimensional analysis of project manager competences. I*EEE Transactions on Engineering Management,* 60, 506–517.

Clarke, N., & Kingdom, U. (2010). Emotional Intelligence and Its Leadership and Key Project Manager, *41*(2), 5–20. http://doi.org/10.1002/pmj

Cooke-Davies, T. (2002). The “real” success factors on projects. *International Journal of Project Management*, *20*, 185–190. http://doi.org/10.1016/S0263-7863(01)00067-9

Crawford, L. (2005). Senior management perceptions of project management competence. *International Journal of Project Management*, *23*(2005), 7–16. http://doi.org/10.1016/j.ijproman.2004.06.005

Crawford, L., & Nahmias, A. H. (2010). Competencies for managing change. *International Journal of*

Project Management, *28*(4), 405–412. http://doi.org/10.1016/j.ijproman.2010.01.015

Dean, A., & Sharp, J. (2006). Getting the most from NUD * IST / NVivo. *The Electronic Journal of Business Research Methods*, *4*(1), 11–22.

Dulewicz, V., & Higgs, M. (2003). *Design of a new instrument to assess leadership dimensions and styles*. UK: Henley Management College: Henley Working Paper Series HWP.

Duriau, V. J., Reger, R. K., & Pfarrer, M. D. (2007). A Content Analysis of the Content Analysis Literature in Organization Studies: Research Themes, Data Sources, and Methodological Refinements. *Organizational Research Methods*, *10*(1), 5–34. http://doi.org/10.1177/1094428106289252

Edum-Fotwe, F. T., & McCaffer, R. (2000). Developing project management competency: Perspectives from the construction industry. *International Journal of Project Management,* 18(2), 111–124.

El-Sabaa, S. (2001). The skills and career path of an effective project manager. *International Journal of Project Management,* 19, 1–7.

Giraldo González, G. E., Pulido Casas, G. H., & Leal Coronado, C. A. (2013). Project Manager Profile Characterization in the Construction Sector in Bogotá, Colombia. *Project Management Journal*, *44*(6), 68–93. http://doi.org/10.1002/pmj.21381

Guedes, M. A. (2014). Os melhores sites para procurar emprego no Brasil. Retrieved December 11, 2014, from http://www.ehow.com.br/melhores-sites-procurar-emprego-brasil-info_77583/

Harison, E., & Boonstra, A. (2009). Essential competencies for technochange management: Towards an assessment model. *International Journal of Information Management*, *29*(4), 283–294. http://doi.org/10.1016/j.ijinfomgt.2008.11.003

Henderson, L. S. (2008). The Impact of Project Managers' Communication Competencies: Validation and Extension of a Research Model for Virtuality, Satisfaction, and Productivity on Project Teams. *Project Management Journal*, *39*(June), 48–59. http://doi.org/10.1002/pmj.20044

Hodgson, D. (2002). Disciplining the professional: The case of project management. Journal of Management Studies, 39(6), 803–821.

Hölzle, K. (2010). Designing and implementing a career path for project managers. International Journal of Project Management, 28, 779–786.

IPMA. (2015). *ICB - IPMA Individual Competence Baseline for Project , Programme and PortfolioManagement version 4.0*.

Joslin, R., & Müller, R. (2016). Identifying interesting project phenomena using philosophical and methodological triangulation. *International Journal of Project Management,* 34(6), 1043-1056

Kerzner, H. R. (2013). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 11th Edition* (11th ed.).

Lee, H., Park, J., & Lee, J. (2013). Role of Leadership Competencies and Team Social Capital in It Services. *Summer Journal of Computer Information Systems*, *1*, 1–12.

Littel, J. ., Corcoran, J., & Pillai, V. (2008). *Systematic Reviews and Meta-Analysis*. Oxford University Press, New York.

Marsh, S. J., & Stock, G. N. (2003). Building Dynamic Capabilities in New Product Development through Intertemporal Integration, (815), 136–148.

Martens, M. L., & Carvalho, M.M. (2017) Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *International Journal of Project Management*. 35, 1084-1102.

Medina, R., & Medina, A. (2014). The project manager and the organisation's long-term competence goal. *International Journal of Project Management*, *32*(8), 1459–1470. http://doi.org/10.1016/j.ijproman.2014.02.011

Muller, R., Geraldi, J., & Turner, J. R. (2012). Relationships Between Leadership and Success in Different Types of Project Complexities. *IEEE Transactions on Engineering Management*, *59*(1), 77–90. http://doi.org/10.1109/TEM.2011.2114350

Müller, R., & Turner, J. R. (2007). Matching the project manager's leadership style to project type. *International Journal of Project Management*, *25*, 21–32. http://doi.org/10.1016/j.ijproman.2006.04.003

Müller, R., & Turner, J. R. (2010a). Attitudes and leadership competences for project success. *Baltic Journal of Management*, *5*(3), 307–329. http://doi.org/10.1108/17465261011079730

Müller, R., & Turner, R. (2010b). Leadership competency profiles of successful project managers. *International Journal of Project Management*, *28*, 437–448. http://doi.org/10.1016/j.ijproman.2009.09.003

Palacios-Marqués, D., Cortés-Grao, R., & Lobato Carral, C. (2013). Outstanding knowledge competences and web 2.0 practices for developing successful e-learning project management. *International Journal of Project Management*, *31*(1), 14–21. http://doi.org/10.1016/j.ijproman.2012.08.002

Patanakul, P., Milosevic, D. Z., & Anderson, T. R. (2007). Assignments, *54*(3), 548–564.

Pinto, J. K., & Slevin, D. P. (1988). Project Success : Definitions and Measurement Techniques. *Project Management Journal*, *xix*(February), 67–72. Retrieved from http://marketplace.pmi.org/Pages/ProductDetail.aspx?GMProduct=00100879500&iss=1

PMI. (2007). *Project Manager Competency Development (PMCD) Framework*. *Management*.

PMI. (2013). *A Guide to the Project Management Body of Knowledge - PMBOK Guide*. http://doi.org/10.1002/pmj.21345

Reis, T. (2014). MBA em Gestão de Projetos ou certificação PMP? Retrieved December 27, 2014, from http://www.projectbuilder.com.br/blog-pb/entry/projetos/mba-em-gestao-de-projetos-ou-certificacao-pmp

Sadeghi, H., Mousakhani, M., Yazdani, M., & Delavari, M. (2013). Evaluating Project Managers by an Interval Decision-Making Method Based on a New Project Manager Competency Model. *Arabian Journal for Science and Engineering*, *39*(2), 1417–1430. http://doi.org/10.1007/s13369-013-0631-0

Safarzadegan Gilan, S., Sebt, M. H., & Shahhosseini, V. (2012). Computing with words for hierarchical competency based selection of personnel in construction companies. *Applied Soft Computing*, *12*(2), 860–871. http://doi.org/10.1016/j.asoc.2011.10.004

Schildt, H. (2002). *Sitkis: Software for Bibliometric Data Management and Analysis*. *Helsinki: Institute of Strategy and International Business*. Helsinki: Institute of Strategy and International Business.

Silva, M. A. S. (2008). Certificação X MBA. Retrieved December 27, 2014, from http://www.ogerente.com.br/novo/colunas_ler.php?canal=14&canallocal=46&canalsub2=149&id=1269

Silva, V. P. (2011). MBA em Gestão de Projetos ou certificação PMP? O que escolher. Retrieved December 27, 2014, from http://www.tiespecialistas.com.br/2011/02/mba-em-gestao-de-projetos-ou-certificacao-pmp-o-que-escolher/

Souder, W. E., & Jenssen, S. A. (1999). Management Practices Influencing New Product Success and Failure in the United States and Scandinavia: A Cross-Cultural Comparative Study. *Journal of Product Innovation Management*, *16*(2), 183–203. http://doi.org/10.1111/1540-5885.1620183

Souder, W., & Song, M. (1998). Analyses of U.S. and Japanese Management Processes Associated with New Product Success and Failure in High and Low Familiarity Markets. *Journal of Product Innovation Management*, *15*(3), 208–223. http://doi.org/10.1016/S0737-6782(97)00079-9

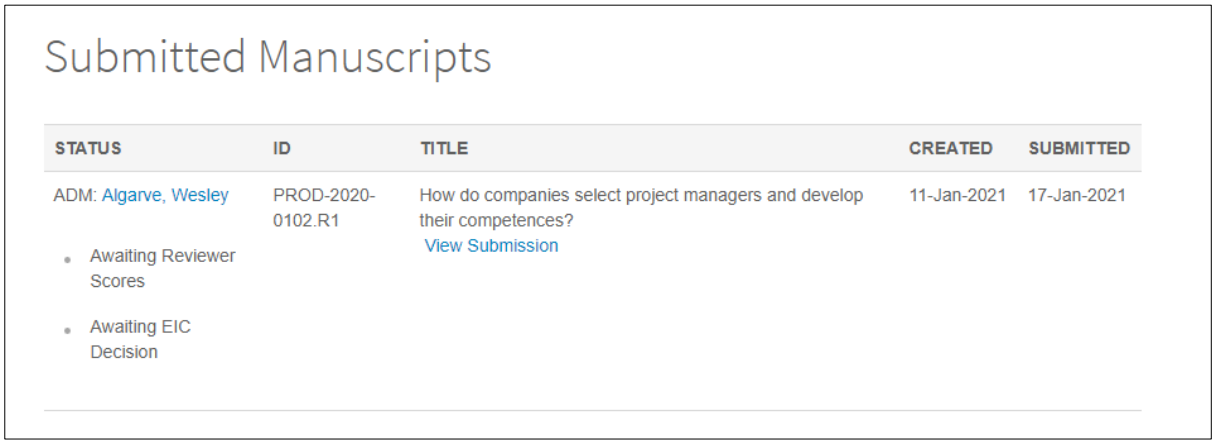
Stevenson, D. H., & Starkweather, J. A. (2010). PM critical competency index: IT execs prefer soft skills. *International Journal of Project Management*, *28*(7), 663–671. http://doi.org/10.1016/j.ijproman.2009.11.008

Takey, S. M., & Carvalho, M. M. de. (2015). Competency mapping in project management: An action research study in an engineering company. *International Journal of Project Management*, *33*(4), 784–796. http://doi.org/10.1016/j.ijproman.2014.10.013

6.2 Paper #2 - How do companies select project managers and develop their competences?

Status: Submitted (Awaiting Decision)

Figure 11 - Paper # 2 submission information



Abstract

The purpose of this study is to investigate how companies select project managers and develop project managers' competences. The methodological approach used was a case-based research carried out in eight organizations. The research showed that project managers are usually selected according to their past work experience and through a set of screening interviews with human resources, the project management office and the department manager. The results also point to the lack of structured project management competence development programs to drive career pathways. Most of the studied companies would prefer to develop and promote staff internally to the position of project manager; however, they recognize that, often, an external professional is selected instead. Usually, the companies select a external professional because of the duration it takes to develop someone. When companies develop staff, they usually adopt experiential learning approaches, particularly on-the-job training programs.

Keywords:
project management (PM), selection, competence, project manager (PMer), human resource management (HRM)

6.2.1 Introduction

The search for the selection of the most competent professional for a given function is constant in all areas; and in the area of project management (PM), it is no different (Celkevicius and Russo, 2018; Sankaran et al., 2019;Cha and Maytorena-Sanchez, 2018). Talent attraction and retention are key strategic issues for high-performance organizational culture (Kontoghiorghes, 2016). Also, in the PM context, studies point out that behavioral competences significantly and positively influence project performance (Gruden and Stare, 2018).

Project magement guides have attempted to consolidate the practitioner perspective on the core project managers' (PMers) competences needed to achieve successful projects (APM, 2015; IPMA, 2015; PMI, 2017). However, there is continuing skepticism regarding the list of competences (Chipulu et al., 2013), because different projects demand different skills (EL-Sabaa, 1999).

While the literature focuses on identifying the competences (Crawford, 2005, 2000; Nijhuis et al., 2018, Vale et al., 2018) and investigates their effect on project performance (Gruden and Stare, 2018, Brill et al., 2006; Müller and Turner, 2010a,b), PMers are more concerned with competency development and the career system (Gruden and Stare, 2018).

Some studies shed light on the PMer selection process through job advertising surveys (Vale et al., 2018) and on the career system as an important way of maintaining and increasing competences' (Ekrot et al., 2016). The critical link between career development needs and project activities (Turner et al., 2008) are pointed out and the lack of alignment can result in staff turnover and lack of engagement (Becker and Smidt, 2015).

It is necessary, therefore, to understand the pathways for building PM competences, linking competences with professional experience and challenges in practice (Takey and Carvalho, 2015).

The purpose of this article was to identify what paths organizations are taking to select project managers and to develop their competences.

Aiming at narrowing the research gap discussed above, this study contributes to answer the following research questions (RQs).

(RQ1): How organizations select their PMers and which competences do companies value throughout this process?

(RQ2): What paths do organizations take to develop the competences of their project managers?

(RQ3): Who are responsible for selecting and developing the competences of project managers?

This article contributes to the theory in broadening the discussion on the process of selecting and developing project managers. The study explores the difficulties that those responsible for selecting these professionals have in confirming the candidate's competences pointed out or not in the literature. In the development part, it presents both the project manager's learning process in formal or non-formal terms as well as what competences organizations seek to develop in their professionals. Regarding the practical part, this article facilitates the understanding by the HR (Human Resource), PMO (Project Management Office) and / or Department Manager of what will be the main challenges in the selection and development of these professionals, which will allow a better preparation for these activities that are important for project success.

The methodological approach is a case-based research carried out in eight organizations. This article is divided into five sections. Section 2 is a literature review of the PM competences and HRM practices in the PM context. Section 3 presents the research design, detailing the research protocol used to conduct the case studies. Section 4 gives the results and, finally, Section 5 presents the conclusions'.

6.2.2 Theoretical background

6.2.2.1 Project managers' competences

Scholars are concerned about the characteristics of managers that affect performance. Boyatzis (1982), using a survey of more than 2000 managers, defines managerial competences as characteristics of a person that lead to, or cause, a performance in a job in an effective way and beyond expectation.

In the project management (PM) field, professional certification plays a relevant role in careers of project managers (PMers). In addition, institutes and associations profile the core PMer competences for companies selecting professionals and to aid in career development. These include the Project Manager Competency Development

Framework (PMCD), the PMI Talent Triangle® (PMI, 2017), and the Competence Baseline (IPMA, 2015).

Following the notion that project management and management are alike (Nijhuis et al. 2018), the definition of competence for a PMer in the PM field is similar to that in the management field as follows: “Individual competence is the application of knowledge, skills, and abilities in order to achieve the desired results” (IPMA, 2015) and, “Competency is the demonstrated ability to perform activities within a project environment that lead to expected outcomes based on defined and accepted standards” (PMI, 2017).

PM research focuses on general competences rather than the specific characteristics and needs of the PM profession (Nijhuis et al., 2018). In addition, there is a tendency to mystify a PMer as a hero, with a long list of competences required. Instead, the focus should be divided between individual competencies of PMers and the integrative competencies of organizations (Loufrani-Fedida and Missonier, 2015).

The skepticism that some have regarding the long list of competences required (Chipulu et al., 2013) is supported by the evidence of the contingent theory, in which different projects demand different PMer competences (EL-Sabaa, 1999; Müller and Turner, 2010b; Takey and Carvalho, 2015).

A critical analysis of PMer competence literature clusters four competence groups: behavioral, management, contextual, and technical or industry specific competences (Vale et al., 2018).

6.2.2.2 Project managers’ competences and project success

Since competences are associated with high performance, several studies seek to identify key PM competences and how these influence project success. (Clarke, 2010a, 2010b; Davis, 2011; Monteiro de Carvalho, 2013; Müller and Turner, 2010b). The results of these researches show some controversial results, competences in PM tools and practices, so-called hard skills, are considered to be less important than soft skills (Carvalho and Rabechini, 2015).

With the increase in professional PM certification, the level of interest in the competencies of PM professionals has also grown (Starkwheather and Stevenson,

2011). However, there appear to be no significant differences between the success rates for certified versus non-certified project managers (Starkweather and Stevenson, 2011) and the expected higher success rates for PMP®-certified PMers were not verified (McKevitt et al., 2017).

A recent study states out that behavioral competences significantly and positively influence project performance, particularly regarding the time dimension and work hours requirements, but not concerning costs (Gruden and Stare, 2018). These results corroborate the findings of Marzagão and Carvalho (2016a, b) who point out the positive and significant effect of PMer competences on a multidimensional project success perspective. Leadership is considered a prominent behavioral competence. To succeed, different projects require different PMer leadership competencies. However, some characteristics of PMer leadership are successful in all types of projects: critical thinking, influencing skills, motivation, and conscientiousness, for instance (Müller and Turner, 2010b).

However, it is not simply a matter of knowing which competences are necessary for PM. It is also important to understand how to apply a suitable PM selectin process, how to develop PM Competences in professionals and relevant career pathways (Ahsan et al., 2013; El-Sabaa, 2001). These are discussed in the next sections.

6.2.2.3 Project managers and human resource management

Several aspects of HRM – Human Resource Management, such as as selection, training, competence development, career models and performance evaluation, positively affect competence planning and competence utilization (Medina and Medina, 2014). Regarding project success, the results are controversial: employee recruitment and selection, employee performance appraisals and employee compensation systems are seen to influence project success; the influence of

employee training and development, on the other hand, could not be demonstrated (Khan and Rasheed, 2015).

Dealing with the challenges of recruiting PMers from outside or developing staff internally, several aspects should be taken into account. For example, a system of selection and training is critical to maintain a pool of talent with the optimal mix of skills (Hauschildt et al., 2000).

In organizations with career pathways in place, there is a greater likelihood of PMers' retention (Ekrot et al., 2016), avoiding high staff turnover. However, little attention has been paid to the careers and career models of PMers. The literature presents two archetypes of PMer career models: the competence strategy model and the talent management model (Bredin and Soderlund, 2013).

In order to design a model for professional development successfully, there has to be support from the human resources sector, the confidence of the relevant PMer, and the identification of the key competences (Hölzle, 2010).

Studies seek to identify how the competences of PMer professionals are developed (Bredin and Söderlund, 2013; El-Sabaa, 2001; Hölzle, 2010; PMI, 2017).

6.2.2.4 Project managers' development pathways

Both the human resources department and the Project Management Officer (PMO) play an important role in developing professionals. Typically, the PMO is responsible for developing PMer competences (Hobbs and Aubry, 2007), testing competence levels and encouraging PMer competence development (Gruden and Stare, 2018), in order to achieve the benefits of investing in PM training and education (Pinto et al., 2010). Egginton (2012) and Ramazani and Jergeas (2015) point to the benefits of investing in project management education and training; however, it is important for

the organization to track a path for the PMer, and, in this, both HRM and PMO has a role (Pinto et al., 2010; Savelsbergh et al., 2016).

In general terms, for an organization it is important to have its PMers ready to deal with complexities; and, for that to happen, it is important that PMers develop their soft skills over their hard skills (Pant and Baroudi, 2008; Carvalho and Rabechini, 2015; Ramazani and Jergeas, 2015; Stevenson and Starkweather, 2010; Thomas and Mengel, 2008).

According to PMI (2017), there are three ways of addressing the development of competences: experiential learning, formal learning, or non-formal learning, and the way PMers develop their competences depends of many aspects, such as their level of competence, availability of resources, time, and costs.

6.2.3 Research methods

Using a case-based research method, the study aims to answer the following research questions:

- (RQ1): How organizations select their PMers and which competences do companies value throughout this process?
- (RQ2): What paths do organizations take to develop the competences of their project managers?
- (RQ3): Who are responsible for selecting and developing the competences of project managers?

A case study approach is aligned with the exploratory “how” nature of these RQ research questions (Yin, 2006). This method allows the researcher to analyze significant characteristics of events as organizational changes and managerial processes (Yin, 2006).

6.2.3.1 Case selection

Conducting a multi-case study reduces the chance of researcher bias and it enhances external validation (Voss et al., 2002). In addition, using multiples cases provides results that are more robust, generalizable and testable (Eisenhardt and Graebner, 2007). It is considered appropriate to have between four to ten cases.

The case selection criteria used for theoretical sampling were as follows. First, the company was required to have PMer job positions. Second, the company must have a project management office (PMO). Third, the researchers must be allowed access to key stakeholders from different areas related to the research scope. Fourth, the researchers should be allowed access to key documents, when not restricted, and site observation.

Based on these criteria, eight organizations were selected in which to conduct the cases, as shown in Table 1. The names of organizations and interviewees have been hidden for privacy reasons.

Table 1. The names of organizations and interviewees have been hidden for privacy reasons

Company	Area	Type of Project	Interviewed	Sector	Company Size (Number of employees)
A	Engineering	Civil Engineering	Engineer Director	PMO/Engineer	~100 employees
B	IT	IT	PMO Manager	PMO	~150 employees
C	Engineering	Civil Engineering	Operations Director	PMO/Engineer	~50 employees
D	Education	Business and IT	HR	HR	>10.000 employees
E	IT	IT	HR	PMO	~150 employees
F	Health	Business and IT	PMO Manager	PMO	>10.000 employees
G	IT	IT	Project Director	PMO	>10.000 employees
H	IT	IT	Project Director	PMO	>10.000 employees

The research protocol for selecting the interviewees demanded an executive or managerial position in the areas of the research scope, and the interviewee was

required to have spent at least 12 months in the company; this was a prerequisite to qualify for the interview.

6.2.3.2 Data collection

The case study method consists of understanding the present dynamics of a context and combines several sources of evidence such as: documents, interviews, questionnaires and direct observation (Eisenhardt, 1989). In this research, semi-structured interviews were conducted with professionals who were directly involved in the selection and development process of PMers. In general, the profile of the interviewees was different in each organization, either a member of the human resources department, a member of the PMO, or the manager of the Department. It was a prerequisite of the study that all interviewees had spent at least one year in the company and had already worked for more than one year in the area of PM.

Data was gathered in several ways to allow further triangulation (Voss et al., 2002; Eisenhardt and Graebner, 2007); in particular, interviews and document analysis were used. Prior to the interviews, information was gathered in from documents, reports, through the organizations' website and job posting sites where organizations advertised their job opportunities for project managers. In some cases, if the organization allowed it, the project manager's career plan documentation was also analyzed.

To conduct the interviews, a support script was prepared, containing four blocks of open questions aligned with the literature review presented in Section 2. The script, first, explored the organizational context and the interviewee's overall perception. Second, the key PMer competences required by the organization were explored. Third, questions relating to the PMer selection process were investigated. Finally, the PM career and competence development pathways were explored.

In all the interviews, annotations were made to facilitate the subsequent analysis. All the interviews took place in Brazil, they were recorded, except in one instance where the interviewee asked not to be recorded. The interviews were transcribed and validated with the interviewee.

6.2.3.3 Data analysis

Content analysis of both the interviews and documents was performed and reports were generated (Duriau et al., 2007), applying a computer-aided approach performed using the software NVivo 12.

The nodes used by NVivo emerged both from the studied literature and from the analysis of the content of the interviews. Nodes were used both in relation to selection and in the development of competences. To point out some, in the selection, nodes related to the sector responsible for the selection, such as: PMO, Area Manager and HR, as well as the most relevant competence group, such as: behavioral, technical, managerial and contextual were used. In the development part, several nodes related to the items in the groupings of the form of learning, such as: group training, on-the-job training, classroom training were used.

An in-depth report of each case was created followed by a cross-case analysis, based on the core topics of each script block.

6.2.4 Results

6.2.4.1 Company A

Company A is a French engineering company with its headquarters in France. It company specialized in the manufacture of turbines.

In the selection process, the job description is based on other job listings advertised on job search sites. In the curriculum analysis, the organization seeks to identify if the applicant possesses relevant work experience and a higher education. During the job interview, the interviewer tries to discern: the level of motivation to work for the organization; whether the applicant is able to work under pressure; whether the applicant acts with coherence and assertiveness (does not renege on promises). In brief, the interviewee for Company A reported that, during an interview, it is important to try to find out a little of the personality of the applicant, including its resilience regarding the position and whether she/he is likely to fit in with the existing team. The organization does not carry out technical engineering tests with the candidates and it is believed that, if a professional is very technically oriented, he/she is likely to be somewhat deficient in issues of conflict management. It is considered important, in the

selection process, to identify how the applicant would handle critical points in a projects.

The competences needed to manage a project change throughout the project's phases Behavioral and managerial competences are more important for these contract managers, while the project management director, who is also the PMO Manager, takes care of the project's management; that is, holds management competences.

At the time of the interview, the organization does not have any PMer certified as PMP in its Brazil office. However, the organization is encouraging its professionals to gain PMP qualifications. For that reason, the organization is willing to pay for staff to gain PMP certification, the organization pays the certification Fee. One of the reasons the organization wants PMP-certified professionals is for marketing purposes. In general, clients believe that qualified professionals are more able to achieve project objectives. On the other hand, the company already has postgraduate professionals in the area of PM, including the project director, who was the interviewee for this research.

In Company A, an applicant is not rejected from the selection process for speaking only one language or having no knowledge of software, the organization provides the necessary software training after an applicant be selected. On the other hand, knowing how to relate to clients, having leadership and management skills, being proactive, and possessing a higher education are fundamental competences. Overall, the main requirement is that the job applicant shows the ability to have good relationships with clients and the team.

In addition to providing a course on project management software, Company A, when necessary, holds other specific courses, such as a course for communication and negotiation.

6.2.4.2 Company B

Company B is a Brazilian company specializing in technology services, with a focus on management. Company B is a project-based company with a consolidated culture in this discipline, including its own, internally-developed project-management method.

About the process of selecting PMers, Company B, in a partnership between, the PMO, the human resources department and an external consultant, developed a Career Plan (CP). In this, the minimum skills required for each level of PMer are set out: trainee,

junior, full, and senior. The organization divides the PMer skills into four groups: *knowledge* – relating to English courses and software, for example; *competence* – involving proactive behavior, leadership and customer relationships, for example; *training* – relating to the level of education held (higher education and postgraduate), for example; *experience* – relating to past experiences and work/projects already achieved. Out of the four groups, Company B prioritizes the second, *competence*.

In the selection process, the human resources department focuses on evaluating behavioral competences and identifying previous experience. In Company B, practical tests are not performed; however, group dynamics are performed as well as psychological tests. Most of the time, the organization is able to identify the behavioral competences of the candidate; but it was pointed out that technical skills are a little more difficult to perceive during the selection process.

The job description of the project manager sometimes needs to be adjusted depending on the level of ability required and the project characteristics. In the selection process, knowing another language and being able to travel are essential requirements for employment.

In most cases, a candidate for a project manager must achieve a minimum set of conditions in terms of training and knowledge levels and prior experience in projects of various sizes.

Both the boards and the PMO participate take care of the the competency development pathway; but the responsibility lies with human resources.

The structured career development process, called CP (Career Plan), is based on the competences needed to perform the roles in the organization. The CP was implemented in early 2013, with the main objective of retaining talent in the organization. The main difficulty regarding its implementation was to reach a consensus on the descriptive competences of PMers that could serve all areas of the organization. The next difficulty was to structure the careers and their process of evolution with regards to competence versus salary. As it is a recent program, great improvements have not yet been identified; the main impact, so far, has been regarding salaries.

For many years, Company B prioritized technical and managerial competences. However, after having some negative experiences from selecting only professionals

with these strong characteristics, the organization started to focus on behavioral and contextual competences.

The company has invested in training, including in PMP certification. With the implementation of the CP, it was noticed that staff members became aware of the requirements necessary for the level of their employment and at subsequent levels. According to the interviewee, the CP encourages professional growth.

6.2.4.3 Company C

Company C is active in the field of e-consulting engineering dedicated to: the development of multidisciplinary engineering and architecture projects, technical monitoring of works, management of the implementation of enterprises, management of the maintenance of enterprises, and development of corporate technology systems of information.

Since 1995, the organization has sought to train PMers. It recognizes the benefits of training internal staff members, as they already know the organizational culture and may give a better return than new employees recruited from the marketplace. However, in times of high work volume, it is not always possible to train internal staff and then it becomes necessary to look outside the company for new staff.

The organization includes examining candidates through applications and interviews. During curriculum analysis, the organization seeks to select for interview only graduates from known colleges and universities. According to the interviewee, professionals from good universities have a greater cognitive capacity for learning and have resilience in periods of stress or challenges.

The organization prioritizes behavioral skills, then technical competences and, lastly, managerial skills.

According to the interviewee, when the organization did not go through such strict financial controls, it used external human resource companies to shortlist candidates for interviews with the board of relevant staff. Therefore, external human resources were responsible for the applicants' adherence to the PMer job description, while the PMO/project director are held the interviews, which coverted the applicant' PM skills and technical know-how. When the organization underwent cost-cutting exercises, the

selection process became entirely the jurisdiction of the PMO responsible for the project.

In the analysis of the applications, most attention is paid to the candidates' work experiences and any clients already known. However, the interview is more important. According to the interviewee, curriculum vitae can be falsified; whereas, during an interview, applicants need to provide details of prior experience and past projects. The information given is analyzed and the performance of the candidate is noted.

Another point mentioned by the interviewee was that, despite using job websites to advertise for recruitments, often a specific professional from another competing company is approached. According to the interviewee: "... it is common for organizations to steal from each other"; but, in any case, a curriculum analysis and an interview are carried out.

For the development of competences, Company C doesn't have a formal process, such as a career plan or a salary plan. However, normally, a technical professional is selected for employment and, then, the organization acts in the development of this professional to become a PMer over time.

The initial employment is likely to be in a technical role. This is considered to have less seniority. As behavioral competences and knowledge of the project grow, the PMer's career path develops accordingly. This process of qualification of the PMer learning takes place through mentoring and on-the-job training. Company C begins to involve junior employees in activities alongside senior PMers, ranging from attending meetings with clients to planning project events.

6.2.4.4 Company D

Company D is a company that has been in the market for more than 100 years. In Brazil, the organization works in the education sector. Its educational projects sometimes involve other sectors such as IT.

Human resources are responsible for the selection of PMers for the different areas in Company D. For this reason, the staff there need to understand how the PM is organized in different departments. Job candidates need to show they meet the competences necessary for the role for which they are applying. Candidates also need

to show they understand the importance of the project they hope to manage in terms of the company as a whole.

Job descriptions are created by human resources in conjunction with the area that requires a new PMer. The relevant department prepares a preliminary text and human resources make any necessary adjustments. A framework is not used for this process. Regarding selection, both human resources and the department manager usually take part in interviewing; human resources are responsible for analyzing whether applicants would fit into the company culture; and the department manager is responsible for deciding whether candidate is able to manage the project successfully.

Usually any relevant competences identified in an applicant's curriculum vitae are validated during the interview through careful questioning (what he/she did in the situation and the resulting effect on the project).I In general, the company looks for evidence that proves a competence.

The organization does not have in place a general career pathway for PMers; rather, an individual plan is made for the development of each PMer. In general, the plan is drawn up the PMer and renewed from one year to the next. Throughout the year, the PMer is periodically assessed on performance and in relation to set goals . There is also some mentoring and coaching in place to help PMers develop.

In terms of PMer development, Company D rates competences in the following order of importance: behavioral, contextual (related to the project and company environment itself), technical, and managerial at last.

6.2.4.5 Company E

Company E is a banking automation, commercial automation, and services company that has a focus on research in Latin America and Europe. An interview was conducted with a PMO Member.

In Company E, PMer job descriptions are created by the PMer team coordinator. The most important competences required when selecting a PMer are: conflict resolution skills and people management.

As the company is involved in IT, it prefers to employ PMers with a degree in computer science or a related subject.

The selection process consists of examining the curricular vitae, an interview with human resources to discern candidates' soft-skills competences and a further interview with the PMO, in which candidates' past experiences are explored and skills, such as communication and good organization, are identified. Both internal and external candidates are considered for PMer roles.

Having the relevant technical competences is important but not fundamental in the selection process. Since projects are generally complex, it is important that applicants do not try to deceive the interviewer or exaggerate their abilities.

In the selection process, behavioral competences are prioritized. However, according to the interviewee, these are difficult to identify. Often, it was said, even an indication was useful when selecting a candidate.

A lack of certain PM competences, such as time management, project balancing, or knowledge of particular PM software, would not necessarily lead to candidates being rejected for a position. According to the interviewee, such skills can be taught, if the candidate already knows the concepts.

Company E does not have a structured career plan in place for PMers. However, it frequently trains its PMers, based on their needs. Usually, courses are held internally and are more likely to be related to PM tools, leadership competences, and legal issues related to projects.

Training needs are identified from managers' feedback. Competences are generally developed in order of importance: behavioral, contextual, managerial, and technical

6.2.4.6 Company F

Company F is a healthcare operator. The interview was conducted with the PMer responsible for the organization's business projects.

For many years, Company F had a functional structure, where the department manager, often without the necessary competences, took the role of PM. However, in recent years, with the support of the PMO and the company's management, has started to select employees with the competences needed to carry out PM effectively.

After this change, Company F has used outsourced organizations to initiate the selection process. The PMO and project sponsor then analyze the shortlisted candidates' applications, looking mostly at past work experience, including previous employers and relevant projects undertaken. Interviewers also check whether applicants have prior experience in or knowledge of the healthcare sector.

In the interviews, interviewers look for evidence of behavioral competences through discussing different scenarios. For example, the interviewer suggests a situation and questions the candidate as to how she/he would behave. All PMers are required to have completed tertiary education and have knowledge of specific PM tools used by the company.

In order to develop its PMers, Company F uses a process of evaluation from three different perspectives: the team, the PMO Manager, and the project sponsor. Once the perspectives have been consolidated, areas for improvement or development are shared with the individual concerned.

In general, competences that require improvement are: conflict resolution, communication, leadership skills, and emotional intelligence.

Technical competences are not usually the focus of development for PMers. In the company's view, the technical part of a project should be performed by someone other than the PMer, a specialist, for example.

6.2.4.7 Company G

Company G is an IT company working in the field of developing and implementing ERPs systems. The case study was carried out in the area of systems implementation.

The company works as a Project Based Organization and the PMer job descriptions are drawn up by the project director and the human resources department.

For the selection of a PMer, a job description is prepared. For a junior-level PMer, it is not necessary for the candidate to have prior experience. However, for the other levels of seniority, previous work experience is required.

The selection process involves: Curriculum Vitae analysis, interview, group dynamics with the participation of directors from related areas, and a technical evaluation through cases. Candidate references are considered carefully in the process. In addition, the

applicants' competences of general and people management, and conflict resolution are evaluated, as well as the ability to make presentations.

For the role of a PMer, it is essential to be a graduate, to speak English, and have a general knowledge of politics and economics. Whilst it is not mandatory to have completed a postgraduate degree and to speak another language, such as Spanish, these are differential qualities.

In terms of competence blocks, behavioral and managerial competences are considered the most important in the selection process. Technical competences are not so much necessary because there is a team of specialists for a project. Behavioral competences, according to the company, are very important in the selection process; however, it is believed that it is only possible to assess these after interaction takes places with the selected candidate.

To develop the competences of its PMers, Company G designs an annual professional development plan. This plan aims to empower its PMers in the new tools and techniques necessary for the management of their projects. In this plan individual behavioral competences are also worked on.

The organization does not pay for the certification preparatory courses for managers who do not yet have it; but it bears the cost of the exam if it is passed.

In order to improve the development of its professionals, the organization establishes partnerships with educational institutions to carry out postgraduate courses.

In general, the PMer's career pathway in Company G works primarily on a need for learning to be focused on technical competences initially. Later on, when a PMer reaches a higher seniority, the focus moves to the development of soft-skill competences.

6.2.4.8 Company H

Company H is a multinational in the field of developing and selling IT products. The case study was carried out with the manager responsible for the coordination of projects in the contact center implementation sector. In Company H, there is no specific sector for projects (PMO), and projects are managed in their departments.

In general, when a department manager requires a new PMer, support is requested from human resources.

The recruitment of PMers happens most frequently through external contracting, and Company H's human resources department keep information on job descriptions and seniority levels.

The department manager makes adjustments to a standard, basic job description as is necessary for the role. This might include, for example, whether the applicant needs a particular language, the minimum number of work hours, or whether a specific qualification, such as PMP, is required.

The selection process is organized into two stages: examining the curriculum vitae and an interview. In the first stage, a shortlist of candidates to be interviewed is drawn up and unsuitable applicants are excluded. The most important factors taken into account are past work experience, previous employers, the position currently held, and education level. All PMers in Company H have a higher qualification.

In the second stage, the interview, the interviewer looks for evidence of the following competences: leadership skills, teamwork abilities and contextual knowledge (in this case, the context is the contact center project). During the interview, candidates are asked questions about particular scenarios in order to ascertain specific competences, including: proactive behavior, conflict resolution skills, and management and leadership abilities. These are considered fundamental competences for a candidate to be successful in the selection process.

Company H seeks to develop all its employees, whether PMers or not. Development takes place through mentoring and coaching, one-on-one feedback, providing an E-learning platform with courses focused on the broadest areas of competence, such as leadership and organization. In addition, organizational courses are held for its employees.

It is the responsibility of the department (area) manager to identify the development needs of each employee and to ensure that these needs are met, including through courses or mentoring.

Company H also finances postgraduate studies and the gaining of qualification for its employees. Whilst not all staff are funded in this way, such incentives stimulate the development of individual career plans.

6.2.4.9 Cross-case analyses

In order to make a comparison between the case-study companies, and their project manager selection and development processes, Tables 2 and 3 were created, with the aid of Nvivo software. Table 2 focuses on the PMer selection process and Table 3 on the PMer development process; both help to identify similarities and differences between the organizations.

From analyzing Table 16, it has been found that the Leader of the PMO and the Department manager are mostly responsible for selecting PMers in the organizations. However, human resources also offer support in identifying behavioral competences. In all the selection processes, there were analyses of curriculum vitae and an interview. The purpose of the interview in each organization is solely to ascertain the applicants' competences (Huemann et al., 2007; Pinto et al., 2010).

Most of the organizations prefer to develop existing employees to become PMers. However, because of the time required, new staff are often recruited from external sources. Prior work experience (Marsh and Stock, 2003) was considered to be the most important factor for PMer selection, according to the cases. Behavioral competence is, in most cases, considered to be the most important competence for job applicants to possess. No particular guidelines were used in order to create job profiles for selected PMers.

Table 16 – Selecting Project Managers

Item	Company							
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Whom defines **PM Competences**?	PMO	HR with support from PMO	PMO	PMO and HR	PMO	PMO	PMO	HR
Which competencies are **important** ?	1. Behavioral 2. Contextual 3. Technical 4. Managerial	1. Contextual 2. Behavioral 3. Technical 4. Managerial	1. Behavioral 2. Contextual 3. Technical 4. Managerial	1. Behavioral 2. Contextual 3. Technical 4. Managerial	1. Behavioral 2. Contextual 3. Technical 4. Managerial	1. Behavioral 2. Managerial 3. Contextual 4. Technical	1. Managerial 2. Technical 3. Behavioral 4. Contextual	1. Behavioral 2. Managerial 3. Technical 4. Contextual
Whom select the PM?	PMO	HR and PMO	HR and PMO	HR and PMO	HR and PMO	PMO with support from HR	HR and PMO	Department Manager
Usually **hire** of **develop** the PM?	Hire	Hire	Develop	Develop	Develop	Hire	Develop	Develop
Steps to select the PM on the market?	1. Curriculum Analysis (CA) 2. Interview with Directors	1. CA 2.Psicological Tests 3. Technical Tests (not always - depend of the project needs) 4. Interview with HR focused on interpersonal competencies 5. Interview with PMO focused on past experiences	1. CA 2. Interview with Directors	1. CA 2. Interview with HR and Manager	1. CA 2. Interview with HR and PMO	1. CA 2. Interview with PMO and Director	1. CA 2. Technical Tests 3. Group Dynamic (Directors are involved to analyse) 4. Interview with Directors	1. CA 2. Group Dynamic (not always) 3. Interview with Deparment Manager and HR
Certification level of importance?	**	**	**	***	*	***	****	***
What are the **most important** factors during the selection process of a Project Manager?	Previous experience (PE) and Resilience	PE	PE	Leadership, proative and Team management	IT background, conflict management, Pro-active	PE	PE	PE

Legend:*-Not relevant; **-Relevant for business conditions; ***-Relevant for project success;****- Relevant for business and project success

From analyzing Table 17, it was found that career programs are created for all staff, not just PMers. The programs identified in the case-study companies do not involve a continuous and ascending pathways for developing competences; instead, career plans feature positions and salaries. Most programs are not tied to the competences of PMers.

The two reasons cited for the existence of programs are: reduction of staff turnover and the increase of potentially successful projects. In general, the Leader of the PMO and the department manager are responsible for evaluating PMers. Most courses provided by the companies are focused on developing leadership and communication competences, and PM tools. The way PMers mostly develop their competences, however, is through on-the-job training, working with smaller projects, or, even, participating in and managing large and complex projects. Informally, PMers receive feedback through face-to-face meetings and these provide pathways for development. Most of the training takes place either in class or in a class mode, and may or may not be performed internally within the company.

Regarding the size of the companies and the results, two points deserve to be highlighted in relation to the selection process: the first is that most (3 of 4) large companies (> 1000 employees) prefer to develop their employees to become managers instead of to hire them. Second, these companies value more certification in the area of project management than other companies. Regarding small organizations (<1000 employees), only one among the four has a formal career development process for the project manager.

None of the case-study companies has carried out a complete assessment of PMer types, as suggested by (Hauschildt et al., 2000) to create appropriate project management training programs (Loufrani-Fedida and Missonier, 2015).

The absence of formal plans oriented to project management has already been highlighted by (Bredin and Soderlund, 2013). The main challenges corroborate with what was pointed out by the authors: number of levels, volume of activities to maintain, the degree of formal requirements. In addition to these, a new point was mentioned: the cost of implementing and adapting project managers to the career plan.

Table 17 - Developing PMers Competences

Item	Company							
	A	B	C	D	E	F	G	H
Is there any career plan or program to develop competencies?	No formal career program. However the company has a parnership with a institution that gives courses to develop the PM Competences.	Yes, developed by HR, PMO with a help of a Consulting Company	No formal development program. However the company work to develop internally their PM the technical and managerial content. Depending on the financial circunstancies, the company pay for their training.	Yes, the organization has a program for all colaborators.	There is no formal competency development program. They do training ad hoc, in other words, as they identify the PMer needs	There is no formal competency development program, however they are constraly giving feedback from the Team, Sponsor and PMO to PM in order to improve his competences	The company has a program to train its PM. The training focus of on PM and Company needs.	The organization works with a development program for all its collaborators.
Why was it implemented and what its benefits?	Increase project success rate	Reduce Turnover	Increase project success rate Reduce turnover	Increase project success rate Reduce turnover	Increase project success rate	Increase project success rate	Increase project success rate Reduce turnover	Reduce Turnover and easily reallocation of professionals
Whom is responsible for the development Competencies ?	PMO Manager	HR is mostly responsible followed by PMO Manager	PMO Manager	Department Manager	PMO Manager	PMO Manager	PMO Manager	Department Manager / Project Manager
Which competences are developed ?	Ms Project, Communication, Leadership and Negotiation	PM tools, managerial competences and personal competences	Technical, Managerial Competences and Personal competences	The competencies developed are based on the needs of project managers.	Management and Technical (legal that are related to the projects)	Communication, Leadership, Conflict resolution and Emotional Intelligence	Internal methodology of project management, communication, leadership, PM tools, resilience and conflict resolution	PM tools and frameworks
How competencies are developed Experiential Learning?	On-the-job-training	On-the-job-training	Mentoring/Coaching On-the-job-training	On-the-job-training	On-the-job-training	Mentoring/Coaching	Mentoring/Coaching On-the-job training	Mentoring/Coaching On-the-job training
How competencies are developed Non Formal Learning?	Not mentioned	Face-to-face meetings	Face-to-face meetings	Not mentioned	Not mentioned	Face-to-face meetings	Face-to-face meetings	Face-to-face meetings
How competencies are developed in a Formal Learning?	Group Training Classroom Training	Group Training, Classroom Training, Blended Learning	Group Training, Classroom Training, Blended Learning	Group Training, Classroom Training, Blended Learning	Group Training, Classroom Training, Blended Learning	Group Training, Classroom Training, Blended Learning	Group Training, Classroom Training, Blended Learning Virtual learning environment	Group Training, Classroom Training, Blended Learning Virtual learning environment

6.2.5 Conclusions

The purpose of this article was to identify how companies carry out the selection of their PMers and what actions these companies take in order to develop the competences of their employees so that they become effective PMers. With regards to both objectives, this research has been successful.

Regarding the first objective, it was possible to identify that the case-study companies act in several ways in PMer selection: internally, by developing staff for these positions, often those professions are already working on small projects and/or as part of the management team and them they are assigned to PMer position. Externally, through the selection of market professionals, which mostly happens through curricular analysis followed by an interview with the human resources department, focusing on behavioral competences, and with the department manager and/or the PMO Manager, focusing technical and managerial competences – mostly the companies have looked for prior experience to testify those competences. (Skulmoski et al., 2010).

With respect to the second objective, PMer development, the majority of the case-study companies have in place a program aimed at the company as a whole; that is, it is suitable for all employee roles, rather than designed specifically for PMers. PMer development consists mostly of experimental learning, by allocating the employee to work on small projects and/or in project teams, before moving on to manage larger projects or to manage independently. Regarding formal training, classroom settings are used widely. Only one company indicated the use of online tools. Finally, regarding informal training: this is a limitation of the research, since the PMers of the case-study companies were not interviewed and, so, it remains unknown whether they are participating in project management activities as part of their development..

Another finding of the research is that guides, although they exist, are not used by any of the companies, either for development purposes or in the identification of compentences.

The present work has limitations. One of these is that the work did not seek to identify and/or confirm with PMers the effectiveness of any training provided. Another limitation is mentioned above, and is that the research does not confirm the informal training in which PMers take part.

Future research could include surveying PMers in order to identify the forms of training and their effectiveness in carrying out PM activities.

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6.2.6 References of Paper #2

Ahsan, K., Ho, M., Khan, S., 2013. Recruiting Project Managers: A Comparative Analysis of Competences and Recruitment Signals From Job Advertisements. Proj. Manag. J. 44, 36–54. doi:10.1002/pmj.21366

Association for Project Management (APM). 2015. APM competence framework (2nd ed.). Buckinghamshire, UK: Association for Project Management.

Becker, K., Smidt, M., 2015. Workforce-related risks in projects with a contingent workforce. Int. J. Proj. Manag. 33, 889–900. doi:10.1016/j.ijproman.2014.10.014

Belout, A., 1998. Effects of human resource management on project effectiveness and success: toward a new conceptual framework. Internattonal J. Proj. Manag. 16, 21–26. doi:10.1016/S0263-7863(97)00011-2

Belout, A., Gauvreau, C., 2004. Factors influencing project success : the impact of human resource management 22, 1–11. doi:10.1016/S0263-7863(03)00003-6

Boyatzis, R.E., 1982. The Competent Manager: A Model for Effective Performance. Wiley.

Bredin, K., Söderlund, J., 2013. Project managers and career models: An exploratory comparative study. Int. J. Proj. Manag. 31, 889–902. doi:10.1016/j.ijproman.2012.11.010

Brill, J.M., Bishop, M.J., Walker, A.E., 2006. The Competences and Characteristics

Required of an Effective Project Manager: A Web-Based Delphi Study. Educ. Technol. Res. Dev. 54, 115–140. doi:10.1007/s11423-006-8251-y

Carvalho, M., 2014. An investigation of the role of communication in IT projects. Int. J. Oper. Prod. Manag. 34, 36–64. doi:10.1108/IJOPM-11-2011-0439

Celkevicius, R., Russo, R. F. S. M.,2018 An integrated model for allocation and leveling of human resources in IT projects. International Journal of Managing Projects in Business. 11, 234-256.

Cha, J., & Maytorena-Sanchez, E. (2019). Prioritising project management competences across the software project life cycle. International Journal of Managing Projects in Business.

Chipulu, M., Neoh, J.G., Williams, T., 2013. Manager Competences 60, 506–517.

Clarke, N., 2010a. Emotional intelligence and its relationship to transformational leadership and key project manager competences. Proj. Manag. J. 41, 5–20. doi:10.1002/pmj.20162

Clarke, N., 2010b. Emotional Intelligence and Its Leadership and Key Project Manager 41, 5–20. doi:10.1002/pmj

Crawford, L., 2005. Senior management perceptions of project management competence. Int. J. Proj. Manag. 23, 7–16. doi:10.1016/j.ijproman.2004.06.005

Crawford, L., 2000. Profiling the Competent Project Manager. Management 3–15.

Davis, S.A., 2011. Investigating the impact of project managers' emotional intelligence on their interpersonal competence. Proj. Manag. J. 42, 37–57. doi:10.1002/pmj.20247

Egginton, B., 2012. Realising the benefits of investment in project management training: Evidence supporting the need for a more strategic approach. Int. J. Manag. Proj. Bus. 5, 508–527. doi:10.1108/17538371211235344

Eisenhardt, K.M., 1989. Building Theories from Case Study Research. Acad. Manag. Rev. 14, 532–550. doi:10.5465/AMR.1989.4308385

Ekrot, B., Kock, A., Gemuenden, H., 2016. Georg Retaining project management competence - Antecedents and consequences International Journal of Project Management, 34(2): 145-157.

El-Sabaa, S., 2001. The skills and career path of an effective project manager. Int. J. Proj. Manag. 19, 1–7. doi:10.1016/S0263-7863(99)00034-4

EL-Sabaa, S., 1999. The skills and career path of an effctive project manager. Int. J. Proj. Manag. 19, 1–7. doi:10.1016/S0263-7863(99)00034-4

Gruden, N., Stare, A. The Influence of Behavioral Competences on Project Performance Project Management Journal, 49(3) 98–109, 2018.

Hauschildt, J.J., Keim, G., Medcof, J., 2000. Realistic Criteria for Project Manager Selection and Development. Proj. Manag. J. 31, 23–32. doi:10.1177/875697280003100304

Hölzle, K., 2010. Designing and implementing a career path for project managers. Int. J. Proj. Manag. 28, 779–786. doi:10.1016/j.ijproman.2010.05.004

Huemann, M., Keegan, A., Turner, J.R., 2007. Human resource management in the project-oriented company: A review. Int. J. Proj. Manag. 25, 315–323. doi:10.1016/j.ijproman.2006.10.001

International Project Management Association (IPMA). 2015. ICB— IPMA individual competence baseline for project, programme and portfolio management version 4.0. Nijkerk, the Netherlands: International Project Management Association.

Khan, A.S., Rasheed, F., 2015. Human resource management practices and project success, a moderating role of Islamic Work Ethics in Pakistani project-based organizations. Int. J. Proj. Manag. 33, 435–445.

doi:10.1016/j.ijproman.2014.08.006

Kontoghiorghes, C., 2016. Linking high performance organizational culture and talent management: satisfaction/motivation and organizational commitment as mediators. Int. J. Hum. Resour. Manag. 27, 1833–1853. doi:10.1080/09585192.2015.1075572

Loufrani-Fedida, S., Missonier, S., 2015. The project manager cannot be a hero anymore! Understanding critical competences in project-based organizations from a multilevel approach. Int. J. Proj. Manag. 33, 1220–1235. doi:10.1016/j.ijproman.2015.02.010

Marsh, S.J., Stock, G.N., 2003. Building Dynamic Capabilities in New Product Development through Intertemporal Integration 136–148.

Medina, R., Medina, A., 2014. The project manager and the organisation's long-term competence goal. Int. J. Proj. Manag. 32, 1459–1470. doi:10.1016/j.ijproman.2014.02.011

McKevitt, D, Carbery, R., Lyons, A. 2017, A profession but not a career? Work identity and career satisfaction in project management. International Journal of Project Management, 35 (8): 1673-1682.

Marzagão, D.S.L., Carvalho, M.M. 2016a, Critical success factors for Six Sigma projects. International Journal of Project Management 34(8): 1505-1518. doi: 10.1016/j.ijproman.2016.08.005

Marzagão, D.S.L; Carvalho, M.M. 2016b, The influence of project leaders' behavioral competencies on the performance of Six Sigma projects. Revista Brasileira de Gestão de Negócios. 18(62): 609-632 doi: 10.7819/rbgn.v18i62.2450.

Müller, R., Turner, J.R., 2010a. Attitudes and leadership competences for project success. Balt. J. Manag. 5, 307–329. doi:10.1108/17465261011079730

Müller, R., Turner, R., 2010b. Leadership competency profiles of successful project managers. Int. J. Proj. Manag. 28, 437–448. doi:10.1016/j.ijproman.2009.09.003

Nijhuis, S., Vrijhoef, R. and Joseph Kessel, J. Tackling Project Management Competence Research. Project Management Journal, 49(3) 62–81, 2018

Ojiako, U., Ashleigh, M., Chipulu, M., Maguire, S., 2011. Learning and teaching challenges in project management. Int. J. Proj. Manag. 29, 268–278. doi:10.1016/j.ijproman.2010.03.008

Pant, I., Baroudi, B., 2008. Project management education: The human skills imperative. Int. J. Proj. Manag. 26, 124–128. doi:10.1016/j.ijproman.2007.05.010

Pinto, A., De Matheus Cota, M.F., Levin, D.G., 2010. The PMO Maturity Cube, a Project management iffice maturity model. PMI Res. Educ. Congr. 2010, Washingt. D.C., USA 1–56.

PMI, 2017. Project Management Competency Development Framework - Third edit. PMI Publications, Pennsylvania.Popaitoon, S., Siengthai, S., 2014. The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. Int. J. Proj. Manag. 32, 908–920. doi:10.1016/j.ijproman.2013.12.002

Ramazani, J., Jergeas, G., 2015. Project managers and the journey from good to great: The benefits of investment in project management training and education. Int. J. Proj. Manag. 33, 41–52. doi:10.1016/j.ijproman.2014.03.012

Sankaran, S., Vaagaasar, A., Bekker, M.,2019. Assignment of project team members to projects Project managers' influence strategies in practice. International Journal of Managing Projects in Business. doi: 10.1108/IJMPB-12-2018-0285

Savelsbergh, C.M.J.H., Havermans, L.A., Storm, P., 2016. Development paths of

project managers: What and how do project managers learn from their experiences? Int. J. Proj. Manag. 34, 559–569. doi:10.1016/j.ijproman.2016.02.005

Skulmoski, G.J., Dhabi, A., Emirates, U.A., Hartman, F.T., 2010. Information Systems Project Manager Soft Competences: A Project-Phase Investigation 41, 61–80. doi:10.1002/pmj

Starkweather, J.A.; Stevenson, D.H., 2011. PMP (R) Certification as a Core Competency: Necessary But Not Sufficient. Project Management Journal 42(1): 31-41

Stevenson, D.H., Starkweather, J.A., 2010. PM critical competency index: IT execs prefer soft skills. Int. J. Proj. Manag. 28, 663–671. doi:10.1016/j.ijproman.2009.11.008

Takey, S.M., Carvalho, M.M. de, 2015. Competency mapping in project management: An action research study in an engineering company. Int. J. Proj. Manag. 33, 784–796. doi:10.1016/j.ijproman.2014.10.013

Thomas, J., Mengel, T., 2008. Preparing project managers to deal with complexity - Advanced project management education. Int. J. Proj. Manag. 26, 304–315. doi:10.1016/j.ijproman.2008.01.001

Turner, R., Huemann, M., Keegan, A., 2008. Human resource management in the project-oriented organization: Employee well-being and ethical treatment. Int. J. Proj. Manag. 26, 577–585. doi:10.1016/j.ijproman.2008.05.005

Vale, J.W.S.P., Nunes, B., Carvalho, M.M., 2018. Project Managers' Competences. Proj. Manag. J. 49, 82–97. doi:10.1177/8756972818770884

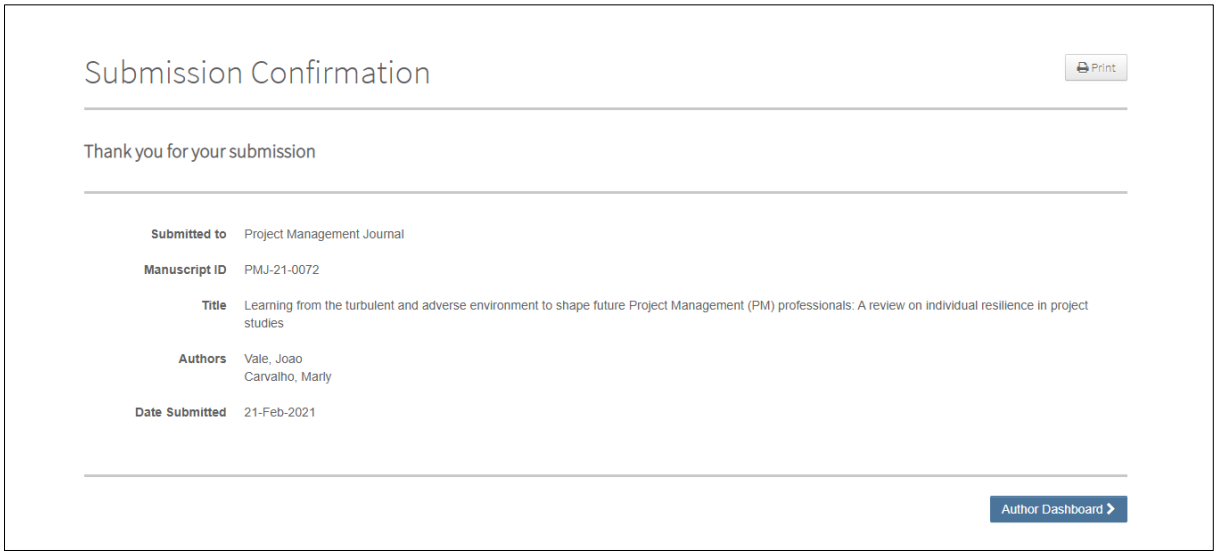
Voss, C., Tsikriktsis, N., Frohlich, M., 2002. Case research in operations management. Int. J. Oper. Prod. Manag. 22, 195–219. doi:10.1108/01443570210414329

Yin, R.K., 2006. Case Study Reserach - Design and Methods. Clin. Res. 2, 8–13. doi:10.1016/j.jada.2010.09.005

6.3 Paper #3 - Learning from the turbulent and adverse environment to shape future Project Management (PM) professionals: A review on individual resilience in project studies

Status: Article submitted

Figure 12 - Paper # 3 submission information



Abstract: The COVID-19 pandemic exposed a lack of resilience and the value of resilience as a resource. This study aims to provide a portrait of individual resilience literature in project studies. Moreover, it explores the relationship between individual resilience and project success. The literature review combines two approaches, bibliometrics and content analysis, with the assistance of VOSViewer, UCINET and Bibliometrix software. The sampling process includes articles from the Web of Science, articles published in the core project management journals, and a backward snowballing sampling through the core references. The study provides a comprehensive portrait of the body of literature on the interplay between individual resilience in the PM field intersection. The main definitions and factors used to operationalize the construct of individual resilience are discussed. Finally, it shows the relationship between individual resilience and project success, providing relevant guidance for future research agenda.

Keywords:
Individual resilience, Personal competence, Behavioral competence, project manager, project management

6.3.1 Introduction

Management in a scenario of increasing complexity leads researchers and practitioners to seek new approaches to managing project management in complex and changing environments where risk and uncertainty are high (Small & Walker, 2010; Thomas & Mengel, 2008; Williams, 2017).

The COVID-19 pandemic brings several new challenges for the Project Management (PM) field, with changing scenarios impacting all areas of life, every industry, the economy and the public sector (Mueller and Klein, 2020). Naderpajouh et al. (2020a) corroborate and point to the increasing trend of abrupt and chronic changes worldwide due to chronic stressors such as climate change and social justice.

It leads to the search for new approaches in PM (Joslin & Müller, 2015) to deal with complexity and increasing uncertainty, including effectuation (Nguyen et al., 2018), improvisation, bricolage (Klein, Biesenthal, & Dehlin, 2015; Leybourne, 2010, Malucelli et al., 2019), and resilience (Geoghegan & Dulewicz, 2008, Geraldi et al. 2010, Müller & Turner, 2010).

However, there is a lack of research on resilience into the Project Management (PM) context (Thomé et al., 2016), with the potential benefit of new research exploring the cross-fertilization among disciplines (Naderpajouh et al., 2020a, b).

The intersection between resilience and PM research involves different levels of analysis, i.e., individual, team, project, organizational, industry, and societal levels (Naderpajouh et al., 2020b). This study focuses on individual resilience and explores the interface with personal and behavioral individual competence in PM (Vale et al. 2018, Gruden & Stare, 2018, Takey & Carvalho, 2015).

Seeking the most qualified professionals is essential in all professions with implications for organizational performance (Kontoghiorghes, 2016). In the PM area, it is no different (Vale et al., 2018), in which the literature has identified personal competencies

for project professionals and their impact on project efficiency and effectiveness (Brill, Bishop, & Walker, 2006; Crawford, 2000, 2005; Mu & Turner, 2010, Marzagão & Carvalho, 2016a; 2016b). Furthermore, it is essential to understand “the competence-building trajectories for the project manager according to professional experience and challenges” (Takey & Carvalho, 2015, page?).

Notwithstanding, in the new turbulent scenario presented, project managers must be able to work in uncertain environments, face hardships and stressful events, to build up solutions and ground their soft skills instead of only hard skills (Pant & Baroudi, 2008; Ramazani & Jergeas, 2015; Stevenson & Starkweather, 2010; Thomas & Mengel, 2008, Takey & Carvalho, 2015).

The COVID-19 pandemic has exposed a lack of resilience (Naderpajouh et al., 2020a), demanding a better understanding of the ecology of stress and the conservation of resources theory to support the value of resilience as a resource (Hobfoll, 2001).

Therefore, there is a need for managing “individuals’ immediate environment, and to develop the protective and promotive factors that individuals can proactively use to build resilience” (Fletcher & Sarkar, 2013), which reinforces the key role of the concept of resilience within the discipline of project studies (Naderpajouh et al., 2020a). As a contribution to narrow this research gap, this study aims at examining the extant literature on the intersection between resilience and PM and answer the following research questions:

RQ1: What does individual resilience mean? RQ2. Which are the most commonly adopted factors that have operationalized the concept of individual resilience? RQ3: How can individual resilience influence project success?

This study makes three relevant contributions. First, it develops a comprehensive portrait of the body of literature on individual resilience in the intersection with the PM

field. Second, this review identified the main factors used to operationalize the construct of individual resilience. Third, it shows the relationship between individual resilience and project success, providing relevant guidance for future research agenda.

The next section presents the literature review on individual resilience. In the third section, the research design is detailed. In the fourth section, the research results and discussion are provided. Finally, in the fifth section, the conclusions, implications and limitations of the work are presented.

6.3.2 Resilience: background in the individual level of analysis

Resilience definitions can vary in different disciplines; Bhamra, Dani, & Burnard (2011) proposes eight definitions in physical, ecological and sociological systems, psychology, disaster management, individual, organizational, and engineering. Therefore, there is an interdisciplinary crossroad of resilience and projects at different levels from the individual to the society's (Naderpajouh et al., 2020a; 2020b). Resilience is not limited to individual personality characteristics since it requires a bidirectional relationship between the environment and the individual (Waller, 2001). Team resilience is not necessarily related to a group of resilient professionals, i.e., it is possible to have resilient teams with non-resilient professionals and vice-versa. This study focuses on the individual level of analysis of the resilience concept.

Two literature reviews, Waller (2001) and Fletcher & Sarkar (2013), cover a period that encompasses more than three decades and help understand psychological resilience in the individual level of analysis.

Two core concepts stood out in the resilience definitions: adversity and positive adaptation, which occurs in the stress process, and play "interactive influence of psychological characteristics" (Fletcher & Sarkar, 2013). Thus, resilience is a positive adaptation in adversity that is the "multidetermined and ever-changing product of

interacting forces within a given eco-systemic context", influencing life circumstances and traumas (Waller, 2001).

The literature on resilience explores the process perspective, highlighting that resilience is not static, given that at different times, the individual may respond differently (Waller, 2001). The process perspective of resilience explores the relationship between personal and situational conditions that result from coping processes, assimilation and accommodation (Leipold and Greve, 2009). In psychological resilience, rebuilding the self occurs through five main processes: connecting, refocusing, accepting, understanding and resisting (Van Vliet, 2008).

Similar to the literature on PM professionals' personal/behavioral competencies (PMI, 2017; IPMA, 2016), there are some assessment instruments for measuring individual resilience available that operationalized the concept through dimensions/factors and offered validated measurement instruments summarized in Table 1.

The literature explores different factors associated with individual resilience. However, there is a lack of consensus among scholars on the factors that better explain this concept. Reivich & Shatté (2002) indicated six factors related to individual resilience: emotional regulation, impulse control, empathy, optimism, causal analysis, self-efficacy and reaching out. However, Alliger, Cerasoli, Tannenbaum & Vessey (2015) suggest the importance of possessing a positive attitude, ability to forgive, internal sense of control, cognitive flexibility, emotional "toughness," realism and the courage to face one’s own fears. On the other hand, for Bhamra, Dani, & Burnard (2011), in the psychological context, resilience is the ability linked with three characteristics: acceptance of reality which believes that life is significant, and the ability to improvise. In crisis management, Boin & Lagadec (2000) indicate that resilience is related to the combination of flexibility, improvisation and ingenuity; however, these authors suggest

that the future vision of crisis management should involve not only resilience but the inclusion of anticipation strategies. Table 2 summarizes the individual resilience factors.

Table 18– Resilience assessment instruments

Assessment Instrument	Reference	Target population	Dimensions	Questions
The Resilience Scale (RS)	Wagnild & Young (1993)	Adults (some application with 16-23)	2 (Personal Competence and Acceptance of Self and Life)	25
The ER 89	Block & Kremen (1996)	Young adults (18 and 23)	1	14
RQ Test	Reivich & Shatté (2002)	-	7 (Emotion regulation, Impulse control, Empathy, Optimism, Causal analysis, Self-efficacy, and Reaching out)	56
The Connor-Davidson Resilience Scale (CDRISC)	Connor & Davidson (2003)	Adults (mean age 43.8)	5 (Personal Competence, High standards and tenacity; Trust in one's instinct, tolerance of negative effects and strengthening effects; Positive acceptance of change and secure relationships; Control; Spiritual Influences)	25
The Resilience Scale for Adults (RSA)	Friborg et al. (2003)	Adults (mean age women = 33.7, men = 36.2)	5 (Personal competence; Social competence; Family coherence; Social Support and Personal Structure)	37
The Resilience Scale for Adults (RSA)	Friborg et al. (2005)	Adults (mean age 22, 24, mid 30s)	6 (Personal Strength: Perception of Self; Personal Strength: Perception of future; Structured Style; Social Competence; Family Cohesion and Social Resource)	33
Resilience Scale for Adolescents (READ)	Hjemdal et al. (2006)	Adolescents aged 13-15 years	5 (Personal Competence, Social Competence, Structured Style, Family Cohesion and Social Resources)	39
Psychological Resilience	Windle, Markland & Woods (2008)	Older Adults (subscales previously used with adolescents)	3 (Esteem; Interpersonal Control and Competence)	19
The Brief Resilience Scale	Smith et al. (2008)	Adults (mean age range 19-62)	1	6

Table 19 – Resilience Factors

Reference	Resilience Factors					
	ER - Emotional Regulation	**PF - Positive Feelings**	**IS - Inner Self**	**PSS - Problem-Solving Skills**	**CR - Creativity**	**RCON - Relationship and Connections**
Waller (2001)	• Emotional regulation • High intelligence • Reflectiveness • Empathy	• Active, easy, outgoing temperament • Positive responsiveness to others • Sense of humor • Hopefulness • Reflectiveness • Recognized talent accomplishments	• Self-efficacy • Self-worth • Self-confidence	• Problem-solving skills • Verbal communication skills • Realistic appraisal of the environment • Sense of direction • Competence in normative roles • Realistic appraisal of the environment • Educational aspiration school commitment	-	•Trust in people as resources •Social skills •Appealing to adults •Strong, positive ethnic identity •Faith religious affiliation •Religious participation
Alliger et. al (2015)	• Internal sense of control • Ability to forgive. • Emotional Toughness	• Positive attitude • Realism	• Courage to face fear	-	• Cognitive flexibility	-

Reference	Resilience Factors					
	ER - Emotional Regulation	**PF - Positive Feelings**	**IS - Inner Self**	**PSS - Problem-Solving Skills**	**CR - Creativity**	**RCON - Relationship and Connections**
Boin and Lagadec (2001)	-	-	-	-	• Improvisation • Flexibility • Ingenuity	-
Reivich and Shatte (2002)	• Impulse control • Emotional Regulation	• Optimism	• Self-efficacy	• Causal analysis	• Reaching-out	• Empathy Reaching-out

It is noteworthy that beyond the individual, other protective factors stimulate the positive result in a situation of adversity such as family, community, and cultural / ethical (Waller, 2001). After the disruption of homeostasis, the reintegration process can lead to one of four outcomes: resilient reintegration, reintegration back to homeostasis, reintegration with loss, or dysfunctional reintegration (Richardson, 2002). However, resilient individuals proactively prepare for adverse events and minimize the impact, exploring their psychological resources effectively (Shin et al., 2012).

Thus, some studies indicated that the resilience process yields positive and negative outcomes. The process of recovering from an adverse event can lead to positive outcomes, such as resilience, quality of life (Haase, 2004), optimism (Reivich & Shatte 2002), positive attitude (Alliger et al., 2015), learning and perspective (Galli & Vealey, 2008), adaptive capacity, growth and job satisfaction (Paton et al., 2008) and productivity and retention (Riolli and Savicki, 2003), but also adverse outcomes, particularly burnout (Dunn et al., 2008; Riolli & Savicki, 2003).

6.3.3 Research Design

Given the research objective's exploratory nature and the research questions proposed, a literature review was conducted based on bibliometrics and content analysis (Littel, Corcoran, & Pillai, 2008). While bibliometry is the study of the quantitative aspects of the production, dissemination and use of the recorded information (Tague-Sutcliffe, 1992), content analysis uses quantitative and qualitative approaches in a set of communication analysis techniques (Bardin, 2010).

A review of the past from the existing literature is essential for any research project. A useful literature review allows creating a foundation for the advancement of new knowledge. Practically, the review facilitates creating new theories, closing open

gaps and presenting the areas where further research is necessary. (Webster, 2002). Particularly interesting are reviews that aim to synthesize a new perspective, providing structure to disparate knowledge (Klein and Mueller, 2020), as the research questions aim to achieve individual resilience in project studies.

6.3.3.1 Sampling process

The sampling procedures comprised searches in the ISI Web of Science Core Collection (WoS) database and the journals of project management that figure in the Journal Citation Report (JCR). Both sampling strategies were combined because the ISI Web of Science (WoS) has a higher quality (Chadegani et al., 2013) and the PM journals on JCR due to the robust peer-reviewed literature (Morioka and Carvalho, 2016). Furthermore, these sampling strategies fit the research questions that explore the intersection between resilience and project studies. The searches in the databases were updated until December 2019 that brings some articles published in 2020.

The search strings adopted were "resilience" AND "project* manag*" as topics in all ISI Web of Science databases to guarantee the fit with the research aim at looking in the intersection (AND logic operator) of resilience and Project Management. The asterisk character (*) contained in the searches was used as a wildcard representing any other character. The result presented 68 documents. In the sequence, the results were filtered according to the document type choosing only articles, reviews and early access, reducing the sample to 48 documents.

Then, a screening process was executed based on the following inclusion/exclusion criteria: (i) the need to address the individual level of analysis for resilience, (ii) the need to target both individual resilience and project thematics, (iii) the core theme of the study is resilience. For instance, articles related to environmental disasters

and city resilience were excluded. At the end of the screening process, 22 documents remain in the sample.

The other stream of the searching process was in PM journals available in JCR. Hence, these three journals were selected: International Journal of Project Management (IJPM), Project Management Journal (PMJ), and International Journal of Managing Project in Business (IJMPB). In that search, only the term related to resilience (resilience and resilient) was used since the journals' scope already guarantees the PM fit. After the searches, the screening process was run again looking at the same inclusion/exclusion criteria. This search stream led to a further 35 articles of the IJPM, 25 articles of the PMJ, and 16 of the IJMPB, which were added to the Web of Science list. Thus, the total sample is composed of 98 papers. Figure 13 illustrates the research sampling flow.

Thus, the total sample, composed of 98 papers, was used and the metadata in the WOS were extracted. It is important to note that some articles were searched directly on the basis of Figure 13 illustrating the research sampling flow used by this research.

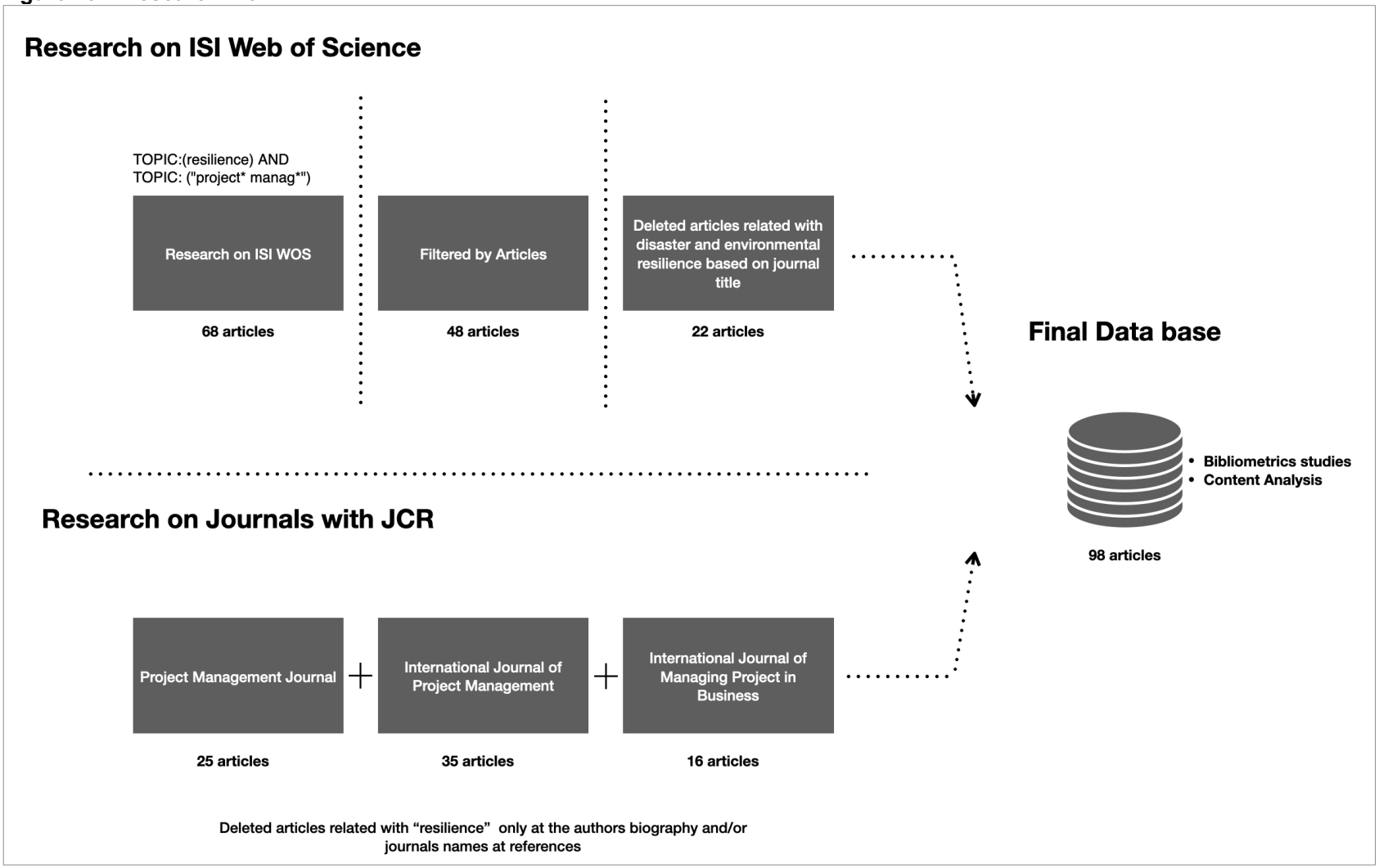
Finally, a backward snowballing procedure was adopted to capture the core references in the previous sample, looking to capture the intellectual roots of this research topic (Fink, 1995a; 1995b; Wohlin, 2014).

Mainly for this research objective, the snowballing sampling proved necessary just as the individual resilience concept has over decades of research in different disciplines. This literature strongly influences the emerging conceptual trends on PM.

This process had several iterations until saturation was achieved, which occurs after the inclusion of several references such as Leipold and Greve (2009); Van Vliet

(2008); Richardson (2002); Waller (2001); Fletcher & Sarkar (2013); Reivich & Shatté (2002) that are detailed and discussed in Section 2.

Figure 13 – Research Flow



6.3.3.2 Data analysis

Firstly, a systematic literature review was performed with bibliometric analysis to trace the publications' profile on resilience in project studies. The study allowed identifying all the research on the intersection between resilience and the PM context. It was also possible to delineate sample demographics as the prominent authors, the leading journals, the main topics and the most relevant references, as suggested by the literature (Bellis, 2009; Ramos-Rodríguez & Ruíz-Navarro, 2004). The bibliometric analysis was carried out with the aid of VosViewer (Van Eck & Waltman, 2009) and Bibliometrix software (Aria & Cuccurullo, 2017). Then, the trend topics were identified, and the relationship among keywords, authors, and references was drawn through network analysis, applying VosViewer and Bibliometrix.

After that, thematic mapping and thematic evolution analysis were used to understand the conceptual structure, allowing understanding the research theme associations within the sample and selected time slices. To understand the intellectual structure, a historiographic analysis was used to create a chronological perspective, measuring the influence of a paper within a specific research stream. Both analyses of the conceptual structure and the intellectual structure were developed applying Bibliometrix software (Aria & Cuccurullo, 2017).

The content analysis was performed manually in parallel with the coding schema development. For the qualitative content analysis, the most recent published articles and the ones with average citations greater or equaled 2 were selected Those articles represent 86% of the volume of citations. The inductive and deductive coding approach was combined through cycling back and forth between data and theory (Skjott Linneberg & Korsgaard, 2019). Therefore, the first list of codes emerged from the literature screening (inductive coding) and were gradually refined

as new codes emerging from the surveyed papers. The final coding schema is detailed in Table 4.

In the final step of the analysis, the relationship between codes through cross-tabulation and network analysis was investigated. IBM SPSS software was used for the code cross-tabulation, which was the input for the network analysis performed in the UCINET6 and Netdraw software (Borgatti et al., 2002).

6.3.4 Research results

6.3.4.1 Sample demographics

Over time, the evolution of publications shows an increasing volume of articles relating to resilience in recent years, particularly since 2015, as presented in Table 20.

Table 20 also shows the number of publications per journal per year in the surveyed sample. Due to the sampling strategy, the two PM journals have the largest number of publications, Project Management Journal and International Journal of Project Management, the first with 27 publications and the second with 41, totaling 69% of the surveyed publications.

There is a large share of England (29.59%), followed by Australia (23.4%), China (11.8%), and the Netherlands (11.2%). These four countries together represent almost 80% of the studied articles.

Table 20 – Publications per year

Source	1992	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
International Journal of Project Management				3	5	1	2	2	3	6	12	3	4		41
Project Management Journal		2	1	3	1		1	1	4		5	4	4	1	27
International Journal of Managing Projects in Business									1	7	2	2	6		18
Australian Journal of Civil Engineering											1				1
Civil Engineering and Environmental Systems													1		1
Engineering Management Journal							1								1
Environmental Innovation and Societal Transitions									1						1
IJISPM-International Journal of Information Systems and Project Management													1		1
Kybernetes						1									1
New Technology Work and Employment										1					1
Public Management Review												1			1
Space Policy	1														1
Team Performance Management												1			1
Techne-Journal of Technology for Architecture and Environment												1			1
Transformations In Business & Economics					1										1
Total	**1**	**2**	**1**	**6**	**7**	**2**	**4**	**3**	**9**	**14**	**20**	**12**	**16**	**1**	**98**

6.3.4.2 Analyzing the impact of authors and studies

First, the most relevant papers were identified using as a proxy the global average citation per year that measures the citations in the entire database provided by WOS. The sum of all citations in this sample was 1862 citations. 25 articles were selected with the average citation per year greater than, or equal to four, as shown in Figure 14. The citations of these articles were 1346 in total which corresponds to 72.28% of the total citations. From 2009 to 2019, there was a consistent increase of citations, with a peak in 2019 with 277 citations. Second, a summary of the content analysis of these top-cited 25 articles is in Appendix A. Finally, Bibliometrix software was used for a set of analyses. The local citations of both the surveyed sample and the references were explored, which measure the number of citations a document received in the observed sample (see Figure 15). Then, the top authors' production over time was identified (see Figure 16) and the intellectual structure was explored to understand the historical paths drawn by the core documents (see Figure 17).

Figure 14 - The 25 articles with citation per year greater than or equal to 4.

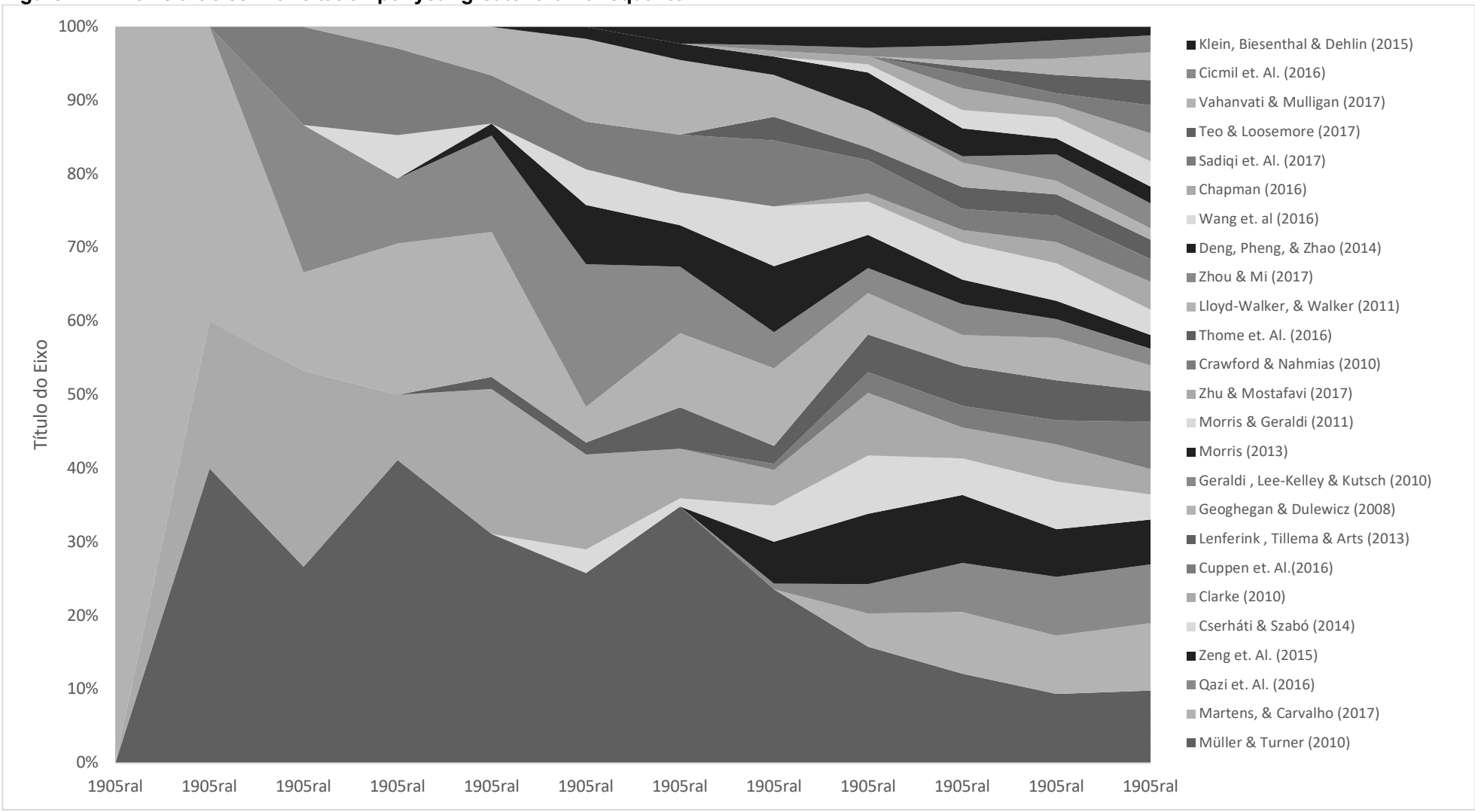
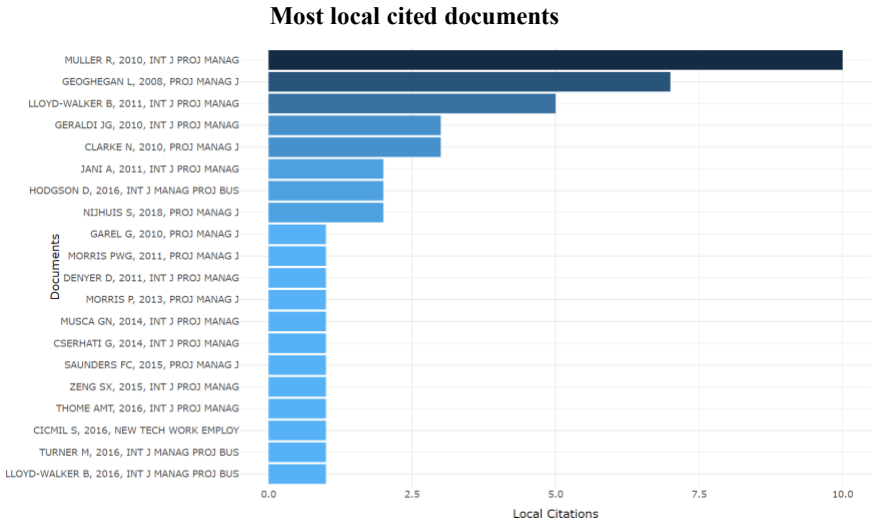


Figure 15 – Local citation: documents and references



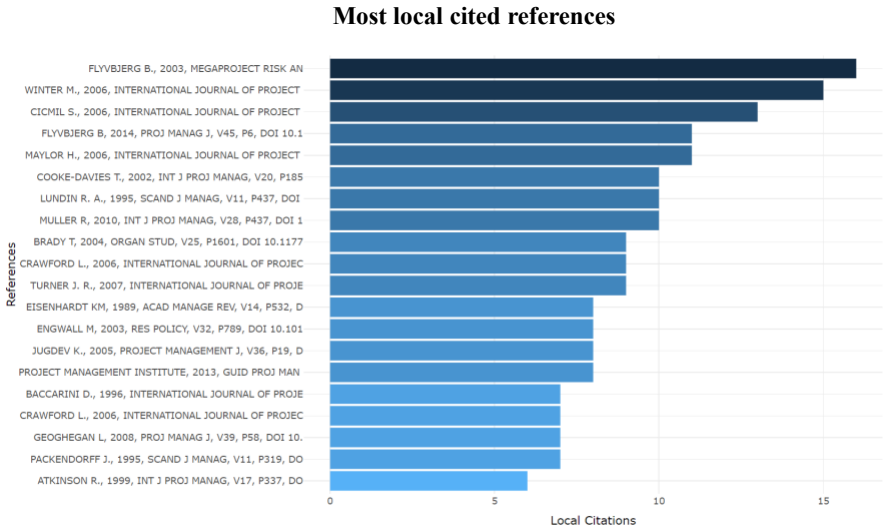
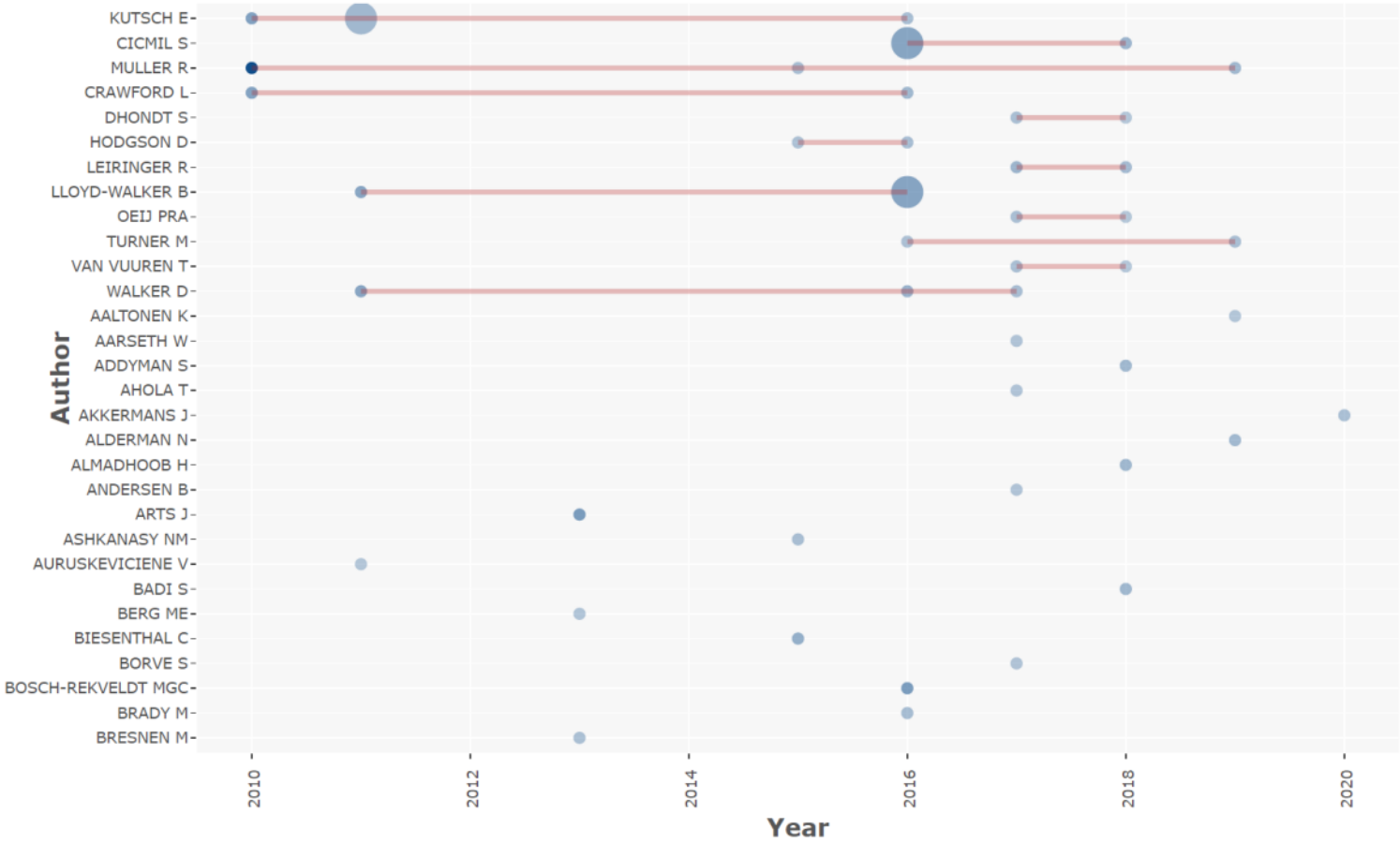
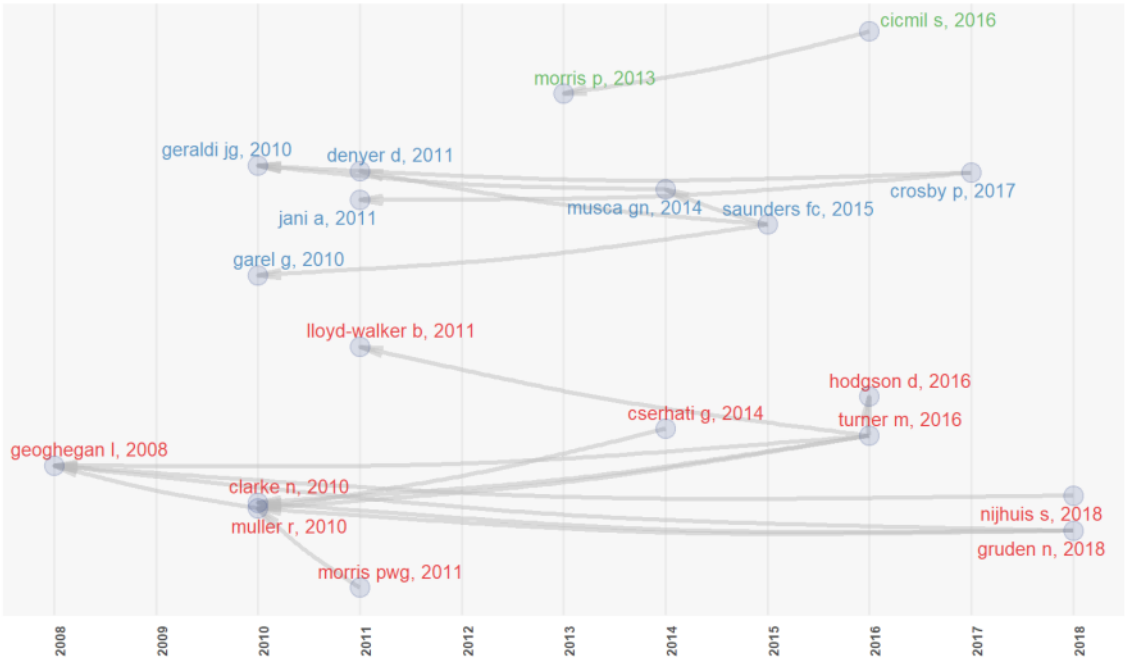


Figure 16 – Top-authors' production over time



Legend:
Lines represents authors' timeline
Bubble size is proportional to the number of documents
Color intensity is proportional to the total citation per year

Figure 17– Historical direct citation network



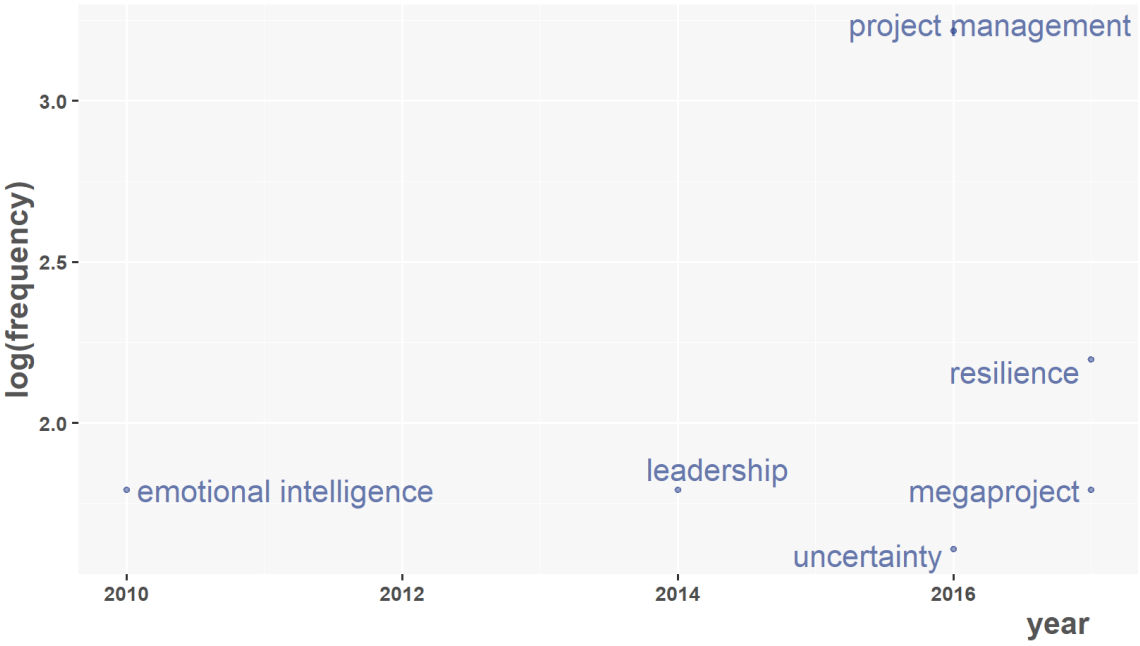
Legend:
Node represents a document cited by other document
Each edge represents a direct citation
Each colour represents a historical path

6.3.4.3 Trend topics and thematic evolution

A set of analyses exploring the keywords in the Bibliometrix software was run to discover the thematic patterns.

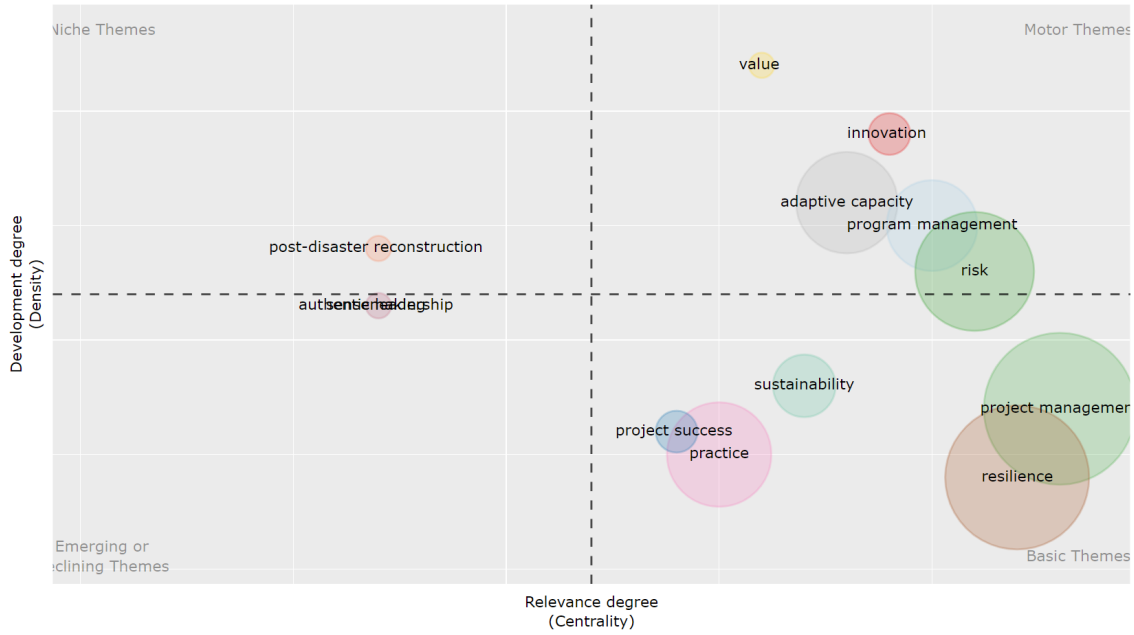
Figure 18 shows the trend topics considering the authors' keywords of the documents studied in this sample. In recent years, resilience appears together with megaproject and uncertainty, but also leadership and emotional intelligence.

Figure 18- Trend topics: Author's Keywords



The thematic evolution presented inFigure 19 brings a different perspective once it shows the cross-analysis between development degree (density) and relevance degree (centrality), leading to four quadrants: basic themes, niche themes, emerging or declining themes and motor themes. In emerging themes, it shows sensemaking and authentic leadership and as motor themes risk and innovation, adaptive capacity and value.

Figure 19 - Thematic Map: Author's Keywords



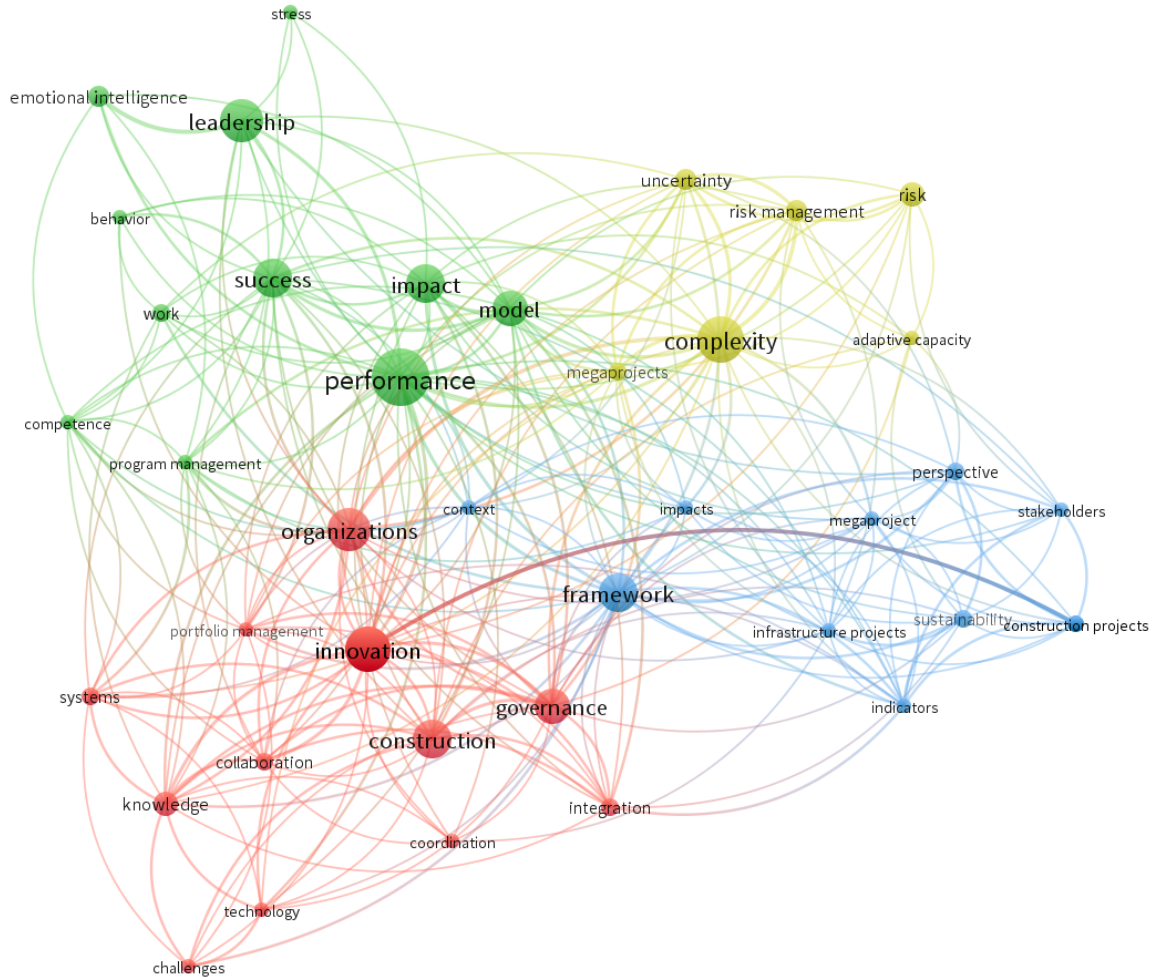
The final analysis related to the themes was the keyword analysis (see Figure 20) applying VOSViewer software using the minimum filter of four citations for each keyword. The hyphenated words were adapted; for example, instead of "mega-project", the word became "megaproject." It was possible to identify four keyword clusters (Table 21). In red are the terms related to the word "resilience" in an organizational context, the second cluster, the yellow, the terms related to risks and uncertainties. The blue cluster is related to the environments where resilience is widely studied recently, particularly in construction and infrastructure projects. The fourth cluster, in green, shows the keywords related to the behavioral aspects of the term resilience, such as emotional intelligence and leadership.

Table 21 – Groups of Keywords relatedness, meaning and article related to it.

Id	Group	Meaning	Articles
1	**Blue**	The group here is related with context of types of projects: mega, infrastructure and construction.	(Chapman, 2016; Eren, 2019; Walker & Lloyd-Walker, 2016; Zeng, Ma, Lin, Zeng, & Tam, 2015)
2	**Yellow**	This group is the articles related with risk, complexity, and uncertainty	(Crosby, 2017; Eren, 2019; Nachbagauer & Schirl-Boeck, 2019a; Novi, 2018; Tavares Thome, Scavarda, Scavarda, & de Souza Thome, 2016)

3	**Red**	These groups are articles that watch the resilience in an organizational level.	(Akkermans, Keegan, Huemann, & Ringhofer, 2020; Lappi, Aaltonen, & Kujala, 2019; Li, Lu, Ma, & Kwak, 2018; Nachbagauer & Schirl-Boeck, 2019a; van Fenema, Rietjens, & van Baalen, 2016)
4	**Green**	This group is the articles related with the personal competence of the project manager: leadership and emotional intelligence	(Berg & Karlsen, 2013; Clarke, 2010; Gallagher, Mazur, & Ashkanasy, 2015; Jugdev, Mathur, & Cook, 2018; Shah & Prakash, 2018a)

Figure 20 - Co-citation network of keywords



Notes: The relatatedness of items is determined based on the number of documents in which they occur together.// Minimum number of occurrences 4 words. Words removed: “project management”, “resilience”, “project” and “projects”.

6.3.4.4 Coding schema analysis

The key thematic was explored and its relationship through the lens of the content analysis. The coding scheme developed is presented in Table 5. As previously shown in Figure 6, there is an increasing concern related to the influence of resilience on value and project success. Moreover, the documents studied explore the resilience factors and the influence of individual resilience on other levels of analysis as a team and an organization.

Table 22 – Coding scheme adopted by the analysis.

Code	Success Dimension	n	%
PME	PM Efficiency	78	79,6%
PS	Product/Service	45	45,9%
FIB	Future Impact on Business	32	32,7%
IMP	Impact on Team	53	54,1%
IMC	Impact on the Customer	36	36,7%
PIB	Present impact on business	30	30,6%
SEI	Social and Environment Impact	48	49,0%
Code	**Resilience factors**	**n**	**%**
ER	Emotional Regulation	31	31,6%
PF	Positive Feelings	10	10,2%
IS	Inner Self	30	30,6%
PSS	Problem-Solving Skills	49	50,0%
CR	Creativity	38	38,8%
RCON	Relationship and Connections	16	16,3%
Code	**Resilience level of analysis**	**n**	**%**
TM	Team	23	23,5%
IND	Individual	38	38,8%
ENV	Organizational	22	22,4%

Table 22 shows the frequency accounting for the content analysis performed from the sample articles. Most of the articles address the individual part of resilience (approximately 38.8% of articles), exploring the Problem-Solving Skills (50%) as a resilience factor and address the impact on project success in the face of the classic dimension of the iron triangle, scope, budget and time.

6.3.4.5 Discussion

The term resilience is defined as the ability to overcome in adverse situations, or even the ability to adapt to situations of risk, adversity and setbacks. (Rahi, 2019)

The discussion is wide-ranging in the context of project management since it goes through several points, from resilience focused on the context of the project in terms of logistics, system and infrastructure of suppliers (Lenferink, Tillema, & Arts, 2013). Another point is related to the resilience of project teams (Oeij, Dhondt, Gaspersz & van Vuuren, 2017; Oeij, Van Vuuren, Dhondt, Gaspersz & De Vroome, 2018). Part of it is related to the resilience of the individual “project manager” who was the main focus of this research.

By reading the articles it was possible to identify how the 5 factors indicated in Table 1 are present in the selected articles

6.3.4.5.1 Emotional Regulation

Emotional control is directly linked to the professional's ability to remain calm and reasonable in the face of high- pressure stages. However, this ability does not mean that the professional is catatonic, on the contrary, he shows confidence in the situation and controls his feelings, so they do not interfere with his decision-making process. (Shao, 2018; Wang, Xu, Zhang, & Chen, 2016).

Several articles state the term: “Emotional Resilience” (Geoghegan & Dulewicz, 2008; Müller & Turner, 2010; Shah & Prakash, 2018b), as a characteristic where the leader manages to maintain a consistent performance and focus on adverse situations / conditions and on the presence of criticism.

6.3.4.5.2 Problem Solving Skills

This block is more related to the professional's ability to structure action plans to solve problems arising from adversity. In this context, several articles punctuate the term of resilience close to coping with the situation.

Resilience is shown to be a characteristic of solving problems in the face of adverse situations, where "disturbance" and/or shock has occurred and is able to return to the previous stage. (Cuppen, Bosch-Rekveldt, Pikaar, & Mehos, 2016; de Wildt-Liesveld, Bunders, & Regeer, 2015; Lloyd-Walker & Walker, 2011; Martens & Carvalho, 2017; Morris & Geraldi, 2011a) It also demonstrates how the individual's proactiveness in executing actions in the face of setbacks instead of giving up the situation. Some authors state it as the ability to bounce back in an adverse situation (Todt, Weiss, & Hoegl, 2019).

6.3.4.5.3 Positive Feelings

Positive feelings are demonstrated by the belief that the problem will be solved and/or that the adverse condition will be overcome – they represent the demonstrations of optimism. In the articles, the term resilience comes close to characteristics that indicate the desire to carry out the necessary actions, transforming negative thoughts into learning experiences, maintaining perspective, and building personal strength through optimism. It still has a positive capacity to adapt to situations (Cowen & Hodgson, 2015; Gallagher et al., 2015; Jani, 2011; Jugdev et al., 2018; Todt et al., 2019; Turner, Scott-Young, & Holdsworth, 2019).

6.3.4.5.4 Relationships and Connections

The relationship and connection factors appear in the articles as the establishment of a chain and / or network that gives support to keep the individual, team and / or organization in its stable state, which means to be able to suffer external shocks, crises or disturbances and to recover or respond to these events. Relationships and connections happen through the structuring of systems, communities, suppliers and people close to the professional, family, or even external agents. From a professional point of view, this is related to the verbal persuasion and social influence of the project manager (Chapman, 2016; de Wildt-Liesveld et al., 2015; Geraldi, Lee-Kelley, &

Kutsch, 2010; Jani, 2011; Martens & Carvalho, 2017; Morris & Geraldi, 2011b; Tavares Thome et al., 2016).

6.3.4.5.5 Creativity

Creativity appears in the articles as terms such as: adaptability, agility, adaptation to changes and flexibility. It is presented more as a search for alternatives to existing problems, not limited to conventional approaches Resilience is present when the professional, the team and/or the organization are able to adjust or mold themselves in situations of adversity, shock and/or conflict. In the articles this is shown by expressions such as: "adapt and respond to crises"; "flexibility to survive", "improvise to keep working", "adjust positively in adversity (Geraldi et al., 2010; Jugdev et al., 2018; Martens & Carvalho, 2017; Musca, Mellet, Simoni, Sitri & de Voguee, 2014; Nachbagauer & Schirl-Boeck, 2019b; Oeij, Dhondt, Gaspersz & Van Vuuren, 2017; Todt et al., 2019).

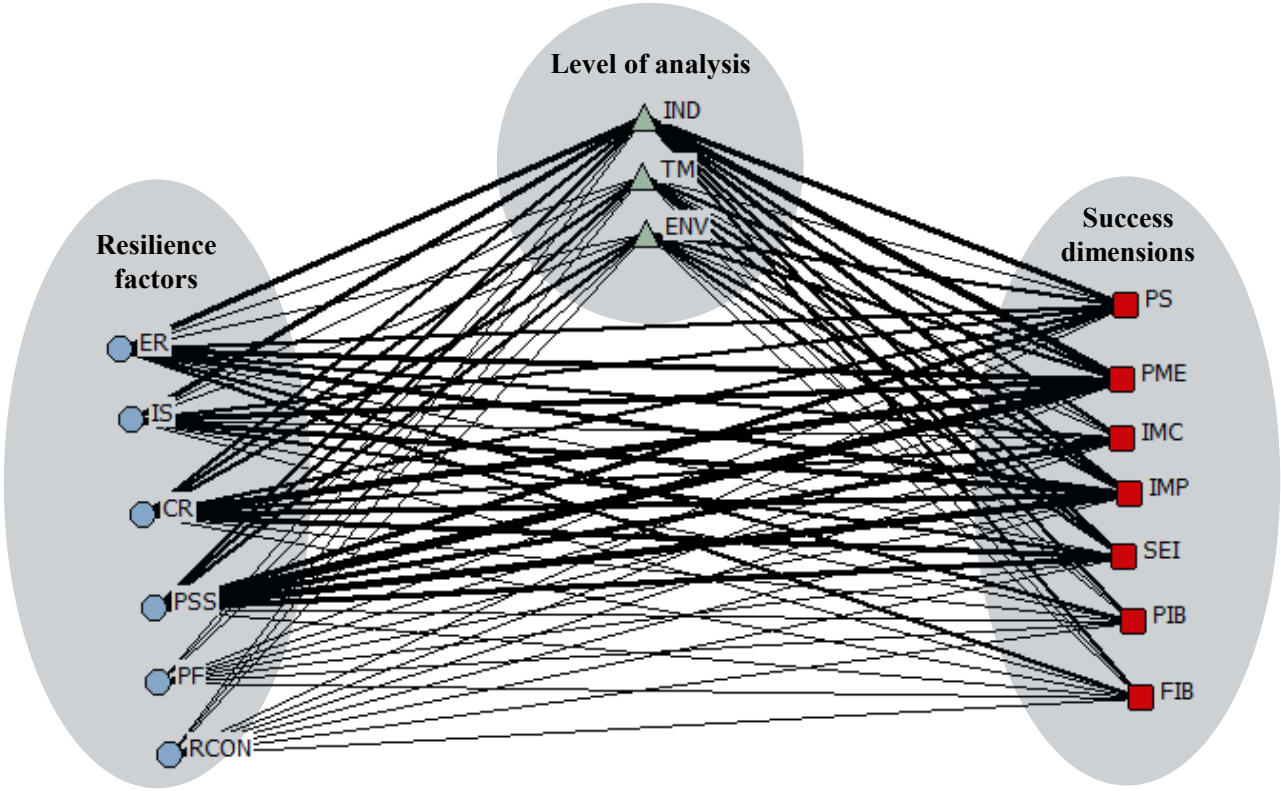
6.3.4.5.6 Inner self

This factor is related to the ability to believe in yourself and your skills. In the articles, some point out that believing in yourself enables resilience so that people are more likely to take actions to solve problems or situations rather than run away from them. In some cases, this is closely related to a behavior of seeking to adapt to achieve positive results (Akkermans et al., 2020; Jani, 2011; Jugdev et al., 2018; Lloyd-Walker, French & Crawford, 2016).

6.3.4.5.7 Influence of resilience factors on project success

To conclude, Figure 9 below points out the relationship between the resilience factors and the project success dimensions. UCINET software (Borgatt et. al. 2002) was used to draw the network and the cross-tabulation shows the intensity of the relationship among variables.

Figure 21 – Relationship between success dimensions and resilience factors.



	PME	PS	FIB	IMP	IMC	PIB	SEI	ER	PF	IS	PSS	CR	RCON	TM	IND	ENV
PME	78	41	29	45	34	27	37	28	10	26	41	30	10	19	32	19
PS	41	45	20	30	26	20	25	15	7	17	23	19	10	7	20	12
FIB	29	20	32	23	16	29	23	13	4	10	11	11	5	5	13	8
IMP	45	30	23	53	23	23	29	22	9	21	32	26	10	13	26	13
IMC	34	26	16	23	36	15	17	14	6	11	20	15	8	9	17	6
PIB	27	20	29	23	15	30	20	13	4	11	10	10	5	5	14	7
SEI	37	25	23	29	17	20	48	11	5	12	23	22	9	12	13	16
ER	28	15	13	22	14	13	11	31	10	19	15	13	5	6	26	1
PF	10	7	4	9	6	4	5	10	10	9	9	7	3	2	9	1
IS	26	17	10	21	11	11	12	19	9	30	18	15	8	6	22	4
PSS	41	23	11	32	20	10	23	15	9	18	49	34	14	18	19	15
CR	30	19	11	26	15	10	22	13	7	15	34	38	12	12	15	16
RCON	10	10	5	10	8	5	9	5	3	8	14	12	16	9	7	3
TM	19	7	5	13	9	5	12	6	2	6	18	12	9	23	5	2
IND	32	20	13	26	17	14	13	26	9	22	19	15	7	5	38	1
ENV	19	12	8	13	6	7	16	1	1	4	15	16	3	2	1	22

Figure 21 shows three resilience factors: Problem-Solving Skills (PSS), Creativity (CR) and Emotional Regulation (ER) which are more often related to the project success dimensions in the studied sample, particularly PM Efficiency (PME) and Impact on Team (IMP). This analysis suggests that the following proposition should be considered in future research agenda:

P1: The individual resilience factors (ER, PME and IMP) influence project success (PME and IMP).

The resilience factors have strong ties, and the most associated ones are Emotional Regulation (ER) - Inner Self (IS), IS - Problem-Solving Skills (PSS), and PSS-Creativity (CR) which suggests that individual resilience can be a reflective construct, leading to the following proposition:

P2: The individual resilience factors reinforce each other.

Finally, the level of analysis has connections with both constructs, individual resilience and project success, which can be an insight on future agenda by exploring its moderate role between these two constructs. Therefore, the following propositions arises:

P3: The level of analysis plays a moderate role in the relationship between individual resilience factors and project success.

6.3.4.5.8 Future research agenda

The trend topics and thematic analysis suggest that authentic leadership and sensemaking are emerging topics. Naderpajouh et al. (2020b) corroborate and go beyond the influence of leadership in resilience. Recent articles have dealt with the subject in view of perspectives related to careers, mega projects and innovative projects.

Akkermans et al. (2020) portray the term resilience in a project manager's career context, and the term is punctuated as an important element in the career development of a project professional. In the face of impacts, one of the factors that differentiate the impact is proactivity and resilience. Still in the context of careers, proactivity is posted as a factor that helps a person to be resilient to remain employed (Havermans, der Heijden, Savelsbergh & Storm, 2019). Moreover, resilience is related to perspective and its development can facilitate training to deal with complexity, uncertainty and the challenges of the project environment (Turner et al., 2019).

In the mega project context, resilience is related to adaptability, which suggests the importance of further studies on the idea of having a sense of the situation, questioning routines, reducing the level of immediate control, increasing diversity, instructions not being fixed tasks, but built tasks (Nachbagauer & Schirl-Boeck, 2019b). Furthermore, further research is needed into the side effect of resilience leading to project termination (Todt et al., 2019) and understanding how the temporary nature and discontinuity of project-based work affect resilience (Naderpajouh et al., 2020b).

6.3.5 Conclusions

This study makes three relevant contributions related to the research questions. First, it shows a portrait of the literature on the intersection of resilience and project success, extracting the trending topic, thematic evolution, and intellectual structure through the historical paths among references over the years. Second, this review identified the main factors used to operationalize the construct of individual resilience, glimpsed which factors are related to professional careers: emotional regulation, ability to solve problems, inner self, creativity, positive thinking, relationship and connections in a context of coping with adversity. Third, it shows the relationship between individual resilience and project success, providing three propositions for further research agenda.

Paper limitations need to be acknowledged. First, the sampling process can miss relevant references due to the selected database and journals, the research strings, and the logical operators—the research subjectivity in the screening process of classifying the exclusion criteria and the snowballing process.

For any future research agenda, studies are suggested to look into how to understand the way resilience will influence project professionals' careers. Moreover, an in-depth analysis of the mechanisms for developing resilience factors is suggested. In this

regard, further studies investigating how these factors are related to the success dimension, and a survey is recommended to identify the potential magnitude of this effect.

6.3.6 References of Paper #3

Akkermans, J., Keegan, A., Huemann, M., & Ringhofer, C. (2020). Crafting Project Managers' Careers: Integrating the Fields of Careers and Project Management. *Project Management Journal*, *51*(2), 135–153. https://doi.org/10.1177/8756972819877782

Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. *Organizational Dynamics*, *44*(3), 176–184. https://doi.org/10.1016/j.orgdyn.2015.05.003

APM. (2015). *APM Competence Framework*.

Aria, M. & Cuccurullo, C. (2017). *bibliometrix*: An R-tool for comprehensive science mapping analysis, *Journal of Informetrics*, 11(4), pp 959-975, Elsevier, DOI: 10.1016/j.joi.2017.08.007 (https://doi.org/10.1016/j.joi.2017.08.007).

Bardin, L. (2010). *Análise de conteúdo* (5a. Ed.). Lisboa, Portugal.

Bellis N. (2009) *Bibliometrics and Citation Analysis.* The Scarecrow Press, Lanham

Berg, M. E., & Karlsen, J. T. (2013). Managing Stress in Projects Using Coaching Leadership Tools. *Engineering Management Journal,* *25*(4, SI), 52–61. https://doi.org/10.1080/10429247.2013.11431995

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: The concept, a literature review and future directions. *International Journal of Production Research*, *49*(18), 5375–5393. https://doi.org/10.1080/00207543.2011.563826

Block, J., & Kremen, A. M. (1996). IQ and Ego-Resiliency: Conceptual and Empirical Connections and Separateness. Journal of Personality and Social Psychology, 70(2), 349–361. https://doi.org/10.1037/0022-3514.70.2.349

Boin, A., & Lagadec, P. (2000). Preparing for the Future: Critical Challenges in Crisis Management. *Journal of Contingencies and Crisis Management*, *8*(4), 185–191. https://doi.org/10.1111/1468-5973.00138

Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. *Ucinet 6 for Windows: Software for Social Network Analysis.* Harvard, MA: Analytic Technologies.

Brill, J. M., Bishop, M. J., & Walker, A. E. (2006). The competencies and characteristic required of an effective project manager: a web-based delphi study. *Educational Technology, Research and Development*, *54*(2), 115–140. https://doi.org/10.1007/s11423-006-8251-y

Chadegani, A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., Farhadi, M., & Ale Ebrahim, N. (2013). A comparison between two main academic literature collections: Web of Science and Scopus databases. Asian social science, 9(5), 18-26.

Chapman, R. J. (2016). A framework for examining the dimensions and characteristics of complexity

inherent within rail megaprojects. *International Journal of Project Management, 34*(6), 937–956. https://doi.org/10.1016/j.ijproman.2016.05.001

Chipulu, M., Neoh, J. G., & Williams, T. (2013). *Manager Competences*. *60*(3), 506–517.

Clarke, N. (2010). Emotional Intelligence and Its Relationship to Transformational Leadership and Key Project Manager Competences. *Project Management Journal*, *41*(2), 5–20. https://doi.org/10.1002/pmj.20162

Connor, K. M., & Davidson, J. R. T. (2003). Development of a new Resilience scale: The Connor-Davidson Resilience scale (CD-RISC). Depression and Anxiety, 18(2), 76–82. https://doi.org/10.1002/da.10113

Cowen, M., & Hodgson, D. (2015). Damaged identities: Examining identity regulation and identity work of Gulf project managers. *International Journal of Project Management*, *33*(7), 1523–1533. https://doi.org/https://doi.org/10.1016/j.ijproman.2015.06.009

Crawford, L. (2000). Profiling the Competent Project Manager. *Management*, (August), 3–15. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.102.3969&rep=rep1&type=pdf

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

Crosby, P. (2017). Shaping complex mega-projects: practical steps for success. *Australian Journal of Civil Engineering*, *15*(1), 1–19. https://doi.org/10.1080/14488353.2017.1362806

Cuppen, E., Bosch-Rekveldt, M. G. C., Pikaar, E., & Mehos, D. C. (2016). Stakeholder engagement in large-scale energy infrastructure projects: Revealing perspectives using Q methodology. *International Journal of Project Management*, *34*(7), 1347–1359. https://doi.org/10.1016/j.ijproman.2016.01.003

de Wildt-Liesveld, R., Bunders, J. F. G., & Regeer, B. J. (2015). Governance strategies to enhance the adaptive capacity of niche experiments. *Environmental Innovation and Societal Transitions*, *16*, 154–172. https://doi.org/10.1016/j.eist.2015.04.001

do Vale, J. W. S. P., Nunes, B., & de Carvalho, M. M. (2018). Project Managers' Competences. *Project Management Journal*, *49*(3), 82–97. https://doi.org/10.1177/8756972818770884

EL-Sabaa, S. (1999). The skills and career path of an effctive project manager. *International Journal of Project Management*, *19*, 1–7. https://doi.org/10.1016/S0263-7863(99)00034-4

Eren, F. (2019). Top government hands-on megaproject management: the case of Istanbul's grand airport. *International Journal of Managing Projects in Business*, *12*(3), 666–693. https://doi.org/10.1108/IJMPB-02-2018-0020

Forza, C. (2002). Survey research in operations management: a process-based perspective. International journal of operations & production management.

Fink A. (1995a) How to Sample in Surveys, Sage Publications, London

Fink A. (1995b) The Survey Handbook Sage Publications, London

Fletcher, D., & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts, and theory. European Psychologist, 18(1):12–23.

Friborg, O., Barlaug, D., Martinussen, M., Rosenvinge, J. H., & Hjemdal, O. (2005). Resilience in relation to personality and intelligence. International Journal of Methods in Psychiatric Research, 14(1), 29–42. https://doi.org/10.1002/mpr.15

Friborg, O., Hjemdal, O., Rosenvinge, J. H., & Martinussen, M. (2003). A new rating scale for adult resilience: What are the central protective resources behind healthy adjustment? International Journal of Methods in Psychiatric Research, 12(2), 65–76. https://doi.org/10.1002/mpr.143

Gallagher, E. C., Mazur, A. K., & Ashkanasy, N. M. (2015). Rallying the Troops or Beating the Horses? How Project-Related Demands Can Lead to Either High-Performance or Abusive Supervision. *Project Management Journal*, *46*(3), 10–24. https://doi.org/10.1002/pmj.21500

Geoghegan, L., & Dulewicz, V. (2008). Do Project Managers' Leadership Competencies Contribute to Project Success? *Project Management Journal*, *39*(4), 58–67. https://doi.org/10.1002/pmj.20084

Geraldi, J. G., Lee-Kelley, L., & Kutsch, E. (2010). The Titanic sunk, so what? Project manager response to unexpected events. *International Journal of Project Management*, *28*(6), 547–558. https://doi.org/10.1016/j.ijproman.2009.10.008

Gruden, N, Stare, A. (2018). The Influence of Behavioral Competencies on Project Performance. *Project Management Journal,* 49(3) 98–109.

Havermans, L., der Heijden, B. I. J. M., Savelsbergh, C., & Storm, P. (2019). Rolling Into the Profession: Exploring the Motivation and Experience of Becoming a Project Manager. *Project Management Journal*, *50*(3), 346–360. https://doi.org/10.1177/8756972819832782

Hjemdal, O., Friborg, O., Stiles, T. C., Martinussen, M., & Rosenvinge, J. H. (2006). A new scale for adolescent resilience: Grasping the central protective resources behind healthy development. Measurement and Evaluation in Counseling and Development, 39(2), 84–96. https://doi.org/10.1080/07481756.2006.11909791

Hobfoll, S.E. (2001). The influence of culture, community, and the nested self in the stress process: Advancing conservation of resources theory. *Applied Psychology: An International Review*, 50: 337–370. https://doi.org/10.1111/1464-0597.00062

IPMA. (2015). *Individual Competence Baseline for Project, Programme & Portfolio Management* (4.0). Zurich.

Jani, A. (2011). Escalation of commitment in troubled IT projects: Influence of project risk factors and self-efficacy on the perception of risk and the commitment to a failing project. *International Journal Of Project Management*, *29*(7, SI), 934–945. https://doi.org/10.1016/j.ijproman.2010.08.004

Joslin, R., & Müller, R. (2015). New Insights into Project Management Research: A Natural Sciences Comparative. *Project Management Journal*, *46*(2), 73–89. https://doi.org/10.1002/pmj.21472

Jugdev, K., Mathur, G., & Cook, C. (2018). Linking workplace burnout theories to the project management discipline. *International Journal of Managing Projects in Business*, *11*(1, SI), 198–221. https://doi.org/10.1108/IJMPB-02-2017-0020

Klein, G.; Mueller, R. 2020. Literature Review Expectations of Project Management Journal. *Project Management Journal,*239-241): 3(51 , n. 8756972820916340

Klein, L., Biesenthal, C., & Dehlin, E. (2015). Improvisation in project management: A praxeology. *International Journal of Project Management*, *33*(2), 267–277.

https://doi.org/10.1016/j.ijproman.2014.01.011

Kontoghiorghes, C. (2016). Linking high performance organizational culture and talent management: satisfaction/motivation and organizational commitment as mediators. *International Journal of Human Resource Management*, *27*(16), 1833–1853. https://doi.org/10.1080/09585192.2015.1075572

Lappi, T. M., Aaltonen, K., & Kujala, J. (2019). The birth of an ICT project alliance. *International Journal of Managing Projects in Business*, *12*(2), 325–355. https://doi.org/10.1108/IJMPB-02-2018-0036

Lenferink, S., Tillema, T., & Arts, J. (2013). Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in Dutch infrastructure projects. *International Journal of Project Management*, *31*(4), 615–627. https://doi.org/10.1016/j.ijproman.2012.09.014

Leybourne, S. (2010). Project Management and High-Value Superyacht Projects: An Improvisational and Temporal Perspective. *Project Management Journal*, *41*(1), 17–27. https://doi.org/10.1002/pmj.20140

Li, Y., Lu, Y., Ma, L., & Kwak, Y. H. (2018). Evolutionary Governance for Mega-Event Projects (Meps): A Case Study of the World Expo 2010 in China. *Project Management Journal*, *49*(1), 57–78. https://doi.org/10.1177/875697281804900105

Littel, J. ., Corcoran, J., & Pillai, V. (2008). *Systematic Reviews and Meta-Analysis*. Oxford University Press, New York.

Lloyd-Walker, B., & Walker, D. (2011). Authentic leadership for 21st century project delivery. *International Journal of Project Management*, *29*(4), 383–395. https://doi.org/https://doi.org/10.1016/j.ijproman.2011.02.004

Lloyd-Walker, B., French, E., & Crawford, L. (2016). Rethinking researching project management: Understanding the reality of project management careers. *International Journal of Managing Projects in Business*, *9*(4), 903–930. https://doi.org/10.1108/IJMPB-04-2016-0033

Malucelli, G., Barbosa, M.T.J. and Carvalho, M.M.d. (2019), "Facing the challenge of improvisation in project management: a critical review", *International Journal of Managing Projects in Business*, Vol. 14 No. 2, pp. 369-389. https://doi.org/10.1108/IJMPB-02-2019-0038

Martens, M. L., & Carvalho, M. M. (2017). Key factors of sustainability in project management context: A survey exploring the project managers' perspective. *International Journal Of Project Management*, *35*(6), 1084–1102. https://doi.org/10.1016/j.ijproman.2016.04.004

Marzagao, D.S.L., Carvalho, M.M. (2016a). Critical success factors for Six Sigma projects. International *Journal of Project Management*, 34 (8): 1505-1518 .

Marzagao, D.S.L., Carvalho, M.M. (2016b). The influence of project leaders' behavioral competencies on the performance of Six Sigma projects. RBGN,609-6)

Morris, P. W. G., & Geraldi, J. (2011a). Managing the institutional context for projects. *Project Management Journal*, *42*(6), 20–32. https://doi.org/10.1002/pmj.20271

Morris, P. W. G., & Geraldi, J. (2011b). Managing the Institutional Context for Projects. *Project Management Journal*, *42*(6, SI), 20–32. https://doi.org/10.1002/pmj.20271

Mu, R., & Turner, J. R. (2010). *Attitudes and leadership competences for project success*. *5*(3), 307–329. https://doi.org/10.1108/17465261011079730

Mueller, R.; Klein, G. (2020). The COVID-19 Pandemic and Project Management Research. *Project Management Journal.* 51 (6): 579-581 , n. 8756972820963316

Müller, R., & Turner, R. (2010). Leadership competency profiles of successful project managers. *International Journal of Project Management*, *28*(5), 437–448. https://doi.org/10.1016/j.ijproman.2009.09.003

Musca, G. N., Mellet, C., Simoni, G., Sitri, F., & de Voguee, S. (2014). ``Drop your boat!{''}: The discursive co-construction of project renewal. The case of the Darwin mountaineering expedition in Patagonia. *International Journal Of Project Management*, *32*(7), 1157–1169. https://doi.org/10.1016/j.ijproman.2014.02.006

Nachbagauer, A. G. M., & Schirl-Boeck, I. (2019a). Managing the unexpected in megaprojects: riding the waves of resilience. *International Journal Of Managing Projects In Business*, *12*(3), 694–715. https://doi.org/10.1108/IJMPB-08-2018-0169

Nachbagauer, A. G. M., & Schirl-Boeck, I. (2019b). Managing the unexpected in megaprojects: riding the waves of resilience. *International Journal of Managing Projects in Business*, *12*(3), 694–715. https://doi.org/10.1108/IJMPB-08-2018-0169

Nader Naderpajouh, Juri Matinheikki, Lynn A. Keeys, Daniel P. Aldrich, Igor Linkov. Call for papers: Resilience in Project Studies: An Interdisciplinary Discourse. *International Journal of Project Management.* Volume 38, Issue 5, July 2020, Pages 307-309

Nader Naderpajouh, Juri Matinheikki, Lynn A. Keeys, Daniel P. Aldrich, Igor Linkov

Nguyen, N.M., Killen, C.P., Kock, A., Gemündend, H.G. (2018). The use of effectuation in projects: The influence of business case control, portfolio monitoring intensity and project innovativeness. *International Journal of Project Management* 36: 1054– 1067.

Novi, F. (2018). Bayesian networks as a resilience tool for decision-making processes in uncertainty conditions. *Techne*, *15*, 341–347. https://doi.org/10.13128/Techne-22100

Oeij, P. R. A., Dhondt, S., Gaspersz, J. B. R., & van Vuuren, T. (2017). Innovation Resilience Behavior and Critical Incidents: Validating the Innovation Resilience Behavior-Scale with Qualitative Data. *Project Management Journal*, *48*(5), 49+. https://doi.org/10.1177/875697281704800504

Oeij, P. R. A., Dhondt, S., Gaspersz, J. B. R., & Van Vuuren, T. (2017). Innovation Resilience Behavior and Critical Incidents: Validating the Innovation Resilience Behavior-Scale with Qualitative Data. *Project Management Journal*, *48*(5), 49–63. https://doi.org/10.1177/875697281704800504

Oeij, P. R. A., Van Vuuren, T., Dhondt, S., Gaspersz, J., & De Vroome, E. M. M. (2018). Mindful infrastructure as antecedent of innovation resilience behaviour of project teams: Learning from HROs. *Team Performance Management*. https://doi.org/10.1108/TPM-09-2017-0045

Pant, I., & Baroudi, B. (2008). Project management education: The human skills imperative. *International Journal of Project Management*, *26*(2), 124–128. https://doi.org/10.1016/j.ijproman.2007.05.010

PMI. (2017). *Project Management Competency Development Framework - 3 Ed* (Third ed). Pennsylvania: PMI Publications.

Popaitoon, S., & Siengthai, S. (2014). The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. *International Journal of Project Management*, *32*(6), 908–920.

https://doi.org/10.1016/j.ijproman.2013.12.002

Rahi, K. (2019). Project resilience: a conceptual framework. *IJISPM-International Journal of Information Systems and Project Management*, *7*(1), 69–83. https://doi.org/10.12821/ijispm070104

Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. *International Journal of Project Management*, *33*(1), 41–52. https://doi.org/10.1016/j.ijproman.2014.03.012

Ramos-Rodríguez, A. R., & Ruíz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. Strategic management journal, 25(10), 981–1004.

Reivich, K., & Shatté, A. (2002). *The resilience factor: 7 essential skills for overcoming life's inevitable obstacles.* New York.

Reivich, K., & Shatté, A. (2002). The resilience factor: 7 essential skills for overcoming life's inevitable obstacles. New York.

Resilience and projects: An interdisciplinary crossroad. *Project Leadership and Society*, Volume 1, December 2020, Pages 100001

Shah, M. N., & Prakash, A. (2018a). Developing generic competencies for infrastructure managers in India. *International Journal of Managing Projects in Business*, *11*(2), 366–381. https://doi.org/10.1108/IJMPB-03-2017-0030

Shah, M. N., & Prakash, A. (2018b). Developing generic competencies for infrastructure managers in India. *International Journal of Managing Projects in Business*. https://doi.org/10.1108/IJMPB-03-2017-0030

Shao, J. (2018). The moderating effect of program context on the relationship between program managers' leadership competences and program success. *International Journal of Project Management*, *36*(1), 108–120. https://doi.org/10.1016/j.ijproman.2017.05.004

Shin, J., Taylor, M. S., & Seo, M. G. (2012). Resources for change: The relationships of organizational inducements and psychological resilience to employees' attitudes and behaviors toward organizational change. *Academy of Management Journal,* 55(3), 727–748.

Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. In *Qualitative Research Journal* (Vol. 19, Issue 3, pp. 259–270). Emerald Group Publishing Ltd. https://doi.org/10.1108/QRJ-12-2018-0012

Small, J., & Walker, D. (2010). The emergent realities of project praxis in socially complex project environments. *International Journal of Managing Projects in Business*, *3*(1), 147–156. https://doi.org/10.1108/17538371011014071

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. International Journal of Behavioral Medicine, 15(3), 194–200. https://doi.org/10.1080/10705500802222972

Stevenson, D. H., & Starkweather, J. A. (2010). PM critical competency index : IT execs prefer soft skills. *International Journal of Project Management*, *28*(7), 663–671. https://doi.org/10.1016/j.ijproman.2009.11.008

Takey, S.M.; Carvalho, M.M. (2015). Competency mapping in project management: An action research

study in an engineering company. *International Journal of Project Management*. 33(4), 784–796URL

Tavares Thome, A. M., Scavarda, L. F., Scavarda, A., & de Souza Thome, F. E. (2016). Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects. *International Journal Of Project Management*, *34*(7), 1328–1346. https://doi.org/10.1016/j.ijproman.2015.10.012

Thomas, J., & Mengel, T. (2008). Preparing project managers to deal with complexity - Advanced project management education. *International Journal of Project Management*, *26*(3), 304–315. https://doi.org/10.1016/j.ijproman.2008.01.001

Thomé, A. M. T., Scavarda, L. F., Scavarda, A., & Thomé, F. E. S. de S. (2016). Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects. *International Journal of Project Management*, *34*(7), 1328–1346. https://doi.org/10.1016/j.ijproman.2015.10.012

Todt, G., Weiss, M., & Hoegl, M. (2019). Leading Through Innovation Project Setbacks: How Authentic Leaders Keep Their Innovators Resilient. *Project Management Journal*, *50*(4), 409–417. https://doi.org/10.1177/8756972819853124

Turner, M., Scott-Young, C., & Holdsworth, S. (2019). Developing the resilient project professional: examining the student experience. *International Journal Of Managing Projects In Business*, *12*(3), 716–729. https://doi.org/10.1108/IJMPB-01-2018-0001

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

van Fenema, P. C., Rietjens, S., & van Baalen, P. (2016). Stability & reconstruction operations as mega projects: Drivers of temporary network effectiveness. *International Journal Of Project Management*, *34*(5), 839–861. https://doi.org/10.1016/j.ijproman.2016.03.006

Wagnild, G., & Young, H. (1993). Development and Pshycometric evaluation of a Recilience Scale. Journal of Nursing Measurement, 1(2), 165–178.

Walker, D. H. T., & Lloyd-Walker, B. M. (2016). Understanding the motivation and context for alliancing in the Australian construction industry. *International Journal of Managing Projects in Business*, *9*(1), 74–93. https://doi.org/10.1108/IJMPB-07-2015-0065

Waller, M. A. (2001). Resilience in Ecosystemic Context: Evolution of the Concept. *American Journal of Orthopsychiatry*, *71*(3), 290–297.

Wang, C. M., Xu, B. B., Zhang, S. J., & Chen, Y. Q. (2016). Influence of personality and risk propensity on risk perception of Chinese construction project managers. *International Journal Of Project Management*, *34*(7), 1294–1304. https://doi.org/10.1016/j.ijproman.2016.07.004

Williams, T. (2017). The Nature of Risk in Complex Projects. *Project Management Journal*, *48*(4), 55–66. https://doi.org/10.1177/875697281704800405

Windle, G., Markland, D. A., & Woods, R. T. (2008). Examination of a theoretical model of psychological resilience in older age. Aging and Mental Health, 12(3), 285–292. https://doi.org/10.1080/13607860802120763

Wohlin, C. (2014), “Guidelines for snowballing in systematic literature studies and a replication in

software engineering", Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering - EASE '14, ACM Press, New York, New York, USA, pp. 1–10.

Zeng, S. X., Ma, H. Y., Lin, H., Zeng, R. C., & Tam, V. W. Y. (2015). Social responsibility of major infrastructure projects in China. *International Journal Of Project Management*, *33*(3), 537–548. https://doi.org/10.1016/j.ijproman.2014.07.007

6.3.7 Appendix A of Paper #3– Summary of content analysis

Authors	Title	Journal	Published year	Nº Citations	Average Citation per Year	Objective	Resilience
Müller & Turner (2010)	Leadership competency profiles of successful project managers	International Journal of Project Management	2010	224	20,36	The article objective is to identify the profile of successful project managers through different types of project, for that the authors structured a Survey research.	Resilience as seen as a emotional competence of the project manager
Martens, & Carvalho (2017)	Key factors of sustainability in project management context: A survey exploring the project managers' perspective	International Journal of Project Management	2017	74	18,5	This paper aims to fulfill this gap by identifying the key aspects of sustainability in project management context and understand the importance based on project manager lens.	The term retrieves from sustainability and construction and the authors use the definition of Bocchini et al. (2014, p.7): "resilience is the ability of human communities to withstand external shocks or perturbations to their infrastructure and to recover from such perturbations."
Qazi et. Al. (2016)	Project Complexity and Risk Management (ProCRiM): Towards modelling project complexity driven risk paths in construction projects	International Journal of Project Management	2016	67	13,4	The paper explores the differences in approach and practice of Project, Program and Change Managers as a basis for determining the competencies required to effectively manage change initiatives.	The term resilience is related to supply chain and project management to deal with complexity and uncertainty- are related to the ability to return to a stable state after a disruption (based on its reference)
Zeng et. Al. (2015)	Social responsibility of major infrastructure projects in China	International Journal of Project Management	2015	80	13,33	It proposes the concept and key issues of major infrastructure projects' social responsibility (MIP-SR) and develops a comprehensive conceptual framework for MIP-SR, which covers three dimensions: (i) project life-cycle dynamics; (ii) stakeholder's heterogeneity and (iii) social responsibility interactivity.	The term resilience is related to disaster prevention that can be helped by Major Infrastructure Projects
Cserháti & Szabó (2014)	The relationship between success criteria and success factors in organizational event projects	International Journal of Project Management	2014	62	8,86	This paper presents the development and investigation of the attributes of the success criteria and factors of organizational event projects, as well as an analysis of the relationship between the criteria and factor areas.	At this context, resilience is related to emotions and have significant impact together with communication in medium-complexity projects.
Clarke (2010)	Emotional Intelligence and Its Relationship to Transformational Leadership and Key Project Manager Competences	Project Management Journal	2010	88	8	Based on a research with 67 UK project managers the articles propose to identify the impacts of the Emotional Intelligence on the management of a project	Resilience as emotional resilience accounted for the most success in project of medium complexity
Cuppen et. Al.(2016)	Stakeholder engagement in large-scale energy infrastructure projects: Revealing perspectives using Q methodology	International Journal of Project Management	2016	39	7,8	The objective of this paper is to use policy and planning studies to conceptualize large-scale energy infrastructure projects as 'unstructured issues' and to demonstrate the use of Q methodology for stakeholder analysis in such projects. The Q methodology as a congruent method for stakeholder analysis that allows for anticipation of unforeseen stakeholder issues or	Resilience is placed together with adaptability and flexibility in a way to respond to risk, impacts and responses by external stakeholders.

						concerns and to kick-off a participatory procedure with external stakeholders.	
Lenferink , Tillema & Arts (2013)	Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in Dutch infrastructure projects	International Journal of Project Management	2013	58	7,25	This article investigates whether linking stages by integrated contracts can lead to more sustainable road infrastructure development by assessing public and private experiences with inclusiveness of integrated Dutch Design-Build-Finance-Maintain (DBFM) projects throughout the procurement, design, construction and maintenance and operation stages.	Resilience is posted together with adaptability and are related to resilience of project elements.
Geoghegan & Dulewicz (2008)	Do Project Managers' Leadership Competencies Contribute to Project Success?	Project Management Journal	2008	94	7,23	This article proposes to identify whether there is a statistically significant relationship between a project manager's leadership competencies and project success.	Resilience as seen as an emotional competence of the project manager related to self-awareness
Geraldi , Lee-Kelley & Kutsch (2010)	The Titanic sank, so what? Project manager response to unexpected events	International Journal of Project Management	2010	69	6,27	The article studies how project managers respond to uncertainty events and how successful/unsuccessful responses differ from the perspective of the practitioner.	Resilience is seen as Organizational approach to adapt from crisis, deal with the unexpected and lead to success.
Morris (2013)	Reconstructing Project Management Reprised: A Knowledge Perspective	Project Management Journal	2013	50	6,25	This paper proposes to summarize the main points of the book Reconstructing Project Management. It investigates: How our knowledge of managing projects (which, for brevity is often, but not always, taken also to cover programs) was 'invented.' (It was not 'found'); how robust that knowledge is, in the sense of being reliable and true; and in what way and to what ends we should be using that knowledge, and why.	Resilience is related to connections which are related to 'organizational ecology' and adaptability
Morris & Geraldi (2011)	Managing the Institutional Context for Projects	Project Management Journal	2011	62	6,2	This article proposes a third level of conceptualization, besides level 1(technical) related to and level 2 (strategic): the institutional level, where management is focused on creating the conditions to support and foster projects, both in its parent organization and its external environment.	These articles put resilience on an organizational level, which are related do adaptability and stability of the project.
Zhu & Mostafavi (2017)	Discovering complexity and emergent properties in project systems: A new approach to understanding project performance	International Journal of Project Management	2017	24	6	The paper proposes an integrated performance assessment framework based on consideration of complexity and emergent properties in project systems.	The word resilience is connected with vulnerability, agility, flexibility, and adaptive capacity with are connected which are related with capability to cope with project complexity.

Crawford & Nahmias (2010)	Competencies for managing change	International Journal of Project Management	2010	65	5,91	The paper explores the differences in approach and practice of Project, Program and Change Managers as a basis for determining the competencies required to effectively manage change initiatives.	This article is related to the ability to bounce back from negative emotions. In general, the authors refer to the state that a resilient person is more capable to accept and to apply changes.
Thome et. Al. (2016)	Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects	International Journal of Project Management	2016	29	5,8	This article aims to synthesize the concepts of complexity, uncertainty, risk and resilience in the context of project management and supply chain management	The article summarizes a model where resilience is connected with 4 strategies: flexibility, redundancy, collaboration and agility and 3 elements: readiness and preparedness, response and adaption and recovery of adjustment
Lloyd-Walker, & Walker (2011)	Authentic leadership for 21st century project delivery	International Journal of Project Management	2011	54	5,4	The paper proposes to identify the characteristics of a successful alliance project leadership which seems close to the ones related to authentic leadership	The context of resilience is related to the ability to bounce back from adversity. Are related to other 3 characteristics: optimism, hope and self-efficacy.
Zhou & Mi (2017)	Social responsibility research within the context of megaproject management: Trends, gaps and opportunities	International Journal of Project Management	2017	21	5,25	This study aims to review relevant studies about social responsibility in mega projects management.	The term is related with infrastructure resilience.
Deng, Pheng, & Zhao (2014)	Project System Vulnerability to Political Risks in International Construction Projects: The Case of Chinese Contractors	Project Management Journal	2014	36	5,14	This study aims to explore the variables affecting the project system vulnerability to political risks in international construction projects	Resilience states in the context of Resilience of systems which are the ability to recover to ensure survival.
Wang et. al (2016)	Influence of personality and risk propensity on risk perception of Chinese construction project managers	International Journal of Project Management	2016	25	5	This research presents the findings of an empirical study in China that investigated whether and how CPMs with different personality traits differed in the way they perceived project risk.	The word resilience is related with emotional stability.
Chapman (2016)	A framework for examining the dimensions and characteristics of complexity inherent within rail megaprojects	International Journal of Project Management	2016	25	5	This paper presents a framework for examining the dimensions and characteristics of project complexity, with an emphasis on rail megaprojects	The term resilience is related with capacity, reliability and connectivity in the context of rail megaprojects.
Sadiqi et. Al. (2017)	A framework for community participation in post-disaster housing reconstruction projects: A case of Afghanistan	International Journal of Project Management	2017	19	4,75	The study aims to develop a framework for community participation that can inform a participatory approach more effectively when planning and developing post-disaster reconstruction projects.	The term resilience is in the context of communities in a post disaster context.
Teo & Loosemore (2017)	Understanding community protest from a project management perspective: A relationship-based approach	International Journal of Project Management	2017	18	4,5	This paper draws on theories of collective identity and social capital to present an ethnographic analysis of community action against a large-scale and highly controversial construction project in Australia	The term resilience is related to a stakeholder's perspective in which the collective identity has an inbuilt resilience which contributes for the duration of a protest.
Vahanvati & Mulligan (2017)	A new model for effective post-disaster housing reconstruction: Lessons from Gujarat and Bihar in India	International Journal of Project Management	2017	18	4,5	The paper critiques the traditional project management (PM) approach for post-disaster reconstruction work in relation to long-term effectiveness at strengthening disaster resilience of communities	The term resilience is related with communities in the context of disaster.

Cicmil et. Al. (2016)	The project (management) discourse and its consequences: on vulnerability and unsustainability in project-based work	New Technology Work and Employment	2016	21	4,2	The paper examines how the discourses related to project-based work and management are drawn upon in the organizing of contemporary work, and the implications they have for project workers.	The term resilience is pointed out as a ability to cope, however the limits of resilience should be accountable. Because it might be destroying some elements of life.
Klein, Biesenthal & Dehlin (2015)	Improvisation in project management: A praxeology	International Journal of Project Management	2015	24	4	The paper aims to to conceptualize a praxeology of resilient project management based on improvisation.	Resilience is very commented on the text, in general terms the authors use the concepts that resilience is a developable capacity to rebound or bounce back from adversity, conflict, and failure or even positive events, progress, and increased responsibility. Resilience is also pointed out as the ability to expect the unexpected and look beyond the given structure, as it emphasizes the problem-solving act of addressing external complexity. Being resilient means to be aware of complexity, and to incorporate and tackle its impact to deliver a successful project.

6.4 Paper #4 - Exploring the relationship among personal competence, resilience and response agility: the mediate effect of personal strength

Status: Article in submisstion phase

Figure 22 - Paper # 3 submission information

Abstract: Managing projects in a highly complex context has led researchers to seek new approaches such as: bricolage, adaptability, improvisation and resilience. In terms of the competences of project managers, several guides and frameworks were created with the purpose of identifying and unifying which are the competences necessary to maximize the probability of successful projects. In general, the competences considered as “soft-skills”, that is those that involve the interpersonal and behavioural side of the project managers, have been characterized as the most relevant to deal with the complexity in the projects. In the field of psychology, several articles have already addressed the term resilience as a characteristic that surrounds the individual who promotes both the ability to adapt and deal with adverse situations (RRA - Resilience Response Agility) as well as to withstand situations of high physical and emotional stress (RPS - Resilience Personal Strength). This research investigates the relationship between those two aspects of resilience, RRA and RPS and its influence on personal competences. For this, a survey was carried out with 136 professionals in the project management area. For the analysis of results, a partial least square structural equation modelling (PLS-SEM) approach was used to assess the proposed hypotheses. The results indicate a significant and positive relationship between Resilience Personal Strength and Resilience Response Agility in personal competences and a positive and significant relationship between RPS in RRA. The study provides a comprehensive portrait of the resilience and its relationship with the personal competences. Finally, it provides a direction for future research agenda between those two blocks: personal competences and resilience.

Keywords:
Resilience, Personal Competence, Project Management.

6.4.1 Introduction

Many works have investigated the issue of complexity in the theme of projects, one of the reasons being the fact that it contributes to the failure of large projects in terms of time and cost (Chapman, 2016; Qazi, Quigley, Dickson & Kirytopoulos, 2016; Tavares Thome, Scavarda, Scavarda & de Souza Thome, 2016). While some studies seek to assess the complexity (Zhu & Mostafavi, 2017), others aim to deal with it through different approaches such as improvisation, bricolage (Klein, Biesenthal, & Dehlin, 2015; Leybourne, 2010; Malucelli et al., 2019) and resilience (Geoghegan & Dulewicz, 2008; Geraldi et al. 2010; Müller & Turner, 2010).

In terms of the competences of project managers, several guides and frameworks have been created for the purpose of unifying what competences are needed to maximize the likelihood of successfully completing a project (APM, 2015; IPMA, 2015; PMI, 2017). Despite the guides indicating different dimensions of competences, in general terms, the competences considered as “soft-skills”, those that involve the interpersonal and behavioral parts of the project managers, have been characterized as the most relevant to deal with the complexity in projects (Pant & Baroudi, 2008; Ramazani & Jergeas, 2015; Stevenson & Starkweather, 2010; Thomas & Mengel, 2008)

From another perspective, in the field of psychology, several articles have already addressed the term resilience as a characteristic that surrounds the individual who promotes both the ability to adapt and deal with adverse situations as well as to withstand situations of high physical and emotional stress (Moenkemeyer, Hoegl, & Weiss, 2012; Smith et al., 2008; Windle, Markland, & Woods, 2008). According to McEwen (2018), this ability to cope with daily stress, stay healthy, fight back and learn from adverse events and still prepare for the future is called resilience. It already points out that this characteristic of allowing to respond to uncertainties and this ability to face these situations successfully is called commitment to resilience.

Although resilience can be addressed at different levels (individual, teams, organizational) (Alliger, Cerasoli, Tannenbaum, & Vessey, 2015; Eskerod & Riis, 2009; Jackson, Firtko, & Edenborough, 2007; Rahi, 2019). In the context of the individual, this research aimed to identify the roles of resilience in the

personal competences of project managers. The methodological approach used was guided by the literature review in order to structure the conceptual model and the survey for empirical validation. The survey results were analyzed using the structural equation technique.

The article is structured in the following format: Chapter 2 presents the theoretical basis Chapter 3 details the empirical study and in Chapter 4 the results are presented and discussed. Finally, chapter 5 presents the final considerations, limitations and indications for future work.

6.4.2 Literature Review

This section discusses points related to resilience from the perspective of the individual, from two perspectives: the personal strength perspective of personal strength and from the perspective of response agility. The personal competence of project managers and the basic theoretical framework are utilized to obtain the model of the relationships and hypotheses to be evaluated with empirical data.

6.4.2.1 Resilience

Working in extreme, highly complex or confined situations are examples of situations where it is challenging to remain effective and feel good. Alliger, Cerasoli, Tannenbaum & Vessey (2015) indicate that resilience would be the ability to work in these adverse circumstances and to overcome these challenges, pressures, stresses and crises. The authors indicate that resilience can be assessed from two points of view: resilience of the individual and resilience of the work team. In summary, the individual indicates that some individuals are able to overcome severe trauma quickly and completely. The resilience of the team, on the other hand, concerns the ability of a team to withstand and overcome stressful situations in a way that allows achieving continuous performance.

The author McEwen (2018) makes a distinction between personal and team resilience, the first of which is related to stress management on a daily basis in order to remain healthy, adaptable and learning from the obstacles of everyday life to learn proactively from these challenges. The team's resilience part concerns the collective capacity to perform satisfactorily while maintaining a

well-being, adapting to the changes and obstacles of the work challenge (McEwen, 2018). The same author states that many resilience studies are focused on mental health and post traumatic situations, however in the concept of this paper, the term is the same related by McEwan as it is related to working well, that is, how the individual deals with the challenges of everyday life. In other words, how the individual manages the challenges of work in psychological, emotional and physical terms.

From the point of view of the individual, there are different factors in the literature associated with resilience. However, there is no consensus among researchers as to what factors actually explain this phenomenon. For example, Reivich & Shatté (2002) indicated six factors related to individual resilience: emotional regulation, impulse control, empathy, optimism, causal analysis, self-efficacy and reaching out. On the other hand, Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal (2005) indicate 6 dimensions of resilience: perception of self, perception of future, structured style, social competence, family cohesion, social resources. Berg & Karlse (2013) have already indicated that resilience consists of 3 aspects, optimism, hope and self-efficacy. On the other hand, Boin & Lagadec (2000) indicate that resilience is related to the combination of flexibility, improvisation and ingenuity. Meanwhile Waller (2001) identifies that there are protective factors at different levels: individual, family, community and cultural ethics that facilitate dealing with the existing risks. Table 1 below presents a structure to facilitate the understanding of the items indicated by the authors.

Based on Table 23, two resilience groups are identified, one focused on the part of individual forces, here we call Resilience Personal Strength – RPS and the other focused on response action, that is, the propensity to solve a problem or a certain situation that here we call it Resilience Response Agility - RRA. Given this scenario, Table 24 was constructed restructuring the dimensions / factors of resilience. The purpose of the concept in Table 24 was to synthesize and regroup based on the concept that resilience has an intrinsic emotional, physical and psychological factor aimed at dealing with this conflict and another related to taking actions and attitudes. Resilience was understood in this work by these two elements: RPS - Resilience Personal Strength, focused on the

part of emotional regulation, optimism, self-efficacy and life structure and the RPA – Resilience Response Agility composed by elements focused on problem-solving based on 3 elements: social resources, knowledge of your self-ability and ability to seek support through connections and relationships (reaching out). Further in this section, those two blocks are discussed.

Table 23 – Resilience Factors

Reference	Resilience Factors					
	ER - Emotional Regulation	PF - Positive Feelings	IS - Inner Self	PSS - Problem-Solving Skills	CR - Creativity	RCON - Relationship and Connections
Waller (2001)	• Emotional regulation • High intelligence • Reflectiveness • Empathy	• Active, easy, outgoing temperament • Positive responsiveness to others • Sense of humor • Hopefulness • Reflectiveness • Recognized talent accomplishments	• Self-efficacy • Self-worth • Self-confidence	• Problem-solving skills • Verbal communication skills • Realistic appraisal of the environment • Sense of direction • Competence in normative roles • Educational aspiration school commitment	-	• Trust in people as resources • Social skills • Appealing to adults • Strong, positive ethnic identity • Faith religious affiliation • Religious participation
Alliger et. al (2015)	• Internal sense of control • Ability to forgive. • Emotional Toughness	• Positive attitude • Realism	• Courage to face fear		• Cognitive flexibility	
Boin and Lagadec (2001)					• Improvisation • Flexibility • Ingenuity	
Reivich and Shatte (2002)	• Impulse control • Emotional Regulation	• Optimism	• Self-efficacy	• Causal analysis	• Reaching-out	• Empathy
(Berg & Karlsen, 2013)	•	• Hope • Optimism	• Self-efficacy			
Friborg (2005)	• Perception of Self	• Perception of Future	• Structured Style			• Family Cohesion • Social Resources • Social Competence

Table 24 - Resilience Factors Regrouped

Source	Resilience Personal Strength				Resilience Response Agility		
	ER - Emotional Regulation	**OP-Optimism**	**Perception of Self**	**Structured Style**	**Self-Efficacy**	**Reaching Out**	**Social Resources**
Waller (2001)	• Emotional regulation	• Active, easy, outgoing temperament • Positive responsiveness to others • Sense of humor • Hopefulness • Recognized talent accomplishments	• Self-worth • Self-confidence • Reflectiveness	• Competence in normative roles • High intelligence	• Self-efficacy • Problem-solving skills	• Verbal communication skills • Realistic appraisal of the environment • Sense of direction • Educational aspiration school commitment	• Trust in people as resources • Social skills • Appealing to adults • Strong, positive ethnic identity • Faith religious affiliation • Religious participation • Empathy
Alliger et. al (2015)	• Internal sense of control • Emotional Toughness	• Positive attitude	• Realism		• Courage to face fear	• Cognitive flexibility	• Ability to forgive.
Boin and Lagadec (2001)						• Improvisation • Flexibility • Ingenuity	
Reivich and Shatte (2002)	• Impulse control • Emotional Regulation	• Optimism			• Self-efficacy • Causal analysis	• Reaching-out	• Empathy
Berg & Karlsen (2013)		• Hope • Optimism			• Self-efficacy		
Friborg (2005)		• Perception of Future	• Perception of Self	• Structured Style		• Social Competence	• Family Cohesion • Social Resources

6.4.2.1.1 Resilience and Personal Strength

Numerous articles in the context of projects use the term “emotional resilience” as a competence for the individual's ability to maintain control over difficult and high stress situations (Clarke, 2010; Geoghegan & Dulewicz, 2008; Gruden & Stare, 2018; Müller & Turner, 2010; Shah & Prakash, 2018). In their study Müller & Turner (2010) structure the definition of the competences pointed out by Dulewicz & Higgs (2005), which indicate that emotional resilience is related to the ability to maintain its performance in numerous situations and adapt its behavior in the face of situations of criticism or personal challenges. In a context of resilience, Reivich & Shatté (2002) state the term “emotional regulation” as the ability to stay calm under pressure. In general, resilient people use skills and techniques that allow them to maintain control of their emotions, attention and behavior. The authors also indicate that people who have difficulty controlling their emotions are difficult to work with. The authors indicate that emotions are not fully controlled and / or repaired, but rather appropriately presented.

Another element of RPS is optimism, although optimism can have positive and negative points as pointed out by Kutsch, Maylor, Weyer, & Lupson (2011). In the field of resilience, optimism is seen as a key element that allows building personal strengths. (Jackson, Firtko, & Edenborough, 2007). In general terms optimism can be considered as an attitude or associated mood as a future social and material expectation in which the appraiser has an expectation that it will be favorable to meet their desires, advantages and pleasures (Moenkemeyer, Hoegl, & Weiss, 2012 and Tiger, 1979). Reivich & Shatté (2002) state that an optimistic person believes that he has the skills to deal with

the adversities that will appear, which is directly related to the ability to self-efficacy, that is another skill related to resilience in the RRA Dimension.

Friborg et al., (2005) in their study on resilience scales for adults, divide personal strength into two parts, ‘perception of self” and “perception of future”. In structuring these, the first part is related to the individual's ability to understand himself and the second part with the individual's perception of perceiving the future. The same authors also deal with the concept of structured lifestyle, where they address the way in which the adult conducts his life in an organized way, if the individual is oriented towards goals, preference for routines and approaches activities in an organized way (Anyan, Hjemdal, Bizumic, & Friborg, 2019; Friborg et al., 2005; Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003)

6.4.2.1.2 Resilience and Response Agility

Another aspect of resilience is related to the individual's propensity to take actions to act in each circumstance, in this concept the Resilience Response Agility - RRA is defined as the individual's propensity to seek solutions and act to solve a given situation (Reivich & Shatté, 2002). A characteristic of resilience is the characteristic of seeking alternative solutions – reaching out, being curious and / or seeking to have new experiences. Many people, however, fail to develop this characteristic because they feel ashamed if something goes wrong and / or does not go as expected. In other papers, adaptability and flexibility are indicated as close to resilience and are placed in a context of seeking solutions, alternatives and / or possibilities to solve an issue (Alliger et al., 2015; Scott, Woolcott, Keast & Chamberlain, 2018)

In addition, reaching out for solutions, self-efficacy is also an important factor for resilience. Berg & Karlsen (2013) and Reivich & Shatté (2002) indicate that

self-efficacy is the ability of the individual to feel effective in the world, representing the feeling of being able to solve problems based on the knowledge of skills in a given circumstance. Although self-efficacy can underestimate the risks and problems of the project (Jani, 2011) and create an illusion of control, self-efficacy is considered necessary for the performance of highly complex tasks, which results in positive results. (Lloyd-Walker, French, & Crawford, 2016). According to (Berg & Karlsen, 2013), self-efficacy consists in having confidence to mobilize motivation, cognitive resources and skills to succeed in carrying out activities.

The last dimension related to the Resilience Response Agility is Social Resource – SR, which is related to the social circle surrounding the individual. This element is related with the ability of the individual to get outside of his family circle to look for help, for example through friends. This element is not only related with an assistance (task), but also with a psychological assistant like encouragement, as mentioned by (Anyan, Hjemdal, Bizumic, & Friborg, 2019; Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005).

6.4.2.2 Personal Competences

From another perspective of project managers, are the competences of these professionals. Over many years, work has been done to identify which are the key competences for this professional to perform his job efficiently and effectively. In this proposal, institutions such as PMI (Project Management Institute and IPMA (International Project Management Association) developed guides for the structuring of these competences and the process of developing them (IPMA, 2015; PMI, 2017)

Several articles have addressed leadership as a key competence in the formation of the project manager and studies have been carried out to deepen

this competence.(Geoghegan & Dulewicz, 2008; Müller & Rodney Turner, 2010; Müller & Turner, 2010). According to PMI (2017), leadership is seen as the most important competence to have when complexity arises.

In addition to leadership, another competence that is quite prominent in the context of projects is the communication competency. Henderson (2008) indicates that communication contributes to both team performance / satisfaction and productivity. Another author, Zulch (2014) states that communication is essential in the area of scope, time and cost projects and has the function of integrating the project areas.

Another dimension of competencies that is highlighted in the project area is emotional intelligence. Emotional intelligence according to the studies of Clarke & Kingdom (2010) improves teamwork and conflict management in a project.

The different guides and articles make a different structuring of the personal skills of the project managers, for example the PMI v3 structure in 6 blocks, on the other hand the IPMA v2, structured in 8 personal attitudes, version 3 in 15 behavioral elements and version 4 in 10 elements. The Table 25 below shows the guides and blocks of competences.

Table 25 – Personal Competences Dimensions according to Guides

Guide	Competences	
(PMI, 2017)	• Communicating • Leading • Managing	• Cognitive Ability • Effectiveness • Professionalism
(IPMA, 1999)	• Ability to communicate • Initiative, engagement, enthusiasm, ability of motivation • Ability to get in contact, open-ness. • sensibility, self- control, ability of value appreciation, readiness for responsibility, personal integrity	• Conflict solving, argumentation culture, fairness. • Ability to find solutions, holistic thinking. • Loyalty, solidarity, readiness for helping • Leadership abilities

Guide	Competences	
(IPMA, 2006)	• Leadership • Engagement & motivation • Self-control • Assertiveness • Relaxation • Openness • Creativity • Results Orientation	• Efficiency • Consultation • Negotatiation • Conflict & Crisis • Reliability • Value appreciation • Ethics
(IPMA, 2015)	• Self-reflection and self-management • Personal integrity and reliability • Personal Communication • Relationships and engagement • Leadership	• Teamwork • Conflict and crisis • Resourcefulness • Negotiation • Results orientation

For the present work, a restructuring was carried out in 4 blocks: leadership, communication, emotional intelligence and professionalism, and the questions were extracted based on the guides (IPMA, 1999; 2015; PMI, 2017). Table 26 below presents the personal competences dimensions regrouped.

Table 26– Personal Competences Dimensions Regrouped

Source	Leadership	Communication	Emotional Intelligence	Professionalism
(PMI, 2017)	• Leading • Managing	• Communicating	• Cognitive Ability	• Professionalism • Effectiveness
(IPMA, 1999)	• Leadership abilities	• Ability to communicate • Ability to get in contact, open-ness	• Initiative, engagement, enthusiasm, ability of motivation • sensibility, self- control, ability of value appreciation, readiness for responsibility, personal integrity • Conflict solving, argumentation culture, fairness.	• Ability to find solutions, holistic thinking. • Loyalty, solidarity, readiness for helping
(IPMA, 2006)	• Leadership • Ethics	• Engagement & motivation • Consultation • Negotatiation	• Self-control • Relaxation • Reliability • Value appreciation • Assertiveness • Openness	• Results Orientation • Creativity • Efficiency • Conflict & Crisis
(IPMA, 2015)	• Leadership	• Personal Communication • Negotiation	• Relationships and engagement • Self-reflection and self-management • Personal integrity and reliability • Teamwork	• Conflict and crisis • Results orientation • Resourcefulness

6.4.2.3 Research Model and hypothesis

According to Turner, Scott-Young, & Holdsworth (2019), there is work around what should constitute the training of a resilient professional in projects. Much has been done for the training of this individual, but much has been criticized about the focus on training, resulting from the focus on the so-called "hard skills", where much has been ignored about the so-called personal skills or "soft skills". Despite little work in training, much is required in the work environment. Therefore, it is necessary to understand how much of resilience interferes with these personal skills.

Resilience has already been identified in several fields as a positive factor in dealing with adversities in the work environment, such as overwork, poor working conditions and lack of autonomy (Eley et al., 2013; Jackson et al., 2007), when it comes to work in the project area, where there are several stressors (Richmond & Skitmore, 2006), it is important not only to identify how resilience is developed, but also what is its effects on the competences of the project manager, in special the personal competenteces which are more relevant to deal with complexity (Pant & Baroudi, 2008; Ramazani & Jergeas, 2015; Stevenson & Starkweather, 2010; Thomas & Mengel, 2008)

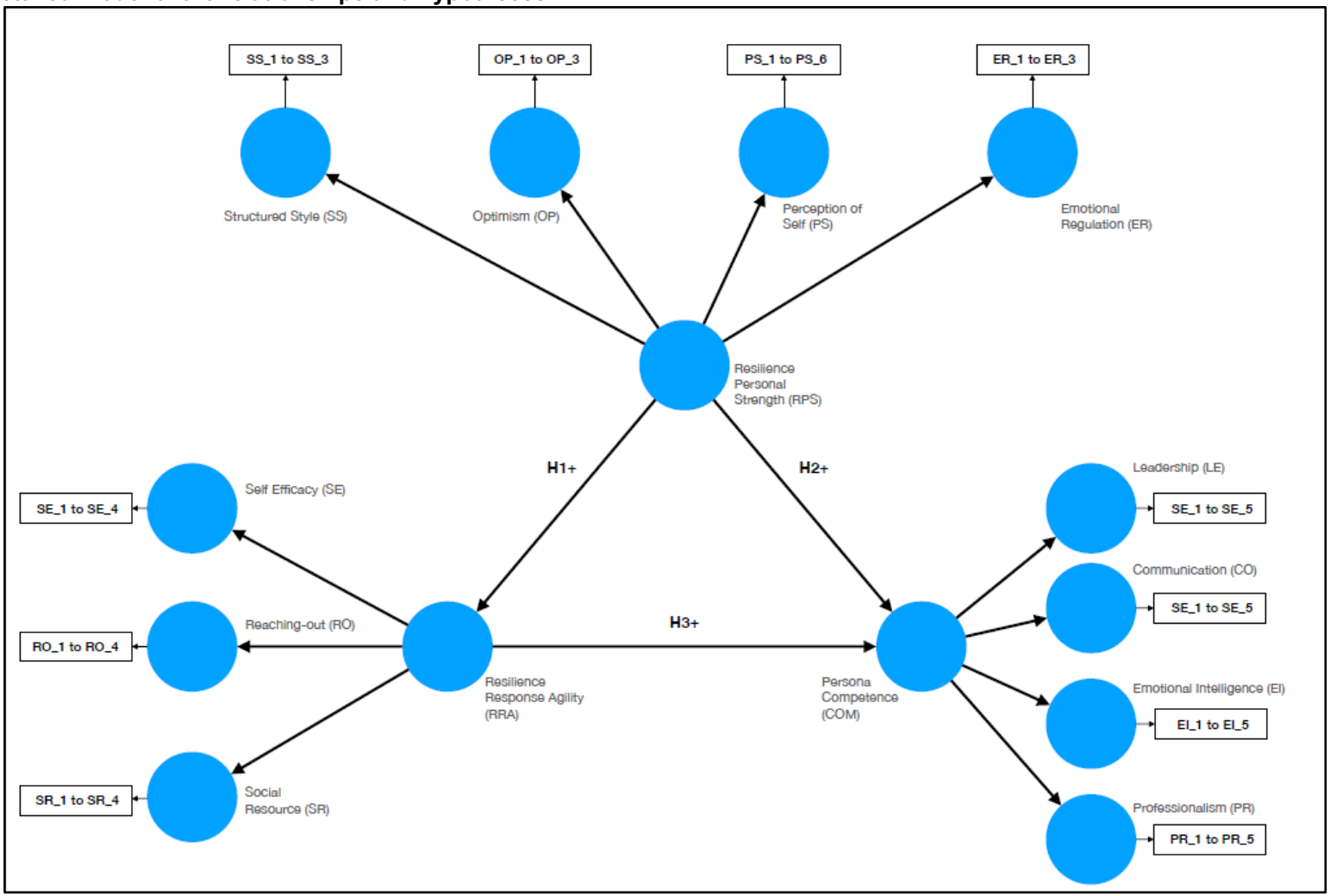
The proposed associations among Resilience Personal Strength and Resilience Response Agility and Personal Competences are presented in Table 23. Therefore, we propose:

H1: Resilience Personal Strength is directly and positively related with the Resilience Response Agility.

H2: Resilience Personal Strength is directly and positively related with Personal Competences.

H3: Resilience Response Agility is directly and positively related with Personal Competences.

Figure 23– Detailed model of the relationships and hypotheses.



6.4.3 Research Methods

This study aims to investigate the relation between resilience and personal competences in project management context. The research model is grounded on a literature review and conceptual model proposition, presented in the previous section. A survey-based research was conducted for empirical validation, following the literature guidelines (Flynn et al., 1990; Forza, 2002).

6.4.3.1 Sample procedures and instrument

The minimum sample size required was calculated by applying G*Power 3.0 software (Faul, Erdfelder, Lang, & Buchner, 2007), considering the statistical significance level of 5%, power level of 95%, effect size of 20% and number of predictors of 4 (Hair et al., 2005), which resulted in an expected sample size of 89 elements.

6.4.3.2 Variables Operationalization

The measurement model was designed driven by the conceptual reasoning previously presented, as suggested by Hair et al. (2013).

The research questionnaire was divided into two blocks, one related to the personal characteristics of the respondent composed of 11 questions and the second block composed of 47 closed questions, applying a 7-point Likert-type scale, as detailed in Table 27. A pre-test was performed with 2 specialists to adjust and revise the protocol for data collection.

Table 27 – Research Questionnaire

2nd Order Latent Variable	1st Order Latent Variable	Codes	Manifest Variables	Scale	References
Personal Competences	Emotional Intelligence	EI	5 questions	7 points Likert-type	IPMA v2.0, IPMA v4.0, PMI (PMCD) 3rd ed.
	Communication	CO	5 questions	7 points Likert	
	Leadership	LE	5 questions	7 points Likert-type	
	Professionalism	PR	5 questions	7 points Likert-type	
Resilience Personal Strength	Optimism	OP	3 questions	7 points Likert-type	Reivich and Shatte (2002)
	Emotional Regulation	ER	3 questions	7 points Likert-type	Reivich and Shatte (2002)
	Perception of self	PS	6 questions	7 points Likert-type	Friborg (2005)
	Structured style	SS	3 questions	7 points Likert-type	Friborg (2005)
Resilience Response Agility	Self- efficacy	SE	4 questions	7points Likert-type	Reivich and Shatte (2002)
	Reaching out	RO	4 questions	7 points Likert-type	Reivich and Shatte (2002)
	Social resources	SR	4 questions	7 points Likert-type	Friborg (2005)

Note: During the measurement model validation 10 indicators were eliminated due to loading factors <0.6

The research questionnaire was made available through a web link, using Google docs to collect, store, and perform the descriptive statistics treatments.

6.4.3.2.1 Dependent variable Resilience

Resilience Personal Strength was constituted as a second-order variable composed of 4 first-order variables: optimism, emotional regulation, self-perception, structured style, as outlined in Section 2 of this article.

The variable Optimism was measured by the questionnaire using 3 elements from the questionnaire by Reivich and Shatte (2002) where they focused on identifying the respondent's degree of optimism.

For Emotional Regulation: Identifying the degree of emotional control was sought in the face of stressful situations, which was structured based on Reivich and Shatte (2002), it was used 3 questions from RT Test.

The variable Perception of self: an attempt was made to identify the perception of the individual in relation to the respondent's self-knowledge. The elements mentioned by Friborg (2005) were used.

Structure Style: an attempt was made to identify the perpetrator of the individual in relation to the respondent's self-knowledge. The elements from Friborg (2005) were used to measure this variable.

Resilience Response Agility was also constituted as a second-order variable composed of 3 first-order variables: Reach-out, Self-Efficacy and Social Resources, as outlined in Section 2 of this article.

The variable Reaching-out, the identification of the search for alternative solutions, was measured by 4 items pointed out in the work of Reivich and Shatte (2002). For Self-Efficacy, self-confidence and knowing yourself in your skills, as also measured by 4 elements of the RT Test of Reivich and Shatte (2002).

At last, for Social Resources to have the possibility and to support in friends for the solution of impasses, it was measured from 4 elements of the scale of Friborg (2005).

6.4.3.2.2 Independent variables – Personal Competence

The Personal Competence was constituted as a second-order variable composed of 4 first-order variables: Leadership, Communication, Emotional Intelligence and Professionalism.

Leadership, Communication, Emotional Intelligence and Professionalism were measured with 5 items that were based on elements from (IPMA, 1999, 2015; PMI, 2017)

6.4.3.3 Data Analysis

Structural equation modelling (Hair et al., 2013) was constructed to validate the research model and to check the research hypotheses.The analysis was performed using the Smart PLS version 3 software (Ringle et al., 2015) and included both the evaluation of the global model and the structural model (Henseler, Hubona, & Ray, 2016).

6.4.4 Results

6.4.4.1 Sample Demographics

The present questionnaire obtained 173 responses, of which 37 were removed for reasons of duplication, professionals with no experience in the area of project management or missing information. The final sample contains 136 valid responses. Of the respondents, 84 (62%) of the respondents are male and 52 (38%) are female. Of the respondents, 96 (70%) have completed a Postgraduate program or have a higher education level. Finally, 107 (78%) of the sample has more than 2 years of experience in the project area. The Table 28 below shows the sample data.

Table 28 – Demographics

Variable		n	%
Age (years)			
	22-28	25	0,18
	26-35	48	0,35
	35-45	42	0,31
	46 and above	21	0,15
Sex			
	Male	84	0,62
	Female	52	0,38
Education			
	Incomplete Bachelor's Degree	1	0,01
	Bachelor's Degree	17	0,13
	Incomplete Postgraduate	22	0,16
	Postgraduate	65	0,48
	Master's Degree	27	0,20
	Doctor's Degree	4	0,03
Country			
	Brazil	133	0,98
	Portugal	1	0,01
	Colombia	1	0,01
	Germany	1	0,01
			0,00
Experience with Project Management (years)			
	Below 2	29	0,21
	>2 - 5	40	0,29
	>5 - 8	19	0,14
	> 8 - 12	19	0,14
	>12 - 15	13	0,10
	Above 15	16	0,12
Type of project			
	IT	42	0,31
	Other	37	0,27
	Consulting	17	0,13
	Construction	15	0,11
	Manufacture	9	0,07
	Finance	6	0,04
	Health and Well being	3	0,02
	Steel	3	0,02
	Not informed	2	0,01
	Oil and Gas	2	0,01

6.4.4.2 Measuring model evaluation

6.4.4.2.1 Reflective indicators

In this study, all first-order variables are reflective, and just a single round of calculations was needed to validate the measurement model. All reflective LVs show significant loading factors and higher than 0.6, which result in an AVE higher than the minimum value of 0.5 (Fornell & Larcker, 1981), with Cronbach's alpha and the CR higher than 0.7 (Chin and Newsted, 1999; Henseler et al., 2009; Tenenhaus et al., 2005), as shown in Table 29.

Table 29 – First order latent variables – measurement model validation

	CO	EI	ER	LE	OP	PR	PS	RO	SE	SR	SS	
Communicatio CO	0.742											
Emotional Intelligence EI	0.687	0.731										
Emotional Regulation ER	0.212	0.264	0.781									
Leadership LE	0.507	0.633	0.206	0.791								
Optimism OP	0.513	0.439	0.243	0.293	0.725							
Professionalism PR	0.615	0.610	0.178	0.467	0.367	0.751						
Perception of self PS	0.570	0.549	0.352	0.435	0.611	0.544	0.733					
Reaching out RO	0.444	0.473	0.167	0.392	0.441	0.439	0.479	0.736				
Self efficacy SE	0.511	0.505	0.286	0.400	0.516	0.433	0.565	0.345	0.774			
Social resources SR	0.393	0.345	0.160	0.208	0.353	0.435	0.395	0.213	0.368	0.751		
Structured style SS	0.333	0.299	0.229	0.136	0.346	0.342	0.406	0.166	0.219	0.190	0.810	
Composite Reliability (CR)	0.786	0.851	0.823	0.834	0.765	0.837	0.853	0.822	0.817	0.837	0.851	>0.7
Average Variance Extracted (AVE)	0.551	0.534	0.610	0.626	0.525	0.563	0.538	0.541	0.599	0.565	0.656	>0.5

Note 1: The diagonal contains the AVE square root which is higher than the correlation among variables

Note 2: All correlations are significant at the 1% level

Table 30 - Second order latent variables – measurement model validation

	COM	RPS	RRA	
COM	0,830			
RPS	0.632	0,724		
RRA	0.683	0.661	0,734	
Composite Reliability (CR)	0,898	0,810	0,778	>0.7
Average Variance Extracted (AVE)	0,689	0,525	0,539	>0.5

Note 1: The diagonal contains the AVE square root which is higher than the correlation among variable

Note 2: All correlations are significant at the 1% level

It can be observed that for all the reflective latent variables, the square root of the AVE is higher than the correlation among them, as the discriminant validity criterion was adopted (Henseler et al., 2009; Tenenhaus et al., 2005). For the indicators' reliability, the indicators' loading factor for their respective LV was also analysed (loading factors >=0.6); moreover, for the discriminant validation, it was observed that the correlation must be higher than in any other latent variable, which was also verified.

6.4.4.3 Evaluation of the structural model: hypothesis testing

6.4.4.3.1 Exploring the direct effects

The research hypothesis and structural model were tested (see Figure 24) on SmartPLS 3.0 software (Ringle et al., 2015), applying bootstrapping simulation for the nomological validity based on the effect size. Table 31 and Figure 24 – Structural Model Validation show the results of the structural model validation.

Table 31 - Structural model validation

	Hypothesis	VIF	f^2	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	R Square	R Square Adjusted
RPS -> RRA	H1	1.000	0.776	0.661	0.063	10.466	**0.000**	0.437	0.433
RPS -> COM	H2	1.776	0.122	0.321	0.091	3.524	**0.000**	0.525	0.518
RRA -> COM	H3	1.776	0.263	0.471	0.083	5.706	**0.000**		

Hypothesis 1 (**H1**), which states that there is a significant and positive relationship between Resilience Personal Strength and Resilience Response Agility, was confirmed (T *student* = 10466 and p-value = 0,000) as shown in Table 31. About Hypothesis 2 (**H2**) of the present work, which indicates that it indicates that there is a positive and direct relationship between Resilience Personal Strength and Personal Competence (T *student* 3524 and p-value 0,000). Regarding Hypothesis 3 (**H3**), which confirms that there is a positive and direct relationship between Resilience Response Agility and Personal Competence (T *student* = 5706 and p-value 0,000). The Figure 24 presents the validated model.

6.4.4.3.2 Exploring the indirect effects

To better understand the indirect effect is important to analyse the Importance-Performance Map. As mentioned by ("SmartPLS: IPMA - Importance-Performance Map Analysis," 2021): "The resulting importance-performance map permits the identification of determinants with a relatively high importance and relatively low performance. These become major and high priority improvement areas with the goal to in turn increase the performance of the selected key target construct in the PLS path model". As mentioned by Ringle & Sarstedt (2016) IPMA allows you to prioritize the construct to improve the target construct. In this way, it facilitates the identification of areas to carry out the actions.

Thus, it is essential in the research model to perform the importance-performance map (Figure 25) and by the analysis of Table 32, it is possible to identify that for each point expanded in RPS - Resilience Personal Strength is increased by ,632 in Personal Competences.

Table 32 – Indirect Effects Evaluation

Effects		Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Direct	RPS -> COM	0.321	0.091	3524	**0.000**
Indirect	RPS -> RRA -> COM	0.311	0.062	5058	**0.000**
Total	RPS -> COM	0.632	0.067	9400	**0.000**

Figure 24 – Structural Model Validation

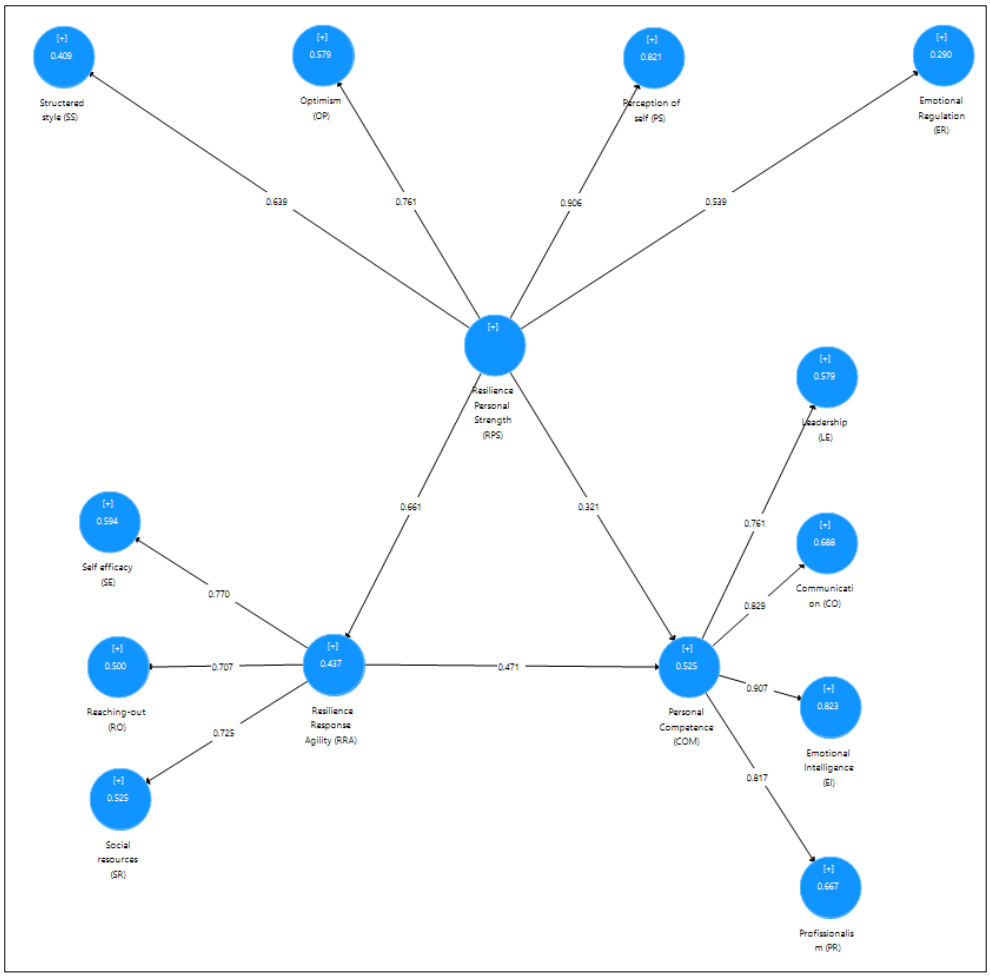
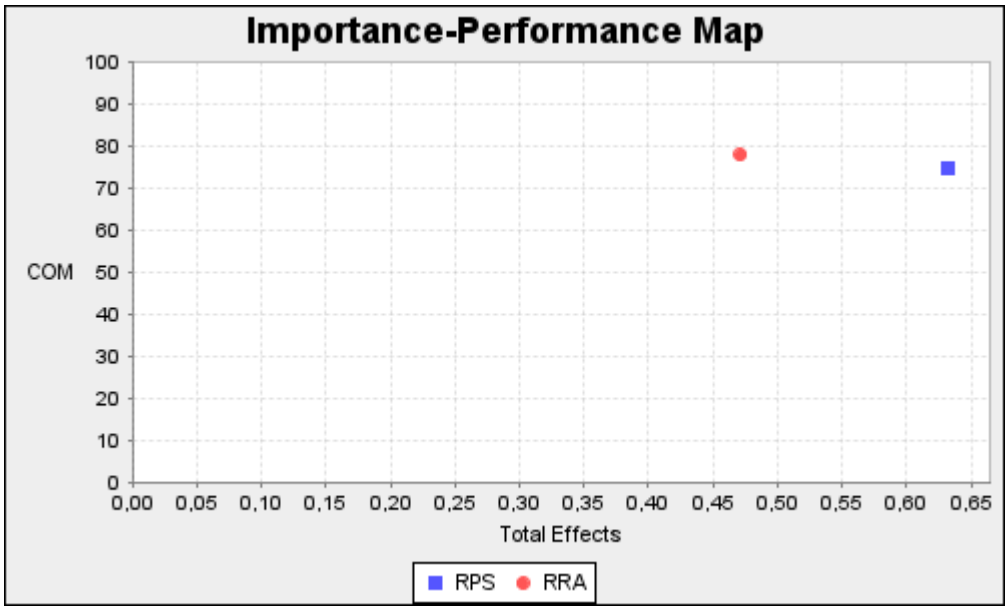


Figure 25 – Importance-Performance Map



6.4.5 Conclusions and Managerial Implications

The present research contributes to the resilience literature, expanding the way in which resilience can be segmented both in a part focused on the personal part, and a

part focused on the propensity to solve a certain issue. One of the points of great importance was the positive relationship between the Resilience of both aspects (Resilience Presonal Strength and Resilience Response Agility) with the Personal Competences, not being enough, an indirect effect of the Resilience Personal Strength was identified that contributed considerably in the interpersonal competences. This study meets what is provided by Turner, Scott-Young, & Holdsworth (2019) to foster the training of project managers on resilience, since it will reflect positively and directly on Personal Competences, the most important Competence to deal with complexity in projects.

The main limitation of this study is because the sample is mainly concentrated in Brazilian respondents, as it was not possible to identify an analysis in relation to the time of experience and / or type of project.

For future research, it suggests the identification of the Impact of Resilience in other competencies such as management as well as the evolution of the agenda on training project managers in resilience.

6.4.6 References of Paper #4

Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience: How teams flourish under pressure. Organizational Dynamics, 44(3), 176–184. https://doi.org/10.1016/j.orgdyn.2015.05.003

Anyan, F., Hjemdal, O., Bizumic, B., & Friborg, O. (2019). Measuring Resilience Across Validation and Psychometric Properties of the English.

APM. (2015). APM Competence Framework.

Berg, M. E., & Karlsen, J. T. (2013). Managing Stress in Projects Using Coaching Leadership Tools.Engineering Management Journal, 25(4, SI), 52–61. https://doi.org/10.1080/10429247.2013.11431995

Chapman, R. J. (2016). A framework for examining the dimensions and characteristics of complexity inherent within rail megaprojects. International Journal of Project Management, 34(6), 937–956. https://doi.org/10.1016/j.ijproman.2016.05.001

Chin, W. W., & Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares. In R. H. Hoyle (Ed.), Statistical strategies for small sample research (pp. 307-341). Thousand Oaks: CA: Sage Publications.

Clarke, N. (2010). Emotional Intelligence and its Relationship to Transformational Leadership and Key Project Manager Competences. Project Management Journal, 41(2), 5–20. https://doi.org/10.1002/pmj.20162

Clarke, N., & Kingdom, U. (2010). Emotional Intelligence and Its Leadership and Key Project Manager. 41(2), 5–20. https://doi.org/10.1002/pmj

Dulewicz, V., & Higgs, M. (2005). Assessing leadership styles and organisational context. Journal of Managerial Psychology, 20(2), 105–123. https://doi.org/10.1108/02683940510579759

Eley, D. S., Robert Cloninger, C., Walters, L., Laurence, C., Synnott, R., & Wilkinson, D. (2013). The relationship between resilience and personality traits in doctors: Implications for enhancing well being. PeerJ, 2013(1), 1–16. https://doi.org/10.7717/peerj.216

Eskerod, P., & Riis, E. (2009). Project Management Models as Value Creators. Project Management Journal, 40(1), 4–18. https://doi.org/10.1002/pmj.20098

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2), 175–191. https://doi.org/10.3758/BF03193146

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research, 18(1), 39. https://doi.org/10.2307/3151312

Friborg, O., Barlaug, D., Martinussen, M., Rosenvinge, J. H., & Hjemdal, O. (2005). Resilience in relation to personality and intelligence. International Journal of Methods in Psychiatric Research, 14(1), 29–42. https://doi.org/10.1002/mpr.15

Friborg, O., Hjemdal, O., Rosenvinge, J. H., & Martinussen, M. (2003). A new rating scale for adult resilience: What are the central protective resources behind healthy adjustment? International Journal of Methods in Psychiatric Research, 12(2), 65–76. https://doi.org/10.1002/mpr.143

Geoghegan, L., & Dulewicz, V. (2008). Do Project Managers' Leadership Competencies Contribute to Project Success? Project Management Journal, 39(4), 58–67. https://doi.org/10.1002/pmj.20084

Gruden, N., & Stare, A. (2018). The Influence of Behavioral Competencies on Project Performance. Project Management Journal, 49(3), 98–109. https://doi.org/10.1177/8756972818770841

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. Long range planning, 46(1-2), 1-12.

Henderson, L. S. (2008). The Impact of Project Managers' Communication Competencies: Validation and Extension of a Research Model for Virtuality, Satisfaction, and Productivity on Project Teams. Project Management Journal, 39(2), 48–59. https://doi.org/10.1002/pmj.20044

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. Industrial Management and Data Systems, 116(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

IPMA. (1999). ICB - IPMA Competence Baseline v2.0. In Management.

IPMA. (2006). IPMA Competence Baseline Version 3.0.

IPMA. (2015). Individual Competence Baseline for Project, Programme & Portfolio Management (4.0). Zurich.

Jackson, D., Firtko, A., & Edenborough, M. (2007). Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: A literature review. Journal of Advanced Nursing, 60(1), 1–9. https://doi.org/10.1111/j.1365-2648.2007.04412.x

Jani, A. (2011). Escalation of commitment in troubled IT projects: Influence of project risk factors and self-efficacy on the perception of risk and the commitment to a failing project. International Journal of Project Management, 29(7, SI), 934–945. https://doi.org/10.1016/j.ijproman.2010.08.004

Kutsch, E., Maylor, H., Weyer, B., & Lupson, J. (2011). Performers, trackers, lemmings and the lost: Sustained false optimism in forecasting project outcomes - Evidence from a quasi-experiment. International Journal of Project Management, 29(8), 1070–1081. https://doi.org/10.1016/j.ijproman.2011.01.010

Lloyd-Walker, B., French, E., & Crawford, L. (2016). Rethinking researching project management: Understanding the reality of project management careers. International Journal of Managing Projects in Business, 9(4), 903–930. https://doi.org/10.1108/IJMPB-04-2016-0033

McEwen, K. (2018). Resilience as a framework for coaching and interventions. White Paper, 1–14.

Moenkemeyer, G., Hoegl, M., & Weiss, M. (2012). Innovator resilience potential: A process perspective of individual resilience as influenced by innovation project termination. Human Relations, 65(5), 627–655. https://doi.org/10.1177/0018726711431350

Müller, R., & Rodney Turner, J. (2010). Attitudes and leadership competences for project success. Baltic Journal of Management, 5(3), 307–329. https://doi.org/10.1108/17465261011079730

Pant, I., & Baroudi, B. (2008). Project management education: The human skills imperative. International Journal of Project Management, 26(2), 124–128. https://doi.org/10.1016/j.ijproman.2007.05.010

PMI. (2017). Project Management Competency Development Framework - 3 Ed (Third edit). Pennsylvania: PMI Publications.

Qazi, A., Quigley, J., Dickson, A., & Kirytopoulos, K. (2016). Project Complexity and Risk Management (ProCRiM): Towards modelling project complexity driven risk paths in construction projects. International Journal of Project Management, 34(7), 1183–1198. https://doi.org/10.1016/j.ijproman.2016.05.008

Rahi, K. (2019). Project resilience: a conceptual framework. IJISPM-INTERNATIONAL JOURNAL OF INFORMATION SYSTEMS AND PROJECT MANAGEMENT, 7(1), 69–83. https://doi.org/10.12821/ijispm070104

Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. International Journal of Project Management, 33(1), 41–52. https://doi.org/10.1016/j.ijproman.2014.03.012

Reivich, K., & Shatté, A. (2002). The resilience factor: 7 essential skills for overcoming life's inevitable obstacles. New York.

Richmond, A., & Skitmore, M. (2006). Stress and Coping: A Study of Project Managers in a Large ICT Organization. Project Management Journal, 37(5), 5–16. https://doi.org/10.1177/875697280603700502

Ringle, C. M., & Sarstedt, M. (2016). Gain more insight from your PLS-SEM results the importance-performance map analysis. Industrial Management and Data Systems, 116(9), 1865–1886. https://doi.org/10.1108/IMDS-10-2015-0449

Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Scott, A., Woolcott, G., Keast, R., & Chamberlain, D. (2018). Sustainability of collaborative networks in higher education research projects: why complexity? Why now? Public Management Review, 20(7, SI), 1068–1087. https://doi.org/10.1080/14719037.2017.1364410

Shah, M. N., & Prakash, A. (2018). Developing generic competencies for infrastructure managers in India. International Journal of Managing Projects in Business, 11(2), 366–381. https://doi.org/10.1108/IJMPB-03-2017-0030

SmartPLS: IPMA - Importance-Performance Map Analysis. (2021).

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. International Journal of Behavioral Medicine, 15(3), 194–200. https://doi.org/10.1080/10705500802222972

Stevenson, D. H., & Starkweather, J. A. (2010). PM critical competency index : IT execs prefer soft skills. International Journal of Project Management, 28(7), 663–671. https://doi.org/10.1016/j.ijproman.2009.11.008

Tavares Thome, A. M., Scavarda, L. F., Scavarda, A., & de Souza Thome, F. E. (2016). Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects. International Journal of Project Management, 34(7), 1328–1346. https://doi.org/10.1016/j.ijproman.2015.10.012

Thomas, J., & Mengel, T. (2008). Preparing project managers to deal with complexity - Advanced project management education. International Journal of Project Management, 26(3), 304–315. https://doi.org/10.1016/j.ijproman.2008.01.001

Tiger, L. (1979). Optimism: The Biology of Hope. New York: Simon & Schuster.

Turner, M., Scott-Young, C., & Holdsworth, S. (2019). Developing the resilient project professional: examining the student experience. INTERNATIONAL JOURNAL OF MANAGING PROJECTS IN BUSINESS, 12(3), 716–729. https://doi.org/10.1108/IJMPB-01-2018-0001

Windle, G., Markland, D. A., & Woods, R. T. (2008). Examination of a theoretical model of psychological resilience in older age. Aging and Mental Health, 12(3), 285–292. https://doi.org/10.1080/13607860802120763

Zhu, J., & Mostafavi, A. (2017). Discovering complexity and emergent properties in project systems: A new approach to understanding project performance. International Journal of Project Management, 35(1), 1–12. https://doi.org/https://doi.org/10.1016/j.ijproman.2016.10.004

Zulch, B. (2014). Communication: The Foundation of Project Management. Procedia Technology, 16, 1000–1009. https://doi.org/10.1016/j.protcy.2014.10.054

6.4.7 Appendix A of Paper #4: Research Questionnaire

2nd Order LV	1st Order LV	Code	Source	Question
Resilience Personal Strengh (RPS)	Emotional Regulation	ER	Reivich and Shatte (2002)	I can control the way I feel when adversity strikes
				If someone does something that upsets me, I am able to wait until an appropriate time when I have cooled down to discuss it
				When I discuss a "hot" topic with a colleague or family member, I am able to keep my emotions in check.
	Optimism	OP	Reivich and Shatte (2002)	I believe that it is better to believe problems are controllable, even if that is not always true.
				Hard work always pays off.
				When faced with a difficult situation, I am confident that it will go well
	Perception of self	PS	Friborg (2005)	I feel that my future looks
				My personal problems
				My judgements and decisions
				In difficult periods I have a tendency to
				My abilities
				Events in my life that I cannot influence
	Structured style	SS	Friborg (2005)	Rules and regular routines
				I am good at
				When I start on new things/projects
Resilience Response Agility - RRA	Reaching out	RO	Reivich and Shatte (2002)	I look at challenges as a way to learn and improve myself.
				I am curious.
				I am the kind of person who likes to try new things.
				What other people think about me does not influence my behavior.
	Self efficacy	SE	Reivich and Shatte (2002)	If my first solution does not work, I am able to go back and continue trying different solutions until I find one that does work.
				I expect that I will do well on most things.
				People often seek me out to help them figure out problems.
				I believe I have good coping skills and that I respond well to most challenges.
	Social Resources	SR	Friborg (2005)	I can discuss personal issues with
				When a family member experiences a crisis/emergency
				I get support from
				When needed, I have

2nd Order LV	1st Order LV	Code	Source	Question
Personal Competences (COM)	Leadership	LE	IPMA v4.0 - Leadership	Do you provide direction, coaching and mentoring to guide and improve the work of individuals and teams?
			PMI 3rd Edition	Do you Plan and manage for project success in an organized manner?
			IPMA v2.0 - Leadership	Do you allow sufficient freedom for action to subordinates to find and realize their ways?
			IPMA v2.0 - Leadership	Do you adopt the management style to the specific team and working situation? Open for feedback
			IPMA v4.0 - Leadership	Do you make, enforce and review decisions?
	Communication	CO	PMI 3rd Edition	Do you actively listen, understand and respond to stakeholders?
			IPMA v2.0	Do you convince others and achieve understanding?
			IPMA v2.0	Do you inform properly and in time?
			PMI 3rd Edition - v3	Do you ensure quality of information?
			IPMA v4.0	Do you employ humor and sense of perspective when appropriate?
	Emotional Intelligence	EI	IPMA v2.0	Do you behave positively in case of acceptable criticism, react coolly on personal attacks, forgive?
			IPMA v4.0	Do you promote cooperation and networking between team members?
			IPMA v4.0	Do you demonstrate empathy through listening, understanding and support?
			IPMA v4.0	Do you support, facilitate and review the development of the team and its members?
			PMI 3rd Edition - v3	Do you effectively resolve issues and solve problems?
	Professionalism	PR	IPMA v4.0	Do you promote a holistic view of the project and its context to improve decision-making?
			IPMA v2.0	Are you happy to applaud others' success, favor the total result to setting up his/her own profile?
			IPMA v4.0	Do you deliver results and get acceptance?
			PMI 3rd Edition - v3	Do you operate with integrity?
			PMI 3rd Edition - v3	Do you resolve individual and organizational issues with objectivity?