Article

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

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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

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 on leadership roles (Müller & Turner, 2010a). Giraldo González, Pulido Casas, and Leal Coronado (2013) indicate there are numerous studies that show that project manager competences are vital to project success. Similarly, Crawford (2005) reports that project management competences have a major impact on project performance and, as a result, performance of the whole organization can also be affected. Nevertheless, the connection between the project manager and success still requires further study (Berssaneti & Carvalho, 2015), particularly concerning a sustainable persepctive (Martens & Carvalho, 2017).

According to *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) –* Fifth Edition (Project Management Institute, 2013), the project manager is responsible for achieving the project objectives; however, the vast literature on the subject also points out that project management is dependent upon the hard (basic) skills of project managers. Nevertheless, there has been a change in the focus of studies toward the interpersonal side of managers—the so-called "soft skills." Carvalho and 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 is a critical success factor for the project (Sadeghi, Mousakhani, Yazdani, & Delavari, 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, Ojiako, & 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 the 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 profiles 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.

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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 guidelines, frameworks, or standards. Some examples of these institutions are: the Project Management Institute (PMI) who created the *Project Management Competency Development* (PMCD), the International Project Management Association (IPMA) who created the *Individual Competence Baseline for Project Programme and Portfolio Management* (ICB), the Association for Project Management (APM) who developed the *APM Competence Framework* (ACF), and the Australian Institute of Project Management (AIPM) who developed the *Professional Competency Standards for Project Management* ([PCSPM] AIPM, 2010a, 2010b; APM, 2015; IPMA, 2015; PMI, 2007).

Despite the existence of these guidelines, some skepticism has been created by the absence of a definitive empirical basis for their 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 project managers, as in the recent studies by Medina and Medina (2014) and Takey and 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 from the perspective of the literature 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.

In this article, 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. Next there is a section on methodology, followed by the results of a systematic literature review and analysis of job advertisements on various websites. The closing sections of the article are the conclusions, implications, and limitations of the research.

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, competences are 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 considered essential for a person to be accepted as appropriate for the field of project management. The key competences are usually fundamental to working in project management (AIPM, 2010a, 2010b; APM, 2015; IPMA, 2015; PMI, 2007).

The guidelines created by those institutions and project management associations bring a comprehensive view of the main competences that a project manager should seek to effectively manage a project. Table 1 presents a synthesis, which aims to facilitate an understanding of the competences cited by competence models.

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

Research Design

Aligned with the research question of identifying the key project manager competence and 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.

Systematic Literature Review

The 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 these four steps:

1. Sampling phase: searching protocol (database selection, search terms definitions, 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; and
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).

First, the bibliometric analysis was aimed at tracing the profiles 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 from other databases, 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 document (article) and adherence to the theme of the research. Searches in the databases were made

Table 1. Comparative Analysis of Project Manager Competences Frameworks.

Proposed Competency Model	PMCD	ICB	APM *Competence Framework*
	Project Manager Competency Development Framework (PMI, 2007)	IPMA *Competence Baseline* (IPMA, 2015)	(APM, 2015)
Behavioral: competences related to personal and social capacities of a project manager.	**Personal competences:** six personal and social competences that an individual needs.	**People competences:** 10 personal and social competences that an individual needs.	Among the 27 competences established, there is 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 competence elements will be specified, implemented, and managed.	Technical competences are related to the integration of design work and the production of project deliverables.
Management competences: Project management competences related to the core activities of project management	**Knowledge:** project manager's knowledge of project management processes, tools, and techniques for project activities **Performance:** it is the application of project management knowledge. In general, what the project manager is able to accomplish with his or her knowledge.	**Practical competences:** fourteen competences related to project, program, and portfolio knowledge areas and project management processes.	Among the 27 competences established, there is a mix of behavioral, management, and contextual competences. Several of the APM competences are related to project management knowledge areas and project management processes, such as procurement, schedule, and risk management.
Contextual competences: competences related to the context and the company's business	**Contextual** competences are considered "other competences," which *PMCD* does not address; however, it recognizes 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 established there is a mix of behavioral, management, and contextual competences. For instance, governance arrangements are one of the APM competences.

Notes. APA = Association for Project Management; IPMA = International Project Management Association; PMCD = Project Management Competency Development.

in November 2014 and the following search terms were used in the search: "competence*" 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 articles.

During the first screening, we filtered by document type (articles), resulting in 97 articles, and also filtered by language (English). As a result, one article 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 composed of 95 articles.

The samples were all published during the period between 1997 and 2014. The analysis from the sample showed that in the last five years of the period analyzed, there had 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* published 18 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 published in the United States (25.6%), followed by the United Kingdom (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 project manager competences.

A computer-aided approach was applied to the data analysis. The sample metadata of these articles are taken from the ISI Web of Science base, and the data analysis was performed using the following software: Sitkis 2.0 (Schildt, 2002), Ucinet for Windows–version 6.289 (Borgatti, Everett, & 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, and Pfarrer (2007), included the project managers' competence encoding based on the extant literature and categories identified, frequency counts on

Table 2. Website Search Parameters.

ID	Website	Term Searched	Filters	Notes
1	http://www.catho.com.br	Project manager	Only at job title Exact term	Founded in 1996, in 2013 Catho identified more than 184,000 hires through the website (Catho, 2014)
2	http://www.infojobs.com.br		Job position: Project manager	Implemented in Brazil in 2004, Infojobs receives around 10 million visits per month; with that number, it is the site with the most visited job seekers in Brazil. (Infojobs, 2014)
3	http://www.hays.com.br		Searched by function title	Hays has professionals working in over 240 offices in 33 countries, which is how she got to be the leader in specialist recruitment. (Hays, 2014)
4	http://www.pagepersonnel.com.br		No filter applied	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	http://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 five continents. (Michael Page, 2014)

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 (see summary of the results in Table 3), and the frequency analyses 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. Using the software, one can then 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.

Survey of Job Advertisements for Project Managers on Employment Websites

Chipulo et al. (2013) mention that when an organization announces a job vacancy, they should not only provide the key features of the company but should also 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 led 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 sources of data. The first two sites selected boast the largest number of visits and time spent on their website by people accessing job offer sites; they are among the best job search sites in Brazil (Castro, 2014; Guedes, 2014). The other three sites are proficient and well-known and considered to provide better, more detailed job descriptions.

According to Castro (2014), internet users who accessed the job sites spent 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 in Table 2.

Data from websites were collected for the period October 2014 through December 2014. Those data were inserted into 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 in the vacancy ads.

Methodological Triangulation Between Literature Review and Job Ads Survey

To address the research question, a methodological triangulation was performed (Joslin & Müller, 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 toward theoretical generalizations and/or future research agendas.

Project Manager Competences: Results

Figure 1 presents the analysis of competences of project managers based on keywords used in the literature. The content analysis shows that the network emphasizes soft skills and has particular focus on project success.

For the development of this network, the co-citation of the keyword has been used as a cut criterion at least four times. By organizing words into common themes using the diagram technique of the affinity or KJ (Kawakita Jiro) method (Carvalho & Paladini, 2012), it was possible to identify three clusters on the network.
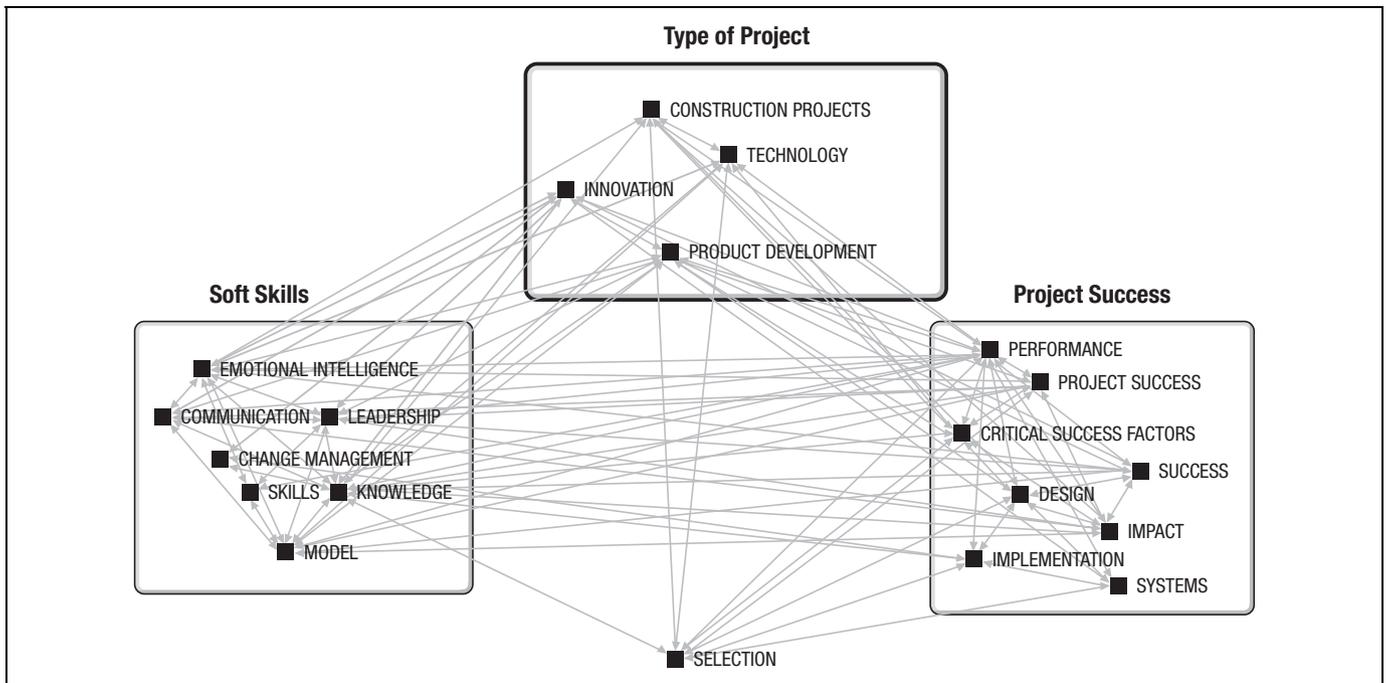
Figure 1. Keywords network.
Note. This network was created with Ucinet and Netdraw software using data that were imported using Sitkis software. The strength of ties corresponds to the relationship intensities.

In the top of the keyword network, there is a cluster called the "type of projects," which 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, in the left-hand corner of Figure 1, one can see an emphasis on soft skills, such as leadership (e.g., Müller, Geraldi, & Turner, 2012; Müller & Turner, 2007, 2010b), communication (e.g., Carvalho, 2013; Henderson, 2008), emotional intelligence (e.g., Clarke, 2010a; Lee, Park, & Lee, 2013), change management (e.g., Crawford & Nahmias, 2010; Harison & Boonstra, 2009), and knowledge (e.g., Chipulu et al., 2013; Palacios-Marqués, Cortés-Grao, & Lobato Carral, 2013).

Table 3 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.

In the 95 articles examined, the sum of all citations was 565 during the period analyzed. To identify the most cited article, it was decided that the cut-off point would be until the twentieth most-cited article. The sum of such publications cited was 382, corresponding to 67.6% of all citations. The most cited articles, as well as their relevance over the period, are presented in Figure 2.

Observing the influence of articles over the period studied and using the time period cited as a proxy for influence, some articles stood out more than others: those by Marsh and Stock (2003), Souder and Jenssen (1999), Souder and Song (1998), and Müller and Turner (2010b).

The most recent article appearing in the group of the most cited is that by Gilan, Sebt, and Shahhosseini (2012), whose objective was to present an approach to select the team in construction projects through a computational aid. Other articles published in this decade and among the most cited were Stevenson and Starkweather (2010), Clarke (2010a), and Patanakul, Milosevic, and Anderson (2007). Figure 3 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, whereas the squares are the most-cited references in the articles in the sample.

Two squares in Figure 3 are not direct toward competences but refer to the critical success factors in projects. The article published by Cooke-Davies (2002) is one of the most cited references and 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 and 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 3 are related more to competences (Müller & Turner, 2007) in leadership styles for different types of projects, based on the model proposed by Dulewicz and Higgs (2004). Crawford (2005) develops an integrated model aligned with the competency standards, which consists of attribute-based inference of competence

Table 3. Code Structure: Construct, Keyword, and Key References.

Cluster	Keywords	Occurrence	References
Competences	Emotional intelligence	8	(Lee et al., 2013)
			(Müller, Geraldi, & Turner, 2012),
			(Davis, 2011)
			(Clarke, 2010b)
			(Müller & Turner, 2010a),
			(Müller & Turner, 2010b),
			(Clarke, 2010a)
			(Geoghegan & Dulewicz, 2008)
	Change management	4	(Crawford & Nahmias, 2010),
			(Harison & Boonstra, 2009),
			(Kræmmergaard & Rose, 2002),
			(Müller, Geraldi, & Turner, 2012),
	Communication	2	(Henderson & Stackman, 2010)
			(Henderson, 2008)
	Leadership	7	(Lee et al., 2013)
			(Geoghegan & Dulewicz, 2008)
			(Clarke, 2010a)
			(Müller et al., 2012)
			(Müller & Turner, 2010b)
			(Müller & Turner, 2010a)
			(Verburg, Bosch-Sijtsema, & Vartiainen, 2013)
	Knowledge	7	(Najafi & Afrazeh, 2011)
			(Darrell, Baccarini, & Love, 2010)
			(Anbari, Carayannis, & Voetsch, 2008)
			(Belkadi, Bonjour, & Dulmet, 2007)
			(Hwang & Ng, 2013)
			(Palacios-Marqués et al., 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	(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)
			(Müller et al., 2012)
			(Geoghegan & Dulewicz, 2008)
			(Anbari et al., 2008)
			(Mazur, Pisarski, Chang, & Ashkanasy, 2014)
	Critical success factors	3	(Gudienė et al., 2013)
			(Gudienė et al., 2014)
			(Plant & Willcocks, 2007)
	Success	2	(Stevenson & Starkweather, 2010),
			(Thi & Swierczek, 2010)
	Design	5	(van Rooij, 2011)
			(Brill, Bishop, & Walker, 2006)
			(Keski-Seppala, 2001)
			(Marmier, Deniaud, & Gourc, 2014)
			(Ahadzie, Proverbs, & Sarkodie-Poku, 2014)
	Impact	1	(Buganza, Kalchschmidt, Bartezzaghi, & Amabile, 2013)

(continued)

Table 3. (continued)

Cluster	Keywords	Occurrence	References
	Implementation	3	(Thi & Swierczek, 2010)
			(Wang, Shih, Jiang, & Klein, 2008)
			(Plant & Willcocks, 2007)
	Systems	7	(Marques et al., 2011)
			(Skulmoski & Hartman, 2010)
			(Wang et al., 2008)
			(Li, Yang, Klein, & Chen, 2011)
			(Plant & Willcocks, 2007)
			(Canavesio & Martinez, 2007)
			(Marmier et al., 2014)
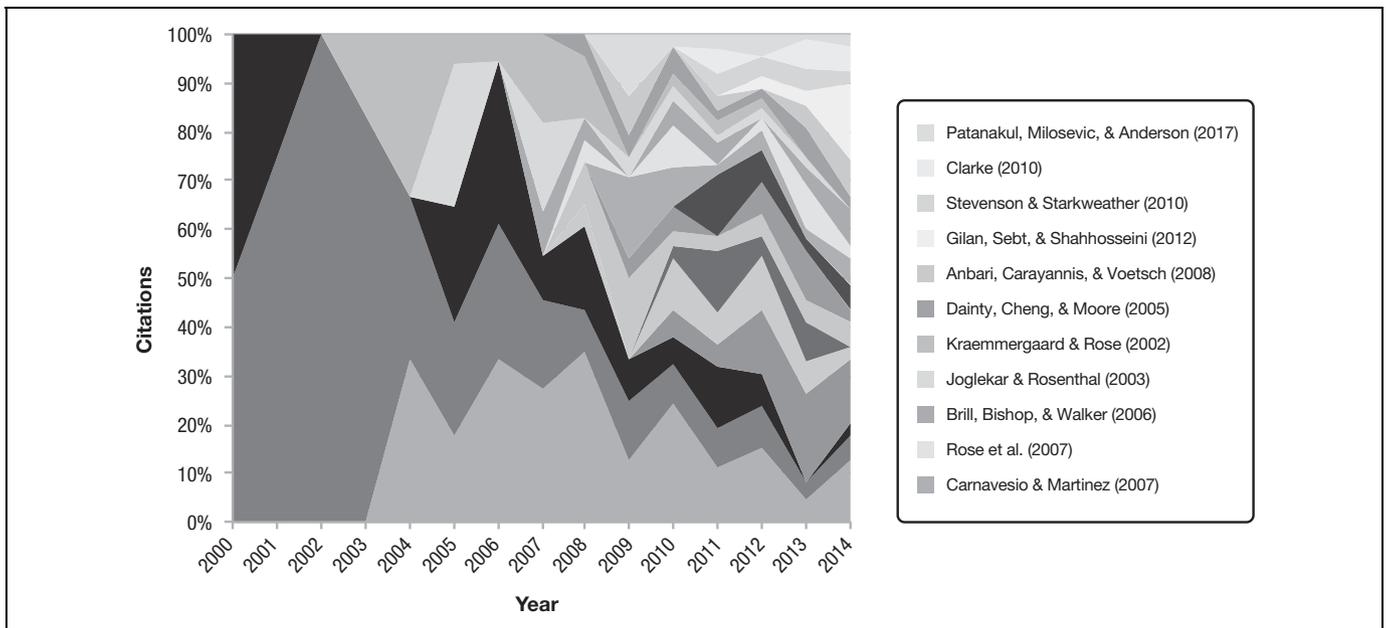
Figure 2. Yearly citation of the top cited articles.

(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 and 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.

Summary of Project Managers' Competences in 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:

- The article could not be found on the internet;
- The item was found, but the university had no access; or
- The 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 4 was prepared. The NVivo software was used in the analysis of the code frequencies.

The content analysis of the methodological approaches applied in the surveyed literature was 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 data gathering. Concerning the units of analysis, most of the studies were based on practitioners
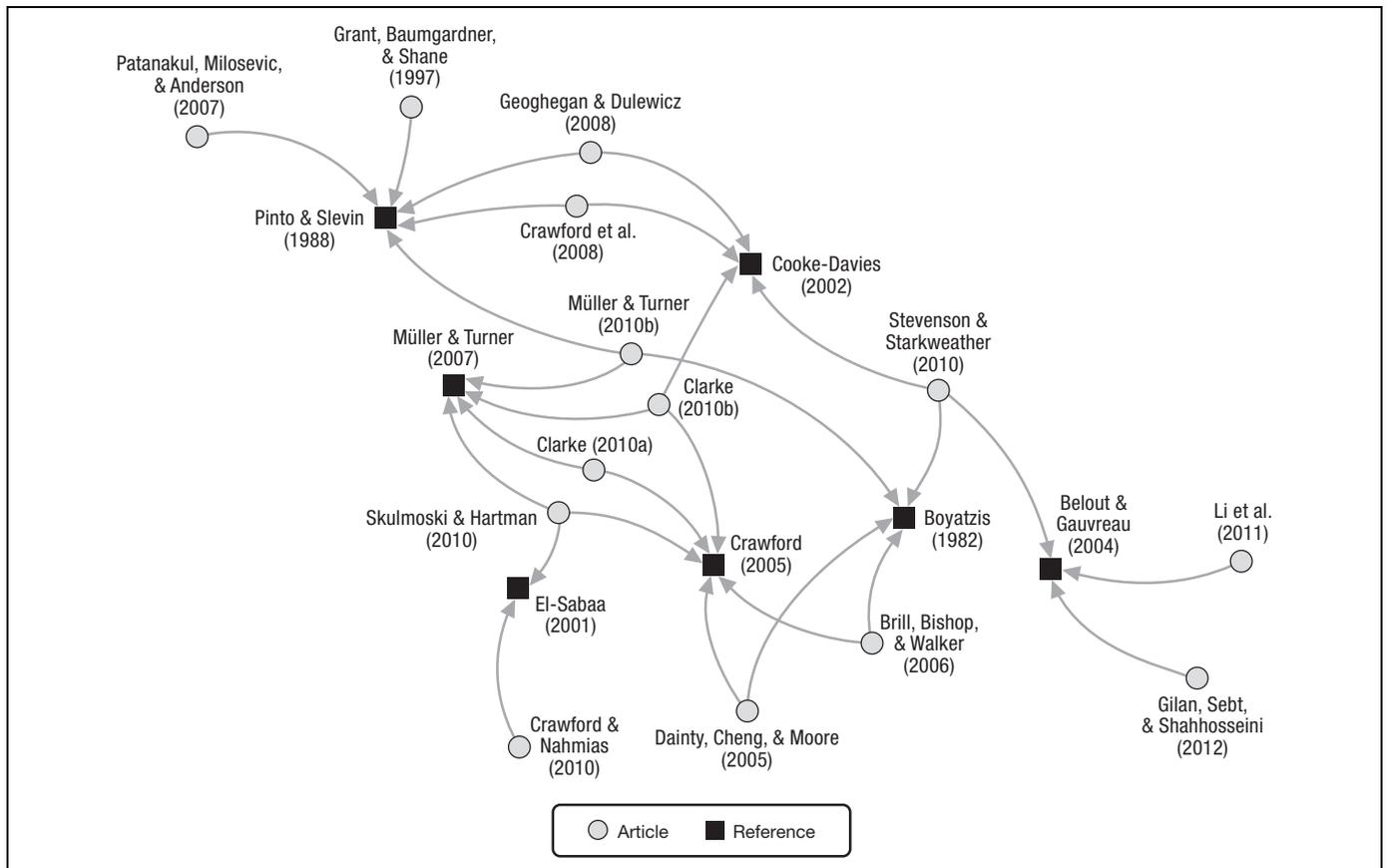
Figure 3. Articles researched (most cited) referring to the most cited references.

(56%), companies (36%), and projects (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 (Cheng, Dainty, & Moore, 2005; Edum-Fotwe & McCaffer, 2000; Hodgson, 2002; Takey & Carvalho, 2015). Just a few articles explored this issue in multiple 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 the differences in the rank (order and occurrence frequency) of key competences according to country and industry.

Project Managers' Competences According to the 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 occurred on the Monster website, because the same ad can contain more than one vacancy. The distribution of income by sites is shown in Table 5. Finally,

duplicate job offers were excluded (i.e., those that appeared on a particular date and were relisted again at a later date).

General Requirements

As far as educational requirements, more than 75% of the 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 carry out specific activities requiring a higher education, such as conduct a technical follow-up during the construction stages, which is a specific activity performed by 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, specifically, the Project Management Professional (PMP)® certification. Insofar as a knowledge of foreign languages, just over one-fifth of vacancies (20.7%) required the candidate to know how to communicate in another language, most often 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

Table 4. Summary of Identified Competences.

Categories	Terms	Number of Occurrences	References that Influenced the Encoding
Behavioral	Leadership	1323	Marsh and Stock (2003); Skulmoski and Hartman (2010); Müller and Turner (2010b); Müller, Geraldi, and Turner (2012); Clarke (2010a); Paajanen, Porkka, Paukku, and Vanharanta (2009); Torkaman, Moradi, and Almutairi (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, and Shane (1997); Rose, Pedersen, Hosbond, and Kræmmergaard (2007); González, Casas, and Coronado (2013); Marsh and Stock (2003); Chipulu et al. (2013); APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	Technical	875	
	Software	868	
	Industry	694	
	Engineering	685	
	Test	269	
Management	Planning	474	Skulmoski and Hartman (2010); Giraldo González, Pulido Casas, and Leal Coronado (2013); Ahsan et al. (2013); Starkweather and Stevenson (2011); Hwang and Ng (2013); Creasy and Anantatmula (2013); Buganza et al. (2013); Crawford and 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 and Rose (2002); Paajanen et al. (2009); Skulmoski and Hartman (2010); Wang et al. (2008); Müller and Turner (2010a); Anbari et al. (2008); APM (2008); PMI (2007); IPMA (2006); AIPM (2010b)
	Business	858	
	Relationship	484	
	Environment	477	
	Process	472	
	Marketing	177	
	Influence	164	

Table 5. Final Distribution of the Number of Opportunities and Job Advertisements in Project Management.

ID	Website	Jobs	Job Ads	Exclusive Ads
1	http://www.catho.com.br	442 positions	348 advertisements	279 advertisements
2	http://www.infojobs.com.br	25 positions	25 advertisements	25 advertisements
3	http://www.hays.com.br	7 positions	7 advertisements	7 advertisements
4	http://www.pagepersonnel.com.br	4 positions	4 advertisements	4 advertisements
5	http://www.michaelpage.com.br	9 positions	9 advertisements	9 advertisements
	Total	487 positions	393 advertisements	324 advertisements

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.

Experience, Knowledge Areas, and Process Groups

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

In terms of project management 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"; these terms appeared in only 15 situations (4.63%) each.

The terms related to the project management 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.

Project Managers' Competences

Regarding the project managers' competences, this research was divided into four blocks to facilitate analysis and comparison with 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, in total).

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, a degree in engineering was specified or the need for knowledge of a specific 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 in more than 150 instances. "...owning an up-to-date 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 including 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 once.

Discussion

Most of the ads were related to the 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", which relates to the relationship improvement projects of companies with their customers.

As expected, almost all jobs require a higher education, although the PMP® certification can be obtained by those without such training. Almost one-third (29.6%) of the vacancies require certification, somewhat below the number of jobs that require a college degree (23.5%). This could confuse a professional seeking employment as to whether he or she should study for a certification or join a postgraduate program (Reis, 2014; Silva, 2008, 2011).

Knowledge in project management software should be an important milestone for the professional planning to enter the labor market, since more than one-fifth of the ads identify that requirement. In most cases, the project manager is required to 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 the ads explicitly announced the need for knowledge of other software in addition to 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 although a larger number of vacancies could require such expertise, that requirement may not specifically indicate that office tools are only standard for a project manager.

For recent graduates not experienced in project management, the number 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 project management Process Groups, planning, executing, and monitoring and controlling had greater prominence than initiating and closing. The planning and controlling phases appeared explicitly in the ads using expressions, such as: "Know and use Microsoft Project tool for planning and control of activities." The ad that involved executing according to the plan was expressed as: "Managing large projects, ensuring scope, and execution within the budget and schedule." And, finally, ads that require monitoring and controlling actions stated: "To develop the schedule and cost control." It is therefore remarkable that organizations expect the hired manager to not only execute plans but also carry out the plans and control them.

For knowledge competences, the main concern of the organizations was to ensure the success of projects in terms of cost and time. Those terms, at least, 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 places 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, which have gained more prominence were "communication," "leadership," and "flexibility" in comparison with the literature, which were "leadership," "communication," and "emotional intelligence." Just two of the items differ: "emotional intelligence" by the side of literature and "flexibility" on the side of job openings. In summary, it can be stated that the literature and the companies/

Table 6. Methodological Triangulation Analysis: Literature Versus Job Ads.

Competences	Terms	Occurrences Literature	Occurrences Job Ads	Literature Versus Job Ads
Behavioral	Leadership	1,323	46	With regard to behavioral competences, the literature, in general, 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 the ability to communicate in the position offered; however, terms such 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 selection 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	3,336	146	
	%	27%	17%	
Technical or specific	Product	908	7	Technical competences are addressed in the literature, however in a more comprehensive and unspecified way than 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 detail as to 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 explain which software, courses, and/or training 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 such as servers and networks for projects related to infrastructure (IT area).
	Technical	875	25	
	Software	868	43	
	Industry	694	5	
	Engineering	685	138	
	Test	269	15	
	Total	4,299	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, which means competences to build a schedule or a project budget. Some ads even point out the need for the project manager to have the ability to allocate resources efficiently and effectively. One difference is that advertisements specify some software for the planning/monitoring phases of a project, such as Microsoft Project or Primavera.
	PMP certification	132	84	
	Resource Management	124	1	
	Other Certification	120	89	
	Change Management	118	8	
	Monitoring	99	24	
	Negotiation	84	24	
	Risk Management	84	6	
	Total	1,235	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 need to interact or work with, for example, the finance department, marketing, and research and development. In this perspective, another point that also deserves to be highlighted is the fact that in international projects, knowledge of a foreign language is a competence required but probably not needed in countries where the language spoken is English.
	Business	858	28	
	Relationship	484	44	
	Environment	477	0	
	Process	472	34	
	Marketing	177	10	
	Total	3,441	141	
	%	28%	17%	
	Total	12,311	843	
	%	100%	100%	

organizations envision a project manager as a leader with the 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 types 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 three of the four terms most frequently cited: "PMP," "certification," and "planning." In terms of managerial competences, organizations

Table 7. Expected Profile of the Project Manager and the Location 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 of foreign languages, especially English
Previous experience	Preferably yes
Project management 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 explain point of view
	(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 issues
	Ability to carry out plans for the project
	(Certification and Planning)
Contextual competences	Ability to relate with stakeholders and influence them
	Bargaining power with stakeholders
	(Relationship and Business)

expect employees to have the ability to plan, and the 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 job opportunities (ads) and "organization," "business," and "relationship" on the side of the guidelines and articles (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 the literature and in the advertisements is shown in Table 6.

It can be noted in Table 6 that different categories are highlighted in the literature and in the job ads. Although literature pays much more attention to technical and contextual competences as important variables to determine the key competences, job ads emphasize managerial competences. The rank of terms inside competence 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, whereas the literature emphasizes a broader range of success dimensions.

Summary of the Project Manager's Profile

In order to synthesize the information about the literature and announcements of job openings, Table 7 shows the profile and best characteristics expected of a professional seeking a job as a project manager.

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 project management literature and labor market.

The competence analysis was driven by four categories: contextual, behavioral, technical, and managerial. These categories were further divided into key competences in each category (see Table 4). This allowed the identification of competences in the articles and in the job advertisements using the frequency of the listed competences.

After analyzing employment opportunities, it can be seen that the literature indicates that many of the competences are seen as essential, although many of these are insignificant or not mentioned in the ads, such as ethics and knowledge of 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 also seek some background requirements, such as higher education, knowledge of the English language, and experience in projects.

With regard to its theoretical contribution, the article 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 most closely linked to each group of competences.

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

Generally, this study outlines the contents of common job vacancy descriptions and thus allowed us to present the basic requirements for getting the job. These include the ability to communicate in other languages, certification, postgraduate degrees, and job experience.

In practical terms, this work gives guidelines to HR sectors in the development of job vacancy descriptions for the

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, which 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 five job ad sites in Brazil. The search could have been expanded to other websites; thus, as suggested, the section describing insights into the literature, the contingent effect of the country and industry were not explored in this study and are important for future research. 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 compared with project managers in other parts of 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 investigation of the connection between organizational performance and project manager competences.

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