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Competence of project management professionals according to type of project: a systematic literature review

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Abstract:
Globalization and economic volatility changed the dynamics of production chains, which required new organizational arrangements from companies, leading them to projectization. Additionally, project professionals are managing increasingly complex projects, which demand an extensive and specific set of competences. In this context, this paper aims to identify the competences of project professionals by project type. A systematic literature review was carried out using the Scopus and Web of Sciences academic databases. The research corpus consisted of 209 articles published between 1989 and 2022. As a result, this research identified 173 competences distributed in 14 different project types; some competences have a greater significance for a given project type. As a contribution, when dealing specifically with projects and competences, project professionals, companies, and educational institutions can learn about the fundamental competences by type of project, improve the processes of selection and diagnosis of the professional, adapt educational programs, or even establish plans for project professionals career.

Keywords:
competence; project type; project professional career; project management; capacity building.

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1. Introduction

Globalization and the volatility of the economy have changed the dynamics of production chains [1]. Although many organizations have consolidated structures, this scenario of changes required new organizational arrangements that led them toward projectization [2]. In this context, project management professionals are dealing with increasingly complex projects [1], which require an ever more extensive and specific set of competencies from these professionals [3], [4].

Crawford [5] states that competences can be understood as a set of attributes that include knowledge, skills, and experiences, as well as personality traits, attitudes, and behaviors. For Perrenoud [6], competence is the individual's ability to use and connect acquired knowledge and experiences in complex, varied, and unpredictable situations. Thus, project management competences are crucial for project success, as indicated by Chipulu et al. [7]. Furthermore, Fereshteh et al. [8] state that the lack of attention to competences is one of the main factors for the failure of projects.

Based on the aforementioned aspects, it can be said that the relevance of project management competences and the search for effectiveness has led to a large number of studies that have produced new research-based understandings and also to the creation of project management competence guides [5], [1]. Among the guides produced by institutions linked to the field of project management is the Individual Competence Baseline (ICB) [9] by the International Project Management Association (IPMA). This guide proposes 29 competences grouped into ten personal and interpersonal competences, fourteen technical aspects of project management, and five contextual competences, that is, strategy, governance, structures and processes, and, culture and values [9].

Another institution that created a competence guide was the Project Management Institute (PMI), which proposes the Project Management Competence Development Framework (PMCDF) guide, where three areas of competence are defined: knowledge, performance, and personal attributes [10]. In the PMCDF, the knowledge competence dimension represents what the project professional knows about project management processes, tools, and techniques [10]. Competence performance describes how knowledge is applied to satisfy project requirements. The personal competence dimension refers to the behavior to be adopted to carry out project activities, including attitude and core personality characteristics [10].

In the same line as PMCDF and ICB, the guide maintained by the Association for Project Management (APM) suggests an APM Competence Framework guide with the proposition of 27 competences [11]. In addition to these guides, among the academic studies, Pariafsai et al. [12] identified 39 project management competences for construction projects; the authors used the PMCDF [10] and the Project Manager Competence Assessment Tool [13] as a basis for the diagnosis of competences of project managers employees. Based on these models, the authors adjusted construction project management competences.

On the other hand, Moradi et al. [14] identified 98 project management competences that have different relevance according to the context and types of projects. Turner and Muller [15] point out project type refers to the nature or attribute by which a project is categorized. For example, application area, execution difficulty, and strategic importance, among others. Along the same lines, Varajão et al. [4] observed the 12 most relevant competences in information systems-type projects. Amoah and Marimon [16] used the ICB model [9] to analyze a set of unique competences for types of construction projects. In view of academic studies such as those of these authors, Kuliš [17] stated that some researchers believe that the competences of project professionals are generic. However, the author reinforces that the prevailing view is that different types of projects need different competences.

Corroborating the ideas presented by Kuliš [17], Podgórska and Pichlak [18] argue that not all types of projects can be treated in the same way due to their size, complexity, and technology, among other variables. Furthermore, Crawford et al. [63], Shenhar et al. [20], and Youker [21] argue that the type of project influences the management approach that will be applied. Still, about project typologies, Crawford et al. [63] identified 14 groups of attributes used for the types of projects that the author identified. Despite the evidence that project management competences have been extensively researched, there is no consensus on specific project management competences, as indicated by Moradi et al. [14] and Skulmoski and Hartman [22]. Thus, it can be said that this situation leads to considerable confusion when designing

effective strategies for the education, employment, and career development of professionals in the field of project management due to its scope of application [12].

Based on this context, this paper aims to identify the competences of project professionals by project type. Therefore, a systematic literature review (SLR) was adopted as a methodological strategy to achieve this aim, which is a methodological procedure that uses literature as its main source of evidence. The rationale for this choice is given by the role of an SLR in facilitating the mapping and assessment of a specific intellectual framework to develop a body of knowledge [23], [24].

As a practical result of this research, project professionals and educational institutions can know the fundamental competences by the type of project, thus planning their career, applying in practice, or adjusting the educational program. Regarding the theoretical contribution, this article highlights the relevance of treating competences according to a project type.

2. Background

Competence is demonstrated by the application of intellectual, cognitive, affective and psychomotor behavior to achieve a certain result, causing individuals to achieve superior performance [50]. For Perrenoud [6], competence is the ability of the individual to use and connect knowledge and experiences acquired in complex, varied and unpredictable situations. Rodriguez et al. [133] argue that competence is a measurable standard of knowledge, skills and attitudes, also recognized by the acronym KSA, which an individual needs to perform work functions effectively [127]. Thus, in order for someone to achieve their goals, it is necessary to apply certain knowledge, skills and have an attitude that determines the willingness to perform activities [27].

Regard project management, we can point out that it is not simple because it requires the application of several and complementary competences, and it is a standing challenge for the professional's project managers [132]. Project development has changed over time, as well as the type of competences required to become an effective project manager. According to Kerzner [128], during the first periods of project management, hard skills had a higher priority. However, soft skills became equally relevant, since the composition of the project team was no longer just for engineering people.

In an attempt to list the competences of project management professionals, entities of project management have created their own frameworks of competences. As cited before, PMI presents the guide PMCDF [10], IPMA proposes the ICB [9], and APM presents the guide APM Competence Framework [11]. For Azim et al. [41], a successful project manager uses hard skills to determine the most appropriate execution approach to the project, and soft skills to put into practice the plan and manage people to achieve project success. Therefore, hard skills in the context of project management cover processes, procedures, tools and techniques, while soft skills can be examined from the perspective of human behavior, that is, human and social skills.

In this context, Cheng et al. [134] stated that identifying the necessary competences to perform the project management function leads to excellence in the performance of this function, which is vital for the success of the project and for organizations [135]. That said, for the development of competences it is necessary to use tools for diagnosing them to identify in project professionals competences considered strengths and competences considered weaknesses. Thus, the professionals' diagnosis will help determine how these competences can be improved or developed ([10]; [90]; [136]).

Although the importance of competences is recognized in a generalized way, Skulmoski and Hartman [22] and Moradi et al. [35] argue that there is no consensus regarding the specific competences in project management. According to Kulis [17], some researchers, such as Birkhead et al. [129], Liikamaa [130] and Ekrot et al. [131], believe that the competences of project professionals are generic. On the other hand, Crawford et al. [19], Shenhar et al. [20] and Youker [21] state that different types of projects need different competences. The type of project, according to Turner and Muller [15], refers to the nature or attribute by which a project is categorized, for example, area of application, difficulty of execution and strategic importance, among others.

With regard to diagnostic competences tools, Fereshteh et al. [8] used the PMCDF competence guide as a premise to assess the competences of project professionals. The authors grouped professionals into different levels using 12 criteria of importance to determine the score of the project on which these professionals work. Other entities, such as the American Management Association (AMA), present their AMA Skill Assessments AMA [138] diagnostic model, which diagnoses the competences needed to meet business demands based on a set of 36 statements.

Additionally, Brahim and Lassad [137] proposed in their invention patent an evaluation questionnaire that makes it possible to compare the diagnosed competences against the target of the pre-established competence, in this way, it is possible to identify the gaps in the professional's competences. Although these diagnostic instruments are presented, it is necessary to understand the relationship between competences and specific project typologies. In this sense, this article responds to this research opportunity. The next section presents the methodological approach.

3. Research design

The research adopted an SLR as a method to understand the relationship of the project manager's competences according to a typology that allows the understanding of specificities in each project. Therefore, it is necessary to understand that an SLR differs from traditional narrative reviews because it adopts a systematized scientific procedure that is replicable and transparent [24]. Thus, its use is justified by minimizing bias in the construction of a theoretical corpus and by enabling the audit of the decisions and procedures applied [25].

An SLR also differs from bibliometric studies in its more qualitative bias, since content analysis procedures are applied to categorize the research corpus based on critical and reflective reading [24]. In order to carry out this SLR, the method proposed by Pollock and Berge [23] was used, including the following stages: (i) Clarify objectives and goals; (ii) Find relevant research; (iii) Collect data; (iv) Analyze the quality of studies; (v) Synthesize the evidence; (vi) Interpret the findings. We emphasize that the first stage refers to the question that guides this research, which is: “What competences of project professionals are adherent to each type of project?”. In this sense, the Scopus and Web of Sciences academic databases were used.

The search in the databases was carried out on April 1, 2022. The string adopted to carry out the searches were: ((competenc* OR (hard AND skill) OR (soft AND skill)) AND ((kanban OR (project AND manag*) OR agile* OR scrum))). In order to obtain greater amplitude and mastery in the construction of this base, Boolean operators “and” and “or” were used, as well as the symbol “*”. The latter incorporates variations in the word in the position after which it is found. Therefore, following the protocol prescribed by Pollock and Berge [23], the body of analysis was constructed as shown in Figure 1.

In the eligibility phase, filters were applied to delimit the base of articles corresponding to the proposal of this study. Subsequently, the databases were imported by the Rayyan software, which is a tool that helps to streamline the initial screening of abstracts and titles using a semi-automation process. The software allows the consolidation of databases and the removal of duplicate articles [26]. Thus, with the consolidation of the database and the removal of duplicate articles, we read the titles and abstracts of available articles and applied the inclusion and exclusion criteria. As a result, we exported a full-read article database containing 314 articles.

The Rayyan database with the 314 selected articles was exported to a spreadsheet in Microsoft Excel software. This phase of the research allowed the categorization of contents based on the full reading of the articles. It is worth mentioning that at this stage, 105 articles that did not adhere to the researched topic were removed. Thus, the remaining 209 articles were analyzed using Microsoft Excel software. This software made it possible to perform data analysis and present the results of the combination of quantitative information by frequency analysis. This research phase also allowed us to present a relevant descriptive analysis of the study carried out.

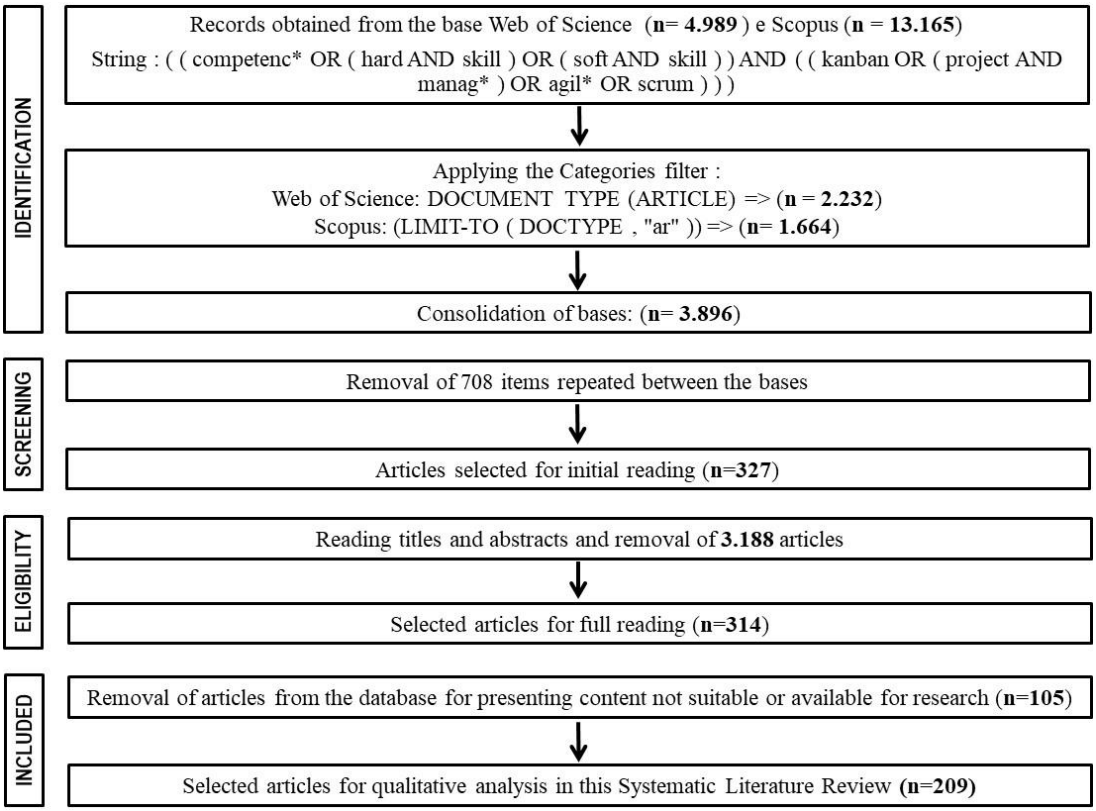

Fig. 1. Results of searches in the databases adapted from [23]

Thus, we emphasize that the last phase of this research was an analysis through in-depth reading of the corpus, which was composed of 209 articles. Following the reading of the articles, the next step was to group the articles by type of project. It is important to clarify that the initial analysis process of the articles was individual. Then, for the selection of the types of projects, the researchers of this research were inquired. The categorization process was carried out through discussion and the establishment of a consensus on the categories constituted by each of the articles [27]. At the end of the categorization process, the process of identifying competences by type of project was then conducted.

The process of analyzing and categorizing competences by type of project observed the following steps. First, the competences were regrouped according to their meaning, thus constituting a standardized competence matrix with the competence name and description. After grouping the competences for each type of project, the next step was to identify which competences are not mentioned in the competence guides presented in this study, namely PMCDF, ICB, and APM.

For this, the meaning of each of the competences was associated with the competence presented in each of the guides. During the association process, it was possible to know whether the competence extracted from the research corpus was contained in each guide. In the case of the absence of this competence in each of the guides, it was identified that there was a competence gap. In summary, at the end of the analysis process, it was possible to identify each type of project, their respective competences, and competences not mentioned in the guides.

4. Analysis of results

This section presents the results of this SLR after performing the collection and analysis processes. Initially, the mapping of the articles that constituted the research corpus was presented. Subsequently, the categories highlighted are reported after an in-depth analysis of the content of the articles.

4.1 Mapping of Articles

The articles selected from the Web of Science and Scopus academic databases were selected, and the research corpus consisted of the articles present in journals, as shown in Table 1.

Table 1. Analysis of Articles by Journals

Journal	**Number of articles**	**%**
International Journal of Project Management	22	11%
Project Management Journal	15	7%
International Journal of Managing Projects in Business	11	5%
International Journal of Information Technology Project Management	6	3%
Sustainability	6	3%
Revista de Gestão e Projetos	5	2%
Construction Management and Economics	4	2%
Engineering, Construction and Architectural Management	4	2%
Up to 3 Published Articles	136	65%
Total	**209**	**100%**

Table 1 shows 209 articles from 122 journals, with 35% of these journals having four or more publications and 65% with less than three publications per journal. This table also presents three journals that published 11 or more articles, that is, 23% of the articles published. The journal International Journal of Project Management published 22 articles, 11% of the total published on the subject, according to this research. It is worth noting that most studies are focused on project management, sustainability, engineering, and construction journals.

After mapping the metadata of the articles that constituted the research corpus, the articles were organized according to their respective years of publication. Still, at this stage of the analysis, the researchers carried out an in-depth analysis of the content of each article. Thus, reading and categorizing the contents led to the classification of articles into 14 types of projects that are presented in Table 2. It is worth noting that this research started from the premise that different types of projects require different sets of competences. In this sense, we explain that even though there are points of intersection between the types of projects and an abundance of competences described, the intention here is to propose that project management be treated in a more specific way concerning its typology.

The justification for this choice is that the competence of project professionals is affected by the context in which this professional works. Among the context variables, it can be mentioned industrial sectors, countries, regions, and the type or scope of the project [28]-[31]. Furthermore, the competence guides produced by associations such as PMI, IPMA, and APM indicate a wide range of competence elements considered the main attributes of the project manager [32]. However, the guides are designed to be applied generically, regardless of the nature, type, size, or complexity of the projects being managed [31]-[34].

Therefore, it was decided to adopt the categorization by type of project, which in the context of this study comprises fourteen types of projects obtained by an abstraction process that allowed a categorization that somehow distinguished each one of them. There are differences between the different types of projects and the requirement for specific competences for their management, or even for selecting people to compose each type of project. For example, in projects of the construction type, greater importance is given to being *Open to New Experiences* [35]; and, for projects of the Complex type, the competence of *Flexibility* is crucial [36].

Project Type / Year	Remote Teams	Telecommunications	Industry 4.0	Multiple Projects	Third Sector	Sustainability	Research and Development	Complex	Education	Public Government	Services	Software Development	Information Technology	Construction Industry	Total
1989												1			1
1992														1	1
2000														1	1
2001														1	1
2003							2				1		1		4
2004														2	2
2005														3	3
2006		1		2					1					1	5
2007										1				1	2
2008	1			1				2			1			3	8
2009		1							1				1	5	8
2010								1					3		4
2011									2		1	2	3	4	12
2012										1				1	2
2013						1	2	1			1			1	6
2014											1	1		2	4
2015					1								2	2	5
2016						1		1	1	1	1		3	5	13
2017								1		3	1		2	3	10
2018					1		1		2		3	1	1	4	13
2019	1							1	1	1	2	4	1	4	15
2020			2					1	1	2	2	2	1	5	16
2021			1		1	2		2	2	3	1	7		14	33
2022							1							3	4
Total	2	2	3	3	3	4	6	10	11	12	15	18	18	66	173
Part.	1%	1%	1%	1%	1%	2%	3%	5%	5%	6%	7%	9%	9%	32%	100%

Table 2 shows that the types of projects in the Construction Industry represent 32% of the studies; the rest of the studies are distributed over the other 14 types of projects with less than 9% each. Among the 14 types of project types, 11 of them have less than 18 articles published between 1989 and 2022, and five types have only three or fewer articles published in the same period, they are: Remote Teams, Telecommunications, Industry 4.0, Multiple Projects, and Third Sector.

The selected articles resulted in 173 competences, and the 14 most cited competences are presented in Table 3.

Table 3. List of Competences

Competences with more than 15 citations	**Citations**
Communication	129
Leadership	65
Technical Abilities	54
Interpersonal Relationship	47
Emotional intelligence	46
Monitoring and Control	41
Analytical Thinking	35
Negotiation	34
Conflict Management	33
Risk and Uncertainty Management	33
Stakeholder Management	33
Information Technology Abilities	33
Problem-Solving	31
Reliability	30

It is worth mentioning that 30 competences identified in this study were mentioned only once by the authors, such as: Digital Skills of the Fourth Industrial Revolution [37], Range of skills [100], and Management of Multiple Projects [38].

4.2 Analysis of the project types found

Based on the reading of the articles, the researchers sought to understand each of the 14 types of projects and their respective competences. For each type of project, a list of competences adhering to the type of project is presented, the competences present in the PMCDF, ICB and APM guides, in addition to the competences absent in the respective guides. The complete list of existing competences by project type can be found in the appendix.

4.2.1 Project Type – Complex

Complex-type projects are those characterized by the unpredictability of their variables. There are no apparent right answers, and analyzing the situation requires many competing ideas, thus making it difficult to implement a plan. The difficulty in managing the various variables is due to a series of uncontrollable variables and a high degree of project risk [39]-[41], [18]. In this type of project, 39 competences were identified, 31 of which are common in the guides: PMCDF, ICB and APM. Table 4 presents the list of the competences found.

Table 4. List of Competences - Project: Complex

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Analytical Thinking	x			x	x	
Change Management	x			x	x	
Communication	x	x	x	x	x	
Conscientiousness	x			x	x	
Contract Management	x	x	x	x	x	
Cooperation	x	x	x	x	x	
Cost Management	x	x	x	x	x	
Curiosity	x			x	x	
Decision Making	x	x	x	x	x	
Dedication	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Empowerment	x	x	x	x	x	
Flexibility	x	x	x	x	x	
Motivation	x	x	x	x	x	
Negotiation	x	x	x	x	x	
People Management	x	x	x	x	x	
Phronesis	x		x			
Proactivity	x	x	x	x	x	
Routine Management	x	x	x	x	x	x
Purchasing Management	x	x	x	x	x	
Quality Management	x	x	x	x	x	
Resource Management	x	x	x	x	x	
Results Orientation	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Scope Management	x	x	x	x	x	
Self-awareness	x	x	x	x	x	
Self-taught	x			x	x	
Sensibility	x	x	x	x	x	
Social responsibility	x			x	x	x
Stakeholder Management	x	x	x	x	x	
Strategic Thinking	x			x	x	
Systemic View	x	x	x	x	x	
Team management	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Vision	x	x	x	x	x	
Totals	**38**	**30**	**32**	**38**	**38**	**2**

The following competences were not mentioned in the all the analyzed guides: Self-taught, Change Management and Social Responsibility presented in the study by Li et al. [42]; Conscientiousness, Analytical Thinking and Strategic Thinking described in the research by Podgórska and Pichlak [18]; the Curiosity competence was indicated by Havila, Medlin, and Salmi [43]. Although these competences are mentioned in the ICB and APM guides, they are not mentioned in the PMCDF guide. On the other hand, the Phronesis competence, described as relevant by Bouwman and Brohm [39], is present in the PMCDF guide but is not mentioned in the IPMA and APM guides. Phronesis competence, according to Bredillet et al. [44], is to act practically depending on the context, using patterns and similarities from the experience of the project professional. In addition, complementing Bouwman and Brohm [39], these professional makes combined use of elements such as: experience, and accurate understanding of relevant details.

Also, two competences specific to this type of project (exclusive) were identified: Routine Management and Social Responsibility [23]. For Ward and Chapman [45], the competence of Routine Management means knowing how to operate the project execution regularly to influence the design, basic stakeholder issues and project objectives. The other exclusive competence is Social Responsibility, which, according to Silvius and Schipper [46], represents the ability to consider in an integrated way the elements of: health, safety and environment, environmental protection, public welfare, and community activities within the scope of the project. In this way, the absence of this competence affects the project professional's decision criteria during the project life cycle, which can cause social, health, safety, or environmental impacts on the project's stakeholders.

This type of project requires the project professional to act effectively in a constantly evolving project context with various uncertainties [47]. In addition, this type of project makes the construction of a plan to achieve the goals more challenging [48]. In this scenario, the Phronesis competence is used as a form of response [39]. Furthermore, this type of project requires the professional to act regularly and frequently, making use of Routine Management competence to address basic stakeholder questions [45], in addition to integrating different aspects of the project with Social Responsibility [46].

4.2.2 Project Type - Software Development

Projects of the Software Development type are related to the provision of software development lifecycle programming services [49], [50]. In this type of project, 51 competences were identified, 44 of which are common to all the guides: PMCDF, ICB and APM. Table 5 presents the list of the competences found.

Table 5. List of Competences - Project: Software Development

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Agile Mindset	x				x	
Analytical Thinking	x			x	x	
Attitude	x	x	x	x	x	
Business Skills	x	x	x	x	x	
Collaboration	x	x	x	x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Context Analysis	x	x	x	x	x	
Continuous Improvement	x			x	x	
Cooperation	x	x	x	x	x	
Cost Management	x	x	x	x	x	
Critical Analysis	x	x	x	x	x	
Critical Thinking	x				x	
Cultural Intelligence	x	x	x	x	x	
Customer Focus	x	x	x	x	x	
Decision Making	x	x	x	x	x	
Effectiveness	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empowerment	x	x	x	x	x	
Engagement	x	x	x	x	x	
Ethic	x	x	x	x	x	
Experience	x	x	x	x	x	
Feedback Skills	x	x	x	x	x	
Flexibility	x	x	x	x	x	
Foreign language	x	x	x	x	x	
Influence	x	x	x	x	x	
Information Technology Skills	x			x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Innovation	x			x	x	
Interpersonal Relationship	x	x	x	x	x	
Interpersonal Skills	x	x	x	x	x	
Knowledge Management	x	x	x	x	x	
Leadership	x	x	x	x	x	
Mentoring	x	x	x	x	x	
Negotiation	x	x	x	x	x	
Organizational Skills	x	x	x	x	x	
People Management	x	x	x	x	x	
Persuasion	x	x	x	x	x	
Proactivity	x	x	x	x	x	
Problem-Solving	x	x	x	x	x	
Project Management	x	x	x	x	x	
Reflection	x	x	x	x	x	
Reliability	x	x	x	x	x	
Results Oriented	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Stakeholder Management	x	x	x	x	x	
Strategic Thinking	x			x	x	
Team management	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Totals	**51**	**44**	**44**	**49**	**51**	**0**

For this type of project, the following competences are not mentioned in the PMCDF guide: Continuous Improvement [49],[54]; Information Technology Skills, Analytical Thinking and Critical Thinking [49]; Innovation [52], [53]; Agile Mindset [50]; Strategic Thinking [49], [53], [54].

For Cha and Maytorena-Sanchez [49], and Chen et al. [55], the Information Technology Skills refers to the knowledge and understanding of the use of software, systems, and hardware. Critical Thinking competence, according to Gray and Ulbrich [56], means gathering relevant data from a wide range of sources, probing the facts, critically evaluating the information, and looking for potential limitations. Based on this last competence, it is possible to understand the general framework to outline different options for decision-making in a prioritized way and in a temporal sequence [57].

It is worth emphasizing that the analyzed guides consider that the competences required by design professionals are the same, regardless of the approach used. However, because of the main differences between Traditional and Agile project management, the perception of the importance of these competences may vary according to the project approach adopted [54]. In this sense, companies that are migrating from the traditional to agile project approach have the opportunity to do so in a more targeted way [51].

4.2.3 Project Type - Education

Education-type projects are represented by projects that, through technology such as devices and tools, implement courses and training and improve the overall learning experience, causing a positive impact on knowledge transfer [58], [59]. In this type of project, 39 competences were identified, 33 of which are common to all the guides: PMCDF, ICB and APM. Table 6 presents the list of the competences found.

Table 6. List of Competences - Project: Education

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Analytical Thinking	x			x	x	
Attitude	x	x	x	x	x	
Coherence	x			x	x	x
Collaboration	x	x	x	x	x	
Commitment	x	x	x	x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Creativity	x	x	x	x	x	
Critical Analysis	x	x	x	x	x	
Critical Thinking	x				x	
Cultural Intelligence	x	x	x	x	x	
Curiosity	x			x	x	
Disciplined	x	x	x	x	x	
Effectiveness	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Engagement	x	x	x	x	x	
Focus	x	x	x	x	x	
Foreign language	x	x	x	x	x	
Influence	x	x	x	x	x	
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Innovation	x			x	x	
Interpersonal Relationship	x	x	x	x	x	
Leadership	x	x	x	x	x	
Optimism	x	x	x	x	x	
Problem Solving	x	x	x	x	x	
Project Management	x	x	x	x	x	
Reliability	x	x	x	x	x	
Resilience	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Results Orientation	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Scope Management	x	x	x	x	x	
Self-confidence	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Systemic View	x	x	x	x	x	
Totals	**39**	**33**	**33**	**38**	**39**	**1**

As for the gaps in the competence guides, six of them were not mentioned in the PMCDF guide, namely: Coherence presented by Sołtysik et al. [60]; Critical Thinking, Analytical Thinking and Innovation by Aramo-Immonen et al. [61] and Brill, Bishop and Walker [62]; Information Technology and Curiosity described by Klein and Kelly [58]. In the ICB guide we have a competence gap that is Critical Thinking described in the articles by Aramo-Immonen et al. [61] and Brill, Bishop and Walker [62].

For this type of project, this study found an exclusive competence, that is, a competence not mentioned in the other project types, which is the Coherence competence. Sołtysik et al. [60] and the ICB [9] define competence Coherence as

being able to use a sequence of logical information to convey a message, avoiding contradictions or doubts about a given subject.

4.2.4 Project Type - Remote Teams

Remote Teams projects are characterized by using electronic means and computational resources to support the interaction between professionals. These teams that work remotely need technological resources to carry out the work in a coordinated, specialized, and shared way, ensuring the necessary integration of professionals [33], [64]. In this type of project, 21 competences were identified, 19 of which are common to all the guides: PMCDF, ICB and APM. Table 7 presents the list of the competences found.

Table 7. List of Competences - Project: Remote Teams

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Analytical Thinking	x			x	x	
Autonomy	x	x	x	x	x	
Collaboration	x	x	x	x	x	
Commitment	x	x	x	x	x	
Communication	x	x	x	x	x	
Cooperation	x	x	x	x	x	
Cultural Intelligence	x	x	x	x	x	
Disciplined	x	x	x	x	x	
Experience	x	x	x	x	x	
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	
Leadership	x	x	x	x	x	
Management skills	x	x	x	x	x	
Organizational Skills	x	x	x	x	x	
Professionalism	x	x	x	x	x	
Project Management	x	x	x	x	x	
Reliability	x	x	x	x	x	
Results Orientation	x	x	x	x	x	
Self-control	x	x	x	x	x	
Self-management	x	x	x	x	x	
Totals	**21**	**19**	**19**	**21**	**21**	**0**

In this study, two competence gaps were identified in the PMCDF guide, they are: Information Technology Skills and Analytical Thinking [64]. For Karki and Hadikusumo [65] and Pereira and Freitas [64], Analytical Thinking is the ability to develop an understanding of a situation or problem, dividing it into smaller parts to trace the cause and implications of the situation or problem.

In this type of project, geographic dispersion plays an unexpected and significant role in how the competence of project professionals affects the satisfaction and productivity of team members [66]. Among the competences adhering to this type of project, information technology plays an important role where the project professional needs to know how to use different technologies to adapt to working with remote teams [64].

4.2.5 Project Type – Public Government

Public-type projects implement policies and programs approved by the Government using resources from public management departments for their implementation. In this type of project, there is a wide variety of government stakeholders who have varied and sometimes conflicting interests and expectations. Among those interested there are civil servants and members of local and federal chambers, communities, authorities, and citizens, among others [67], [68]. In this type of project, 80 competences were identified, 56 of which are common to all the guides: PMCDF, ICB and APM. Table 8 presents the list of the competences found.

Table 8. List of Competences - Project: Public Government

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Acceptance	x			x	x	x
Accountability	x		x	x	x	
Adaptability	x	x	x	x	x	
Altruism	x			x		
Analytical Thinking	x			x	x	
Assertiveness	x	x	x	x	x	
Attitude	x	x	x	x	x	
Bidding Management	x	x	x	x	x	
Build Consensus	x	x	x	x	x	
Business Vision	x		x	x	x	
Certification	x			x	x	
Change Management	x			x	x	
Communication	x	x	x	x	x	
Configuration Management	x			x	x	
Conflict Management	x	x	x	x	x	
Conscientiousness	x	x		x	x	
Context Analysis	x	x	x	x	x	
Coordination	x		x	x	x	
Cost Management	x	x	x	x	x	
Courage	x				x	
Cultural Intelligence	x	x	x	x	x	
Customer Focus	x	x	x	x	x	
Decision Making	x		x	x	x	
Delegation	x	x	x	x	x	
Directive Abilities	x	x	x	x	x	
Effectiveness	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Engagement	x	x	x	x	x	
Enthusiasm	x	x	x	x	x	
Entrepreneurship	x			x	x	
Ethic	x	x	x	x	x	
Experience	x	x	x	x	x	
Financial Management	x			x	x	
Flexibility	x	x	x	x	x	
Foreign language	x	x	x	x	x	
Health management and security	x			x	x	
Honesty	x	x	x	x	x	
Influence	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Innovation	x			x	x	
Integration Management	x	x	x	x	x	
Interpersonal Relationship	x		x	x	x	
Knowledge Management	x	x	x	x	x	
Leadership	x	x	x	x	x	
Legal Skills	x	x	x	x	x	
Loyalty	x	x	x	x	x	x
Meticulous	x	x	x	x	x	
Monitoring and Control	x	x	x	x	x	
Motivation	x	x	x	x	x	
Negotiation	x	x	x	x	x	
Optimism	x	x	x	x	x	
Organizational Skills	x	x	x	x	x	
People Management	x	x	x	x	x	
Planning Skills	x	x	x	x	x	
Problem Solving	x		x	x	x	
Project Management	x	x	x	x	x	
Quality Management	x	x	x	x	x	
Reliability	x	x	x	x	x	
Resource Management	x	x	x	x	x	
Responsibility	x		x	x	x	
Results Orientation	x	x	x	x	x	
Results Oriented	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Scope Management	x	x	x	x	x	
Self-awareness	x		x	x	x	
Sensibility	x		x	x	x	
Stakeholder Management	x	x	x	x	x	
Strategic Thinking	x			x	x	
Supplier Management	x	x	x	x	x	
Supply Management	x	x	x	x	x	
Systemic View	x		x	x	x	
Systems Thinking	x		x	x	x	
Team management	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Time Management	x	x	x	x	x	
Training Abilities	x	x	x	x	x	
Transparency	x		x	x	x	
Totals	**80**	**55**	**66**	**79**	**79**	**2**

Two competences were identified as unique to this type of project in this study, which are Loyalty [69] and Acceptance [70]. For Gomes et al. [69], the competence of Loyalty refers to the ability of the project professional to honor their commitments to subordinates and the organization, and thus be an effective politician. According to Bashir et al. [70], Acceptance competence refers to the competence of the project professional applied during the project closing phase. Thus, the project professional must be able to manage the acceptance of all documentation and reports delivered by stakeholders.

In this type of project, for the PMCDF competence guide, 14 competences were not mentioned: Acceptance [70]; Altruism [31], [37], [71], [72]; Courage [31]; Change Management [31], [77]; Certification [7], [31], [71], [73], [74];

Conscientiousness [119]; Entrepreneurship [75]-[77]; Configuration Management [70], [77]-[79]; Financial Management [31], [80], [81]; Health management and security [31], [80]-[82]; Information Technology Skills [31]; Analytical Thinking [31], [70]; Strategic Thinking [70], [80]; and Innovation [31].

In the ICB guide, the Courage competence [31] was not mentioned. Finally, in the case of the APM guide, we have the Altruism competence [31], [37], [71], [72] as not mentioned by the guide. For Rezko et al. [31], Innovation competence is evidenced when the project professional uses negotiation and management. Innovation is the result of a process based on a business and technology mindset to encourage the team to create an environment for improving project performance. As a result, this competence helps to increase stakeholder satisfaction with the project [52].

Projects of this category are generally impacted by numerous restrictions imposed by rules, administrative processes, protection systems for contracting, and environments that can include different political adversaries [81]. In this scenario, the competence of Acceptance, pointed out by Bashir et al. [70], contributes to complying with the requirements of these administrative processes. The competence of Loyalty, pointed out by Gomes, Yasin, and Small [69], favors the relationship with stakeholders.

4.2.6 Project Type - Industry 4.0 Project

Industry 4.0 projects are those that use emerging technologies to integrate physical and virtual environments to produce customized products and services. In this way, this competence allows the business ecosystem to function intelligently and autonomously, decentralizing factories and integrating products and services [83], [37]. In this type of project, 43 competences were identified, 32 of which are common to all the guides: PMCDF, ICB and APM. Table 9 presents the list of the competences found.

Table 9. List of Competences - Project: Industry 4.0

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
4RI Digital Skills	x				x	x
Accountability	x	x	x	x	x	
Adaptability	x	x	x	x	x	
Agile Mindset	x				x	
Altruism	x			x		
Analytical Thinking	x			x	x	
Autonomy	x	x	x	x	x	
Collaboration	x	x	x	x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Courage	x				x	
Conscientiousness	x	x	x	x	x	
Creativity	x	x	x	x	x	
Critical Thinking	x				x	
Cultural Intelligence	x	x	x	x	x	
Digital Skills	x				x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Empowerment	x	x	x	x	x	
Ethic	x	x	x	x	x	
Holistic View	x	x	x	x	x	
Honesty	x	x	x	x	x	
Humility	x	x	x	x	x	
Influence	x	x	x	x	x	
Initiative	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Intuition	x			x	x	
Knowledge Management	x	x	x	x	x	
Leadership	x	x	x	x	x	
Lean Competence	x			x	x	
Negotiation	x	x	x	x	x	
Problem-Solving	x	x	x	x	x	
Processual View	x	x	x	x	x	
Reliability	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Self-awareness	x		x	x	x	
Social Skills	x	x	x	x	x	
Systemic View	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Transparency	x	x	x	x	x	
Vision	x	x	x	x	x	
Witty	x			x	x	
Totals	**43**	**32**	**33**	**38**	**42**	**1**

This study identified one unique competence of this type of project: Digital Skills of Industry 4.0 (4RI Digital Skills). For Yahaya and Ebrahim [85], the Digital Skills of Industry 4.0 are related to the possession and application of knowledge of the architecture of the digital tools of Industry 4.0.

Among the competences not mentioned in the guides, we have for the PMCDF guide 11 competence gaps, they are: Altruism [31], [37], [71], [72]; Lean Competence, Courage, Witty, Digital Skills, Digital Skills 4RI, Intuition, Agile Mindset, Analytical Thinking, Critical Thinking [37].

For the ICB guide, we have six unmentioned competences, namely: Courage, Digital Skills, 4RI Digital Skills, Agile Mindset [31], [70] and Critical Thinking [37]. Finally, for the APM guide, the competence gap found is Altruism [31], [37], [71], [72].

It is worth noting that Industry 4.0 implementation projects cause significant impacts on society, mainly in the way we produce and work, which also positively affects organizations. In this scenario, there is a need to develop new competences such as Industry 4.0 Digital Skills [37], [84], [86].

4.2.7 Project Type - Construction Industry

Construction Industry type projects encompass construction, repair, renovation, and maintenance services of infrastructure in the construction business sector [55], [87]. In this type of project, 141 competences were identified, 100 of which are common to all the guides: PMCDF, ICB and APM. Table 10 presents the list of the competences found.

Table 10. List of Competences - Project: Construction Industry

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Administrative Skills	x	x	x	x	x	
Agile Mindset	x				x	
Altruism	x			x		
Ambition	x	x	x	x	x	
Analytical Thinking	x			x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Assertiveness	x	x	x	x	x	
Attitude	x	x	x	x	x	
Auto Motivation	x	x	x	x	x	
Bidding Management	x	x	x	x	x	
Build Consensus	x	x	x	x	x	
Business Skills	x	x	x	x	x	
Business Vision	x	x	x	x	x	
Certification	x			x	x	
Change Management	x			x	x	
Charisma	x			x	x	x
Claims management	x			x	x	
Cognitive Skills	x		x		x	
Coaching	x			x	x	
Collaboration	x	x	x	x	x	
Commitment	x	x	x	x	x	
Communication	x	x	x	x	x	
Configuration Management	x			x	x	
Conflict Management	x	x	x	x	x	
Construction Management	x			x	x	
Context Analysis	x		x	x	x	
Continuous Improvement	x			x	x	
Contract Management	x	x	x	x	x	
Cooperation	x	x	x	x	x	
Coordination	x	x	x	x	x	
Cost Management	x	x	x	x	x	
Courage	x				x	x
Creativity	x	x	x	x	x	
Critical Analysis	x	x	x	x	x	
Critical Thinking	x			x	x	
Cultural Intelligence	x	x	x	x	x	
Curiosity	x			x	x	
Customer Focus	x	x	x	x	x	
Decision Making	x	x	x	x	x	
Dedication	x	x	x	x	x	
Delegation	x	x	x	x	x	
Developing followers	x	x	x	x	x	
Digital Skills	x				x	
Disciplined	x	x	x	x	x	
Effectiveness	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Empowerment	x	x	x	x	x	
Encouragement	x	x	x	x	x	
Engagement	x	x	x	x	x	
Enthusiasm	x	x	x	x	x	
Entrepreneurship	x			x	x	
Environmental Awareness	x			x	x	
Environmental Legislation and Administration	x			x	x	
Ethic	x	x	x	x	x	
Evaluative Competence	x				x	x
Experience	x	x	x	x	x	
Facilitation	x	x	x	x	x	x
Feedback Skills	x	x	x	x	x	
Flexibility	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Focus	x	x	x	x	x	
Foreign language	x	x	x	x	x	
Health management and security	x			x	x	
Holistic View	x	x	x	x	x	
Honesty	x	x	x	x	x	
Influence	x	x	x	x	x	
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Innovation	x	x		x	x	
Inspiration	x		x	x	x	x
Integration Management	x	x	x	x	x	
Intellectual Skills	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	
Interpersonal Skills	x	x	x	x	x	
Intuition	x			x	x	
Inventory Management	x				x	x
Knowledge Management	x	x	x	x	x	
Leadership	x	x	x	x	x	
Legal Skills	x	x	x	x	x	
Local Skills	x		x		x	
Logical Reasoning	x	x	x	x	x	x
Management of Roles and Responsibilities	x		x	x	x	
Management skills	x		x	x	x	
Marketing Skills	x			x	x	
Mentoring	x	x	x	x	x	
Merge and Acquisition	x	x	x	x	x	
Meticulous	x	x	x	x	x	
Monitoring and Control	x	x	x	x	x	
Motivation	x	x	x	x	x	
Multiple Project Management	x				x	
Negotiation	x	x	x	x	x	
Open to New Experiences	x			x	x	
Operations Research Skills	x				x	x
Optimism	x	x	x	x	x	
Organizational Skills	x	x	x	x	x	
Patience	x	x	x	x	x	x
People Management	x		x	x	x	
Persistence	x	x	x	x	x	
Persuasion	x		x	x	x	
Planning Skills	x	x	x	x	x	
Proactivity	x	x	x	x	x	
Problem Management	x	x	x	x	x	
Problem Solving	x	x	x	x	x	
Professionalism	x	x	x	x	x	
Project Management	x	x	x	x	x	
Project Management Skills	x	x	x	x	x	
Quality Management	x	x	x	x	x	
Recruitment Skills	x			x	x	x
Relational Competence	x	x	x	x	x	
Reliability	x	x	x	x	x	
Resilience	x	x	x	x	x	
Resource Management	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Results Orientation	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Results Oriented	x	x	x	x	x	
Roles and Responsibility Management	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Scope Management	x	x	x	x	x	
Self-awareness	x		x	x	x	
Self-confidence	x	x	x	x	x	
Self-control	x		x	x	x	
Self-management	x	x	x	x	x	
Self-taught	x			x	x	
Sensibility	x	x	x	x	x	
Social Skills	x	x	x	x	x	
Stakeholder Management	x	x	x	x	x	
Strategic Planning	x			x	x	x
Strategic Thinking	x			x	x	
Structured Thinking	x	x	x	x	x	x
Supplier Management	x	x	x	x	x	
Supply Chain Management	x	x	x	x	x	
Supply Management	x	x	x	x	x	
Systemic View	x	x	x	x	x	
Systems Thinking	x	x	x	x	x	
Team management	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Time Management	x	x	x	x	x	
Vision	x	x	x	x	x	
Vision and Imagination	x	x	x	x	x	
Totals	**141**	**100**	**109**	**132**	**140**	**12**

The study identified 12 unique competences for the type of Construction project, they are: Evaluative Competence [76], Logical Reasoning, Charisma, and Patience [12], Facilitation and Courage [88], Inventory Management, Operations Research and Recruitment [77], Inspiration [89], Structured Thinking [90] and Strategic Planning [91].

The following competences were not mentioned for the PMCDF guide: Open to New Experiences [12], [35], [77], [92]; Altruism [31], [37], [70], [71]; Charisma [70], Change Management [31], [77]; Certification [31], [71], [73]; Coaching [12], [55], [92]-[94]; Evaluative Competence [76], Environmental Awareness and Inventory Management [77], [92], [95], [96]; Courage [31], [70]; Curiosity [12], [55] [93]; Entrepreneurship [75]-[77]; Configuration Management [70], [77]; Construction Management [55], [77]; Health management and if security [12], [71], [77], [97], [98]; Claims management [98]; Marketing Skills, Recruitment Skills and Operations Research Skills [76]; Information Technology Skills [70], [71], [91],[92],[95],[96]; Digital Skills [31], [70]; Innovation [16], [31], [71], [92], [96]; Intuition [88], [100]-[101]; Environmental Legislation and Administration [12], [77]; Continuous Improvement [49], [77], [92], [94]; Agile Mindset [31], [70]; Multiple Project Management [38]; Analytical Thinking [16], [32], [55], [65], [70]; Critical Thinking [55], [94], [104]; Strategic Thinking [70], [71], [77], [81], [90]; Self-Taught [88], [94]; [Strategic Planning [91].

For the ICB guide, the following competences were not mentioned: Cognitive Skills [37], [71]; Evaluative Competence [76]; Courage [70], [31]; Inventory Management and Operations Research Skills [76]; Digital Skills and Agile Mindset [70], [31]; Multiple Project Management [38]; Local Skills [100]. Finally, for the APM guide, the following competences were not mentioned: Altruism [31], [37], [71], [72].

Among the gaps in competences pointed out, Lampel [76] argues that Evaluative competence is intended to find a balance regarding human beings and systems during the execution of the project, not allowing the decision-making

process to always be driven by data. The greater number of competences found for this type of project may be related to the number of articles belonging to this research corpus, which corresponds to 32% of the total articles.

4.2.8 Project Type - Multiple Projects

Multiple Projects are those where several projects with independent objectives and deliverables are executed at the same time, in parallel and sharing the same team and the same management system [38], [103], [104]. In this type of project, 29 competences were identified, 23 of which are common to all the guides: PMCDF, ICB and APM. Table 11 presents the list of the competences found.

Table 11. List of Competences - Project: Multiple Projects

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Ambition	x	x	x	x	x	
Analytical Thinking	x			x	x	
Autonomy	x	x	x	x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Customer Focus	x	x	x	x	x	
Disciplined	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Financial Management	x			x	x	
Flexibility	x	x	x	x	x	
Information Technology Skills	x			x	x	
Integrative Thinking	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	
Leadership	x	x	x	x	x	
Merge and Acquisition	x				x	
Monitoring and Control	x	x	x	x	x	
Multitasking	x			x	x	
Multiple Project Management	x			x	x	
Negotiation	x	x	x	x	x	
Proactivity	x	x	x	x	x	
Problem Solving	x	x	x	x	x	
Project Management	x		x	x	x	
Resource Management	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Self-control	x	x	x	x	x	
Strategic Thinking	x			x	x	
Team management	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Totals	**29**	**21**	**22**	**28**	**29**	**0**

As for competences gaps, six of them were not identified in the PMDCF guide: Strategic Thinking [70], [71], [77], [81], [90], Analytical Thinking [64], Multitasking [78], Information Technology Skills [31], Financial Management [31], [80], [81] and Multiple Project Management [38], and Merge and Acquisition [97]. In the ICB, a competence gap is also Merge and Acquisition [97]. According to Patanakul and Milosevic [38], the competence of Multiple Project Management means coordinating one's own work with that of other members of a project or projects in a multi-project scenario.

In this study, only three articles were found, corresponding to 1% of the research corpus. This situation is described by Patanakul and Milosevic [33], who state that studies on Multiple Projects are rare. The same occurs for the Multiple Project Management competence, which is also little studied.

4.2.9 Project Type - Research and Development

Research and Development projects are conducted and financed by public and private research centers using models of collaboration processes in these centers [105], [106]. In this type of project, five competences were identified, all common to the guides: PMCDF, ICB and APM. Table 12 presents the list of the competences found.

Table 12. List of Competences - Project: Research and Development

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Communication	x	x	x	x	x	
Creativity	x	x	x	x	x	
Flexibility	x	x	x	x	x	
Problem-Solving	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Totals	**5**	**5**	**5**	**5**	**5**	**0**

According to Moradi et al. [35] and Vraniak et al. [107], Problem-Solving competence is the ability to recognize the problem and manage activities focused on its resolution ethically. For Mumford [108] and Lamas et al. [109], Creativity competence is defined as the interaction of skills, methods, and processes to produce a new and useful idea within a social context.

Projects of this type are financed by public or private organizations, which are subject to strict schedules imposed by those granting the funding, setting rigid and inflexible deadlines [105]. Given this situation, the sponsoring institution may require creativity from project professionals to adapt the project and activities to this reality.

4.2.10 Project Type – Services

Service-type projects are those that provide industry-specific service standards, capabilities, and experience. Service projects are carried out by professionals in the service sector, for example, in financial and insurance services, training/coaching services and information technology services [110], [111]. In this type of project, 64 competences were identified, 56 of which are common to all the guides: PMCDF, ICB and APM. Table 13 presents the list of the competences found.

Table 13. List of Competences - Project: Services

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Administrative Skills	x	x	x	x	x	
Analytical Thinking	x			x	x	
Assertiveness	x	x	x	x	x	
Autonomy	x	x	x	x	x	
Coaching	x			x	x	
Collaboration	x	x	x	x	x	
Communication	x	x	x	x	x	
Configuration Management	x			x	x	
Conflict Management	x	x	x	x	x	
Context Analysis	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Cooperation	x	x	x	x	x	
Coordination	x	x	x	x	x	
Creativity	x	x	x	x	x	
Critical Analysis	x	x	x	x	x	
Critical Thinking	x				x	
Delegation	x	x	x	x	x	
Developing followers	x	x	x	x	x	
Effectiveness	x	x	x	x	x	
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Engagement	x	x	x	x	x	
Flexibility	x	x	x	x	x	
Foreign language	x	x	x	x	x	
Influence	x	x	x	x	x	
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Integration Management	x	x	x	x	x	
Integrative Thinking	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	
Knowledge Management	x	x	x	x	x	
Leadership	x	x	x	x	x	
Legal Skills	x	x	x	x	x	
Manage Ambiguity	x			x	x	
Management of Roles and Responsibilities	x	x	x	x	x	
Meticulous	x	x	x	x	x	
Monitoring and Control	x	x	x	x	x	
Motivation	x	x	x	x	x	
Multitasking	x			x	x	
Negotiation	x	x	x	x	x	
Optimism	x	x	x	x	x	
Organizational Skills	x	x	x	x	x	
Persuasion	x	x	x	x	x	
Proactivity	x	x	x	x	x	
Problem Solving	x	x	x	x	x	
Project Management	x	x	x	x	x	
Reflection	x	x	x	x	x	
Reliability	x	x	x	x	x	
Resilience	x	x	x	x	x	
Resource Management	x	x	x	x	x	
Respect	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Results Orientation	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Self-awareness	x	x	x	x	x	
Sensibility	x	x	x	x	x	
Social Skills	x	x	x	x	x	
Supplier Management	x	x	x	x	x	
Systems Thinking	x	x	x	x	x	
Team management	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Time Management	x	x	x	x	x	
Totals	**64**	**57**	**57**	**63**	**64**	**0**

Among the competences that belong to this type of project it can be highlighted Reliability. Gray and Ulbrich [56] define Reliability competence as inspiring trust through dialogue. Moradi et al. [14] add to it the fulfillment of promises to complete the agreed work. Among the competences not mentioned in the PMDCF guide are: Coaching [112]; Configuration Management [70], [77]; Manage Ambiguity [56]; Information Technology Skills [70], [71], [91], [92], [95], [96]; Multitasking [78]; Analytical Thinking [16], [32], [55], [65], [70] and Critical Thinking [55], [94], [102]. In the IPMA guide, it is not mentioned the competence Critical Thinking [55], [94], [102].

One of the competence gaps found is Multitasking. This competence, according to Plaza-Lara [78], is the ability not only to manage different projects, but also to make reports, manage resources, and supervise a team, among other activities. While Manage Ambiguity and Multitasking competences have been identified in other types of projects, for service projects, they are more relevant for project professionals to be successful [56], [78].

4.2.11 Project Type – Sustainability

Sustainability projects are related to those that promote the development of activities that are harmoniously integrated with the planet's ecosystem [113], [114]. In this type of project, 37 competences were identified, 27 of which are common to all the guides: PMCDF, ICB and APM. Table 14 presents the list of the competences found.

Table 14. List of Competences - Project: Sustainability

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Analytical Thinking	x			x	x	
Change Management	x			x	x	
Claims management	x			x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Cost Management	x	x	x	x	x	
Creativity	x	x	x	x	x	
Critical Analysis	x	x	x	x	x	
Critical Thinking	x				x	
Curiosity	x			x	x	
Decision Making	x	x	x	x	x	
Delegation	x	x	x	x	x	
Ethic	x	x	x	x	x	
Health Safety Management	x			x	x	
Information Technology Skills	x			x	x	
Initiative	x	x	x	x	x	
Innovation	x			x	x	
Leadership	x	x	x	x	x	
Management skills	x	x	x	x	x	
Meticulous	x	x	x	x	x	
Monitoring and Control	x	x	x	x	x	
Negotiation	x	x	x	x	x	
Open to New Experiences	x			x	x	
Organizational Skills	x	x	x	x	x	
People Management	x	x	x	x	x	
Problem-Solving	x	x	x	x	x	
Professionalism	x	x	x	x	x	
Resilience	x	x	x	x	x	
Resource Management	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Self-taught	x			x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Stakeholder Management	x	x	x	x	x	
Supply Management	x	x	x	x	x	
Team work	x	x	x	x	x	
Vision and Imagination	x	x	x	x	x	
Totals	**37**	**27**	**27**	**36**	**37**	**0**

The study found ten competences gaps in the PMCDF guide: Critical Thinking, Curiosity and Open to New Experiences [115]; Analytical Thinking [115], [114]; Self-Taught [88], [94]; Innovation [116]; Information Technology Skills [116]; Change Management [31], [77]; Claims Management, Health and Safety Management [114]. In the ICB, the competence gap found is Critical Thinking [115].

Among the competences found can be highlighted Health and Safety Management, which, according to Hwang and Ng [114], is related to knowing government policies and regulations designed to protect human health and the environment. Furthermore, Isik et al. [98] emphasize the need to apply and train the team in this competence. Although the competence of Health and Safety Management has been identified in projects of the Construction type, for Sustainability projects, greater importance is inferred [114].

For this type of project, the relevance of this competence is given by the global concerns related to climate change and sustainable development, which has stimulated the need for project professionals with this competence due to their important role in the execution and delivery of projects [114], even complying with environmental and safety standards [65].

4.2.12 Project Type - Information Technology

Information technology projects are those that use resources, team management processes and technology components to achieve the objectives of the organization's information technology strategy plan [121], [118]. In this type of category, 64 competences were identified, 52 of which are common to the PMCDF, ICB and APM guides, presented in Table 15.

Table 15. List of Competences - Project: Information Technology

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Adaptability	x	x	x	x	x	
Analytical Thinking	x			x	x	
Assertiveness	x	x	x	x	x	
Authority	x	x	x	x	x	
Build Consensus	x	x	x	x	x	
Business Skills	x	x	x	x	x	
Certification	x			x	x	
Change Management	x			x	x	
Communication	x	x	x	x	x	
Conflict Management	x	x	x	x	x	
Conscientiousness	x			x	x	
Cooperation	x	x	x	x	x	
Coordination	x	x	x	x	x	
Curiosity	x			x	x	
Customer Focus	x	x	x	x	x	
Decision Making	x	x	x	x	x	
Developing followers	x	x	x	x	x	
Directive Abilities	x	x	x	x	x	
Effectiveness	x	x	x	x	x	

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Emotional intelligence	x	x	x	x	x	
Empathy	x	x	x	x	x	
Ethic	x	x	x	x	x	
Experience	x	x	x	x	x	
Flexibility	x	x	x	x	x	
Holistic View	x	x	x	x	x	
Honesty	x	x	x	x	x	
Human Resource Skills	x	x	x	x	x	
Influence	x	x	x	x	x	
Information Technology Skills	x			x	x	
Innovation	x			x	x	
Intellectual Skills	x	x	x	x	x	
Interpersonal Relationship	x	x	x	x	x	
Leadership	x	x	x	x	x	
Manage Ambiguity	x			x	x	
Management skills	x	x	x	x	x	
Marketing Skills	x			x	x	
Monitoring and Control	x	x	x	x	x	
Motivation	x	x	x	x	x	
Multitasking	x			x	x	
Negotiation	x	x	x	x	x	
Open to New Experiences	x			x	x	
Optimism	x	x	x	x	x	
Persistence	x	x	x	x	x	
Persuasion	x	x	x	x	x	
Planning Skills	x	x	x	x	x	
Problem Management	x	x	x	x	x	
Problem Solving	x	x	x	x	x	
Project Management Skills	x	x	x	x	x	
Reliability	x	x	x	x	x	
Resilience	x	x	x	x	x	
Responsibility	x	x	x	x	x	
Results Orientation	x	x	x	x	x	
Results Oriented	x	x	x	x	x	
Risk and Uncertainty Management	x	x	x	x	x	
Schedule Management	x	x	x	x	x	
Self-taught	x			x	x	
Stakeholder Management	x	x	x	x	x	
Supplier Management	x	x	x	x	x	
Team management	x	x	x	x	x	
Team work	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Training Abilities	x	x	x	x	x	
Transparency	x	x	x	x	x	
Vision	x	x	x	x	x	
Totals	**64**	**52**	**52**	**64**	**64**	**0**

The competence gaps found in the PMCDF guide are: Open to New Experiences [77], [12], [92], [35]; Self-taught [42]; Certification [7], [31], [71], [74]; Conscientiousness [18]; Curiosity [12], [93], [55]; Change Management [118]; Manage Ambiguity [56]; Marketing Skills [76]; Information Technology Skills [95], [96], [70], [71], [92], [91]; Innovation [51], [52]; Multitasking [78]; Analytical Thinking [16], [70], [32], [65], [55].

For Strang and Strang [119], competence Conscientiousness is the ability to operate projects responsibly, oriented towards implementation with discipline and diligence. Podgórska and Pichlak [18] add that it is necessary to

demonstrate a clear commitment to the course of action and, even when confronted, to encourage others to support the chosen direction. Another competence gap is Change Management, which for Brière et al. [99], is associated with the ability to consider the importance of change strategies in project implementation.

For this type of project, executives value competences such as Leadership, Communication, Managing Ambiguity and Change Management, as opposed to other competences such as Experience, Work History, Education and Technical Knowledge [117].

4.2.13 Project Type – Telecommunications

Telecommunications projects are those that develop products and services for the telecommunications segment [124], [36]. In this type of category, four competences were identified, all included in the PMCDF, ICB and APM guides, presented in Table 16.

Table 16. List of Competences - Project: Telecommunications

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Administrative Skills	x	x	x	x	x	
Leadership	x	x	x	x	x	
Project Management	x	x	x	x	x	
Technical Abilities	x	x	x	x	x	
Totals	**4**	**4**	**4**	**4**	**4**	**0**

In this category, there are four competences identified by Kosaroglu and Hunt [120]: Leadership, Technical Abilities, Administrative Skills and Project Management. Also, according to these authors, Leadership refers to skills that underlie behaviors to affect positively in favor of project management. Administrative Skills are related to the process of visualizing and understanding the organization's areas, culture, and formal and informal processes, in order to use methods and tools in an integrated way to optimize results [91], [120].

However, for this type of project, only two articles were identified, and no gaps were identified. Regarding telecommunication projects, it is important to analyze this segment from a technological point of view, where disruptive technologies can have a great effect on the life cycle of projects in terms of the ability to understand the problems and changes caused by them. It is assumed that to remain aligned with the changing needs of the business environment, organizations need to continually assess their internal business strategies for ongoing effectiveness, thus ensuring that current competences do not become obsolete in the future [36].

4.2.14 Project Type - Third Sector

Third Sector projects are non-governmental projects promoted by civil society organizations [100], [121]. In this type of category, 13 competences were identified, 7 of which are common to PMCDF, ICB and APM guides, presented in Table 17.

One competence was identified as unique to this project type: Ability Range [99]. The Ability Range competence, according to Brière et al. [99], addresses a wide variety of competences that a project professional must have to perform various tasks.

Table 17. List of Competences - Project: Third Sector

Competence	Research Literature	Common to Guides	PMCDF	ICB	APM	Exclusive
Ability Range	x			x		x
Adaptability	x	x	x	x	x	
Change Management	x			x	x	
Communication	x	x	x	x	x	
Curiosity	x			x	x	
Empathy	x	x	x	x	x	
Ethic	x	x	x	x	x	
Innovation	x			x	x	
Interpersonal Relationship	x	x	x	x	x	
Local Skills	x				x	
Management skills	x	x	x	x	x	
Passion	x			x	x	
Systems Thinking	x	x	x	x	x	
Totals	**13**	**7**	**7**	**12**	**12**	**1**

Among the competences not mentioned in the PMCDF guide are: Ability Range [99], Curiosity [12], [93], [55]; Change Management [122]; Local Skills [100]; Innovation [96], [16], [71], [31], [92]; and Passion [121]. In the ICB guide, the competence gap found is that of Local Skills [100]. Finally, for the APM guide, the skills gap is Ability Range [99].

One of the identified competence gaps is Local Skills. According to Brière et al. [99], this competence addresses the ability to use local know-how to ensure that the work performed for the project meets the reality of the environment in which the project is inserted. In this type of project, the execution requires competent and qualified professional organizations, with the ability to work in different cultures and sometimes in difficult conditions and complex environments [100],[121]. Another competence gap is Passion competence, which, for Charleston et al. [121], means the capacity to learn about cross-cultural interactions and other challenges passionately.

5. Discussion

Based on the research corpus and categorizing the competences of project professionals by type of project, it is possible to infer that the competence guides addressed in this study have gaps when dealing with the specifics of each type of project.

From the research corpus, 173 competences were identified. The competences were then compared with the PMCDF, ICB and APM guides. Table 18 shows the 14 types of projects identified in this study and the number of competences that are not mentioned in the PMCDF, IPMA and APM guides. For example, for the Complex project type, there are seven missing competences in the PMCDF. Also, for this type of project, in the ICB and APM guides, there are competences not mentioned in the respective guides.

The number of competences not mentioned by guides in the case of construction projects may be related to the high number of studies related to this type of project (32% of the articles). However, it is not possible to make the same analogy for other types of projects. Analyzing the information in Table 18, it can be concluded that within the scope of this study, the PMCDF competence guide presents the largest amount of non-covered competences, which is understandable since PMCDF is described as a guide to competence with a generic structure [10]. Yet, PMCDF also assumes that individual competences are transferable across industries and organizations [10]. However, our study presents competences not covered by the PMCDF and a set of specific competences by type of project.

The PMCDF, ICB, and APM competence guides do not have a solid research base, as pointed out by Chipulu et al. [7] and Crawford [5]. This criticism does not detract from the guides; it only reflects the accuracy in presenting models that tend to be prescriptive and non-specific, not addressing the specific competences required for each type of project [28].

Table 18. Types of projects and competences not mentioned in the guides

Summary - Project Typology	Research Literature	Common to Guides	Not Mentioned			Exclusive
			PMCDF	ICB	APM	
Complex	38	30	7	1	1	2
Construction Industry	141	100	32	9	1	12
Education	39	33	6	1	0	1
Industry 4.0	43	32	10	5	1	1
Information Technology	64	52	12	0	0	0
Multiple Projects	29	21	7	1	0	0
Public Government	80	66	15	1	1	2
Remote Teams	21	19	2	0	0	0
Research Development	5	5	0	0	0	0
Services	64	57	7	1	0	0
Software Development	51	44	7	2	0	0
Sustainability	37	10	10	1	0	0
Telecommunications	4	4	0	0	0	0
Third Sector	13	7	6	1	1	1

Still concerning the types of projects, over time (Table 1), the emergence or importance of certain competences can be seen. These competences may arise as a result of technological evolution, as pointed out by Whitmore et al. [84] and Marnewick and Marnewick [37], such as Industry 4.0 Digital Skills. Along the same lines, the increase in the complexity of projects due to globalization and economic volatility [1] requires competences such as Managing Ambiguity [56], Phronesis [39], and Project Management Routine [42].

Furthermore, for almost all types of projects analyzed, there are specific competences, and in some cases, competences are mentioned for only one type of project. Among the 14 types of projects studied, several competences were not mentioned in at least one of the guides, which may indicate the need to update these. For specific competences associated with some types of projects, five types of projects were identified: Complex, Public Government, Industry 4.0, Construction and Third Sector. In this sense, corroborating what was pointed out by Ahsan et al. [28], Morris et al. [29], Cicmil et al. [30] and Rezk et al. [31], we claim that the type of project influences the competences of the project professional. Thus, we can infer that different types of projects require project professionals with specific competences [124], [14], [34].

Regarding the type of software development projects, all the guides studied consider that the competences needed by design professionals are the same, regardless of the approach used. However, given the main differences between the Traditional and Agile project management approaches, the perceived importance of these competences may vary according to the project approach used [54]. In this sense, companies migrating from the traditional to agile project approach can do so in a more targeted way [50].

Finally, for Education-type projects, it is necessary to carry out a systematic study of the competences of project managers, taking into account the expectations of the students, the stakeholders themselves - that is, project managers - as well as specialists [60]. Thus, educational institutions could explore ways to reinforce their students' preparation to manage projects, emphasizing the preparation and construction of these competences through practical projects during their academic preparation [125].

Table 19 lists all the competences that resulted from this systematic literature review. The table presents the name of the competence and the project type where the competence has been found. The column total presents how many times the competence has been found, regardless of the type of the project.

Table 19. List of Competences x Types of Project / Guides

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
4RI Digital Skills	x																x	1
Ability Range					x											x		1
Acceptance								x								x	x	1
Accountability	x							x							x	x	x	2
Adaptability	x	x		x	x			x		x	x	x	x	x	x	x	x	10
Administrative Skills		x					x						x		x	x	x	3
Agile Mindset	x	x								x							x	3
Altruism	x	x						x								x		3
Ambition		x				x									x	x	x	2
Analytical Thinking	x	x		x		x		x	x	x	x	x	x	x		x	x	11
Assertiveness		x						x			x		x		x	x	x	4
Attitude		x		x				x		x					x	x	x	4
Authority											x				x	x	x	1
Auto Motivation		x													x	x	x	1
Autonomy	x					x			x				x		x	x	x	4
Bidding Management		x						x							x	x	x	2
Build Consensus		x						x			x				x	x	x	3
Business Skills		x								x	x				x	x	x	3
Business Vision		x						x							x	x	x	2
Certification		x						x			x				x	x	x	3
Change Management		x			x			x			x	x		x		x	x	6
Charisma		x														x	x	1
Claims Management		x										x				x	x	2
Coaching		x											x			x	x	2
Cognitive Skills		x													x		x	1
Coherence				x												x	x	1
Collaboration	x	x		x					x	x			x		x	x	x	6
Commitment		x		x					x						x	x	x	3
Communication	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	13
Configuration Management		x						x					x			x	x	3
Conflict Management	x	x		x		x		x		x	x	x	x		x	x	x	9
Conscientiousness	x							x			x			x		x	x	4
Construction Management		x														x	x	1

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
Context Analysis		x						x		x			x		x	x	x	4
Continuous Improvement		x								x						x	x	2
Contract Management		x												x	x	x	x	2
Cooperation		x							x	x	x		x	x	x	x	x	6
Coordination		x						x			x		x		x	x	x	4
Cost Management		x						x		x		x		x	x	x	x	5
Courage	x	x						x									x	3
Creativity		x		x								x	x		x	x	x	4
Critical Analysis		x		x						x		x	x		x	x	x	5
Critical Thinking	x	x		x						x		x	x				x	6
Cultural Intelligence	x	x		x				x	x	x					x	x	x	6
Curiosity		x		x	x						x	x		x		x	x	6
Customer Focus		x				x		x		x	x				x	x	x	5
Decision Making		x						x		x	x	x		x	x	x	x	6
Dedication		x												x	x	x	x	2
Delegation		x						x				x	x		x	x	x	4
Developing followers		x									x		x					3
Digital Skills	x	x															x	2
Directive Abilities								x			x				x	x	x	2
Disciplined		x		x		x			x						x	x	x	4
Effectiveness		x		x				x		x	x		x		x	x	x	6
Emotional Intelligence	x	x		x		x		x		x	x		x	x	x	x	x	9
Empathy	x	x		x	x			x			x		x	x	x	x	x	8
Empowerment	x	x								x				x	x	x	x	4
Encouragement		x													x	x	x	1
Engagement		x		x				x		x			x		x	x	x	5
Enthusiasm		x						x							x	x	x	2
Entrepreneurship		x						x								x	x	2
Environmental Awareness		x														x	x	1
Environmental Legislation and Administration	x															x	x	1
Ethic	x	x			x			x		x	x	x			x	x	x	7
Evaluative Competence		x															x	1
Experience		x						x	x	x	x				x	x	x	5

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
Facilitation		x													x	x	x	1
Feedback Skills		x								x					x	x	x	2
Financial Management						x		x								x	x	2
Flexibility		x	x			x		x		x	x		x	x	x	x	x	8
Focus		x		x											x	x	x	2
Foreign language		x		x				x		x			x		x	x	x	5
Health management and security		x						x								x	x	2
Health Safety Management												x				x	x	1
Holistic View	x	x									x				x	x	x	3
Honesty	x	x						x			x				x	x	x	4
Human Resource Skills											x				x	x	x	1
Humility	x														x	x	x	1
Influence	x	x		x				x		x	x		x		x	x	x	7
Information Technology Skills		x	x	x		x		x	x	x	x	x	x			x	x	10
Initiative	x	x		x				x	x			x	x		x	x	x	7
Innovation		x		x	x			x		x	x	x				x	x	7
Inspiration		x													x	x	x	1
Integration Management		x						x					x		x	x	x	3
Integrative Thinking						x							x		x	x	x	2
Intellectual Skills		x									x				x	x	x	2
Interpersonal Relationship	x	x		x	x	x		x	x	x	x		x		x	x	x	10
Interpersonal Skills		x								x					x	x	x	2
Intuition	x	x														x	x	2
Inventory Management		x															x	1
Knowledge Management	x	x						x		x			x		x	x	x	5
Leadership	x	x		x		x	x	x	x	x	x	x	x		x	x	x	11
Lean Competence	x															x	x	1
Legal Skills		x						x					x		x	x	x	3
Local Skills		x			x										x		x	2
Logical Reasoning		x													x	x	x	1
Loyalty								x							x	x	x	1
Manage Ambiguity											x		x			x	x	2
Management of Roles and Responsibilities		x											x		x	x	x	2

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
Management skills		x			x				x		x	x			x	x	x	5
Marketing Skills		x									x					x	x	2
Mentoring		x								x					x	x	x	2
Merge and Acquisition		x													x	x	x	1
Meticulous		x						x				x	x		x	x	x	4
Monitoring and Control		x				x		x			x	x	x		x	x	x	6
Motivation		x						x			x		x	x	x	x	x	5
Multiple Project Management		x				x											x	2
Multitask						x					x		x			x	x	3
Negotiation	x	x				x		x		x	x	x	x	x	x	x	x	9
Open to New Experiences		x									x	x				x	x	3
Operations Research Skills		x															x	1
Optimism		x		x				x			x		x		x	x	x	5
Organizational Skills		x						x	x	x		x	x		x	x	x	6
Passion					x											x	x	1
Patience		x													x	x	x	1
People Management		x						x		x		x		x	x	x	x	5
Persistence		x									x				x	x	x	2
Persuasion		x								x	x		x		x	x	x	4
Phronesis														x	x			1
Planning Skills		x						x			x				x	x	x	3
Proactivity		x				x				x			x	x	x	x	x	5
Problem Management		x									x				x	x	x	2
Problem Solving	x	x	x	x		x		x		x	x	x	x		x	x	x	10
Processual View	x														x	x	x	1
Professionalism		x							x			x			x	x	x	3
Project Management		x		x		x	x	x	x	x			x		x	x	x	8
Project Management Skills		x									x				x	x	x	2
Purchasing Management														x	x	x	x	1
Quality Management		x						x						x	x	x	x	3
Recruitment Skills		x														x	x	1
Reflection										x			x		x	x	x	2
Relational Competence		x													x	x	x	1
Reliability	x	x		x				x	x	x	x		x		x	x	x	8

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
Resilience	x	x		x							x	x	x		x	x	x	6
Resource Management		x				x		x				x	x	x	x	x	x	6
Respect													x		x	x	x	1
Responsibility	x	x		x		x		x			x		x	x	x	x	x	8
Results Orientation		x		x				x	x		x		x	x	x	x	x	7
Results Oriented		x						x		x	x				x	x	x	4
Risk and Uncertainty Management		x		x		x		x		x	x	x	x	x	x	x	x	9
Roles and Responsibility Management		x												x	x	x	x	2
Routine Management														x	x	x	x	1
Schedule Management		x				x		x		x	x	x	x	x	x	x	x	8
Scope Management		x		x				x						x	x	x	x	4
Self-awareness	x	x		x				x					x	x	x	x	x	6
Self-confidence		x													x	x	x	1
Self-control		x				x			x						x	x	x	3
Self-management		x							x						x	x	x	2
Self-taught		x									x	x		x	x	x	x	4
Sensibility		x						x					x	x	x	x	x	4
Social responsibility														x	x	x	x	1
Social Skills	x	x											x		x	x	x	3
Stakeholder Management		x						x		x	x	x	x	x	x	x	x	7
Strategic Planning		x														x	x	1
Strategic Thinking		x				x		x		x				x		x	x	5
Structured Thinking		x													x	x	x	1
Supplier Management		x						x			x		x		x	x	x	4
Supply Chain Management		x													x	x	x	1
Supply Management		x						x				x			x	x	x	3
Systemic View	x	x		x				x										
Systems Thinking		x			x			x										
Team management		x				x		x		x	x	x	x	x	x	x	x	8
Team work	x	x		x						x	x		x		x	x	x	6
Technical Abilities	x	x	x	x		x	x	x		x	x		x	x	x	x	x	11
Time Management		x						x					x		x	x	x	3
Training Abilities								x			x				x	x	x	2

Competence Name x Types of project / Guides	Industry 4.0	Construction	Research and Development	Education	Third Sector	Multiple Projects	Telecommunications	Public Government	Remote Teams	Software Development	Information Technology	Sustainability	Services	Complex	**PMCDF**	**ICB**	**APM**	**Total**
Transparency	x							x			x				x	x	x	3
Vision	x	x									x			x	x	x	x	4
Vision and Imagination		x										x			x	x	x	2
Witty	x															x	x	1
	43	141	5	39	13	29	4	80	21	51	64	37	64	39	125	155	164	

The information collected made it possible to find the competence gaps. It is recommended that institutes, academies, and companies be closer to producing guides that reflect the specific competences needed for project professionals to successfully deliver projects [7], [51].

6. Conclusion

Although the list of competences needed for the project professional to work effectively and efficiently is beneficial, they will not be very useful if these project professionals do not know what type of project they will work with. Thus, generic competences will not benefit these professionals effectively. In this sense, we argue that greater integration is needed between professional project management organizations, academics, and companies to produce specific competence guides by type of projects. However, just creating these guides is not enough, because it is necessary to reflect on these competences strategically. That said, after identifying which competences are required by a certain type of project, a plan is needed to fill professional competence gaps. In this sense, we emphasize that this is the main contribution of this article, which advances the discussions about relating the competences of project professionals to a given type of project.

Another relevant aspect when dealing with competences related to the types of projects concerns the correct selection of project professionals. Thus, for the type of project the professional will perform, a competence diagnosis will improve the quality of the hiring process or even indicate whether the project professional is suitable for a particular type of project. Another relevant aspect refers to education. In this way, universities and training companies can adapt their training programs according to the type of project and include competence diagnosis and the teaching of competences in their program. Finally, the competence diagnosis will also allow companies to analyze professionals according to a benchmark, which allows them to assess their situation vis-à-vis the competition.

The project management competence models, such as the Project Management Competence Development Framework, IPMA Competence Baseline and APM, should take into consideration in their guides that the type of project may affect the relevance of the competence.

This study has some limitations. First, the framework has no empirical tests and is purely based on applied SLR. Databases and articles are limited to the time and place of search, although they represent sources relevant to the area of study. Another limitation refers to the categorization of project types, these being the result of an abstraction process.

As a future research, we suggest the creation of a competence diagnosis model by type of project, using quantitative and qualitative methods for its creation. Thus, a future study will be able to identify the most relevant competences more accurately by type of project.

Appendix A. Competences by Authors

Competence	Authors
4RI Digital Skills	[84]
Ability Breadth	[99]
Acceptance	[70]
Accountability	[37]; [127]
Adaptability	[1]; [7]; [12]; [16]; [43]; [71]; [74]; [99]; [115]; [121]; [128]-[131]
Administrative Skills	[12]; [78; [88]; [91]; [120]
Agile Mindset	[50]; [101]; [132]
Altruism	[31]; [37]; [71]; [72]
Ambition	[12]
Analytical Thinking	[14]; [16]; [31]; [32]; [37]; [49]; [55]; [62]; [65]; [70]-[71]; [74]; [78]-[79]; [82]; [92]-[94]; [114]-[115]; [131]; [133]-[134]
Assertiveness	[31]; [71]; [92]-[94]; [135]
Attitude	[7]; [69]; [71]; [74]; [117]
Authority	[136]
Auto Motivation	[94]; [137]
Autonomy	[7]; [37]; [78]
Bidding Management	[77]; [80]
Build Consensus	[22]; [31];[71]
Business Skills	[7]; [22]; [55]; [71]; [95]; [112]; [138]-[139]
Business Vision	[31]; [92]
Certification	[7]; [31]; [71]; [73]; [74]
Change Management	[31]; [77]; [99]; [122]; [127]; [134]; [140]
Charisma	[12]
Claims management	[98]; [114]
Coaching	[77]; [141]
Cognitive Skill	[1]; [37]; [71]; [77]-[78]; [88]; [97]; [142]
Coherence	[60]
Collaboration	[1]; [37]; [50]; [88]; [101]; [112]; [143]
Commitment	[92]; [100]; [144]
Communication	[1]; [4]; [7]; [12]; [14]; [16]; [22]; [31]; [35]; [37]; [43]; [49]-[51]; [53]-[55]; [58]; [62]; [65]; [68]; [70]; [71]; [73]-[75]; [77]-[78]; [88]-[92]; [94]-[97]; [99]-[101]; [112]; [114]-[117]; [121]-[122]; [125]; [127]; [129]; [131]-[132]; [134]-[135]; [138]-[139]; [141]-[143]; [145]-[154]
Configuration Management	[70]; [77]-[79]
Conflict Management	[1]; [4]; [14]; [16]; [31]; [37]; [50]; [55]; [65]; [71]-[72]; [77]; [82]; [88]; [92]; [96]; [101]; [114]; [122]; [125]; [145]; [135]; [152]
Conscientiousness	[119]
Construction Management	[55]; [73]; [77]; [95]; [138]
Context Analysis	[7]; [31]; [71]; [82]; [97]; [143]; [155]; [156]
Continuous Improvement	[49]; [54]; [77]; 92; [94]
Contract Management	[12]; [55]; [77]; [92]; [95]; [142]
Cooperation	[22]; [35]; [43]; [55]; [79]; [93]-[94]; [128]; [131]
Coordination	[1]; [75]; [88]; [136]; [138]-[139]
Cost Management	[12]; [49]; [65]; [70]; [77]; [92]; [94]; [96]; [98]; [114]; [151]; [165]
Courage	[37]; [71]
Creativity	[12]; [37]; [92]; [115]-[116]; [131]; [147]; [157]; [173]
Credibility	[146]
Critical Analysis	[58]; [88]-[89]; [100]; [128]; [140]
Critical Thinking	[7]; [14]; [16]; [37]; [49]; [55]; [62]; [72]; [92]-[94]; [115]; [165]
Cultural Intelligence	[14]; [31]; [35]; [37]; [50]; [71]; [77]; [112]; [149]
Curiosity	[12]; [43]; [55]; [58]; [92]-[94]; [115]; [121]; [129]
Customer Focus	[50]; [55]; [71]; [82]; [92]-[94]; [122]; [177]
Decision Making	[12]; [16]; [31]-[32]; [49]; [65]; [77]; [88]; [91]; [92]; [94]-[95]; [114]; [129]; [132]; [136]; [144]; [157]
Dedication	[72]
Delegation	[1]; [12]; [16]; [65]; [69]; [77]; [92]; [95]; [114]
Delegation Skills	[91]

Competence	Authors
Developing followers	[71]; [89]; [92]; [133]; [177]
Digital Skills	[37]; [95]
Directive Abilities	[70]; [88]; [94]; [122]
Disciplined	[14]; [35]
Dynamism	[152]
Effectiveness	[14]; [22]; [31]; [71]; [88]; [101]; [112]; [146]; [152]
Emotional intelligence	[1]; [4]; [14]; [16]; [31]; [35]; [37]; [55]; [71]; [92]-[95]; [100]; [130]-[131]; [137] [145]; [167]; [178]-[184]
Empathy	[1]; [14]; [31]; [35]; [37]; [119]; [121]; [129]; [137]
Empowerment	[51]; [55]; [89]; [100]; [112]
Encourage	[88]
Engagement	[31]; [54]; [55]; [71]; [77]; [112]; [143]
Enthusiasm	[31]; [71]
Entrepreneurship	[75]; [77]; [171]
Environmental Awareness	[77]; [92]; [95]-[96]; [150]
Environmental Legislation and Administration	[12]; [77]
Ethic	[4]; [7]; [12]; [31]-[32]; [37]; [88]; [92]; [96]; [99]; [112]; [115]; [122]; [132]; [134]; [142]; [156]
Evaluative Competence	[171]
Experience	[31]; [49]; [73]-[74]; [88]; [90]; [129]
Facilitation	[88]
Feedback Skills	[16]; [51]; [112]
Financial Management	[7]; [12]; [16]; [31]; [71]; [77]; [80]; [91]-[92]; [96]; [116]; [142]; [156]
Flexibility	[7]; [12]; [14]; [50]; [55]; [71]; [74]-[75]; [78]; [88]; [92]-[94]; [117]; [131]; [143]; [147]
Focus	[35]; [88]
Foreign language	[14]; [35]; [50]; [68]; [77]-[79]; [149]
Health management and security	[12]; [65]; [71]; [77]; [82]; [92]-[98]; [114]; [142]
Holistic View	[37]; [55]; [90]; [92]; [122]
Honesty	[22]; [37]; [69]; [94]
Human Resource Skills	[77]; [74]; [77]
Humility	[37]
Influence	[1]; [12]; [31]; [37]; [51]; [55]; [71]; [88]; [94]; [100]; [122]; [125]; [129]; [133]; [141]
Information Technology Skills	[31]; [49]; [55]; [58]; [71]-[72]; [78]; [91]-[92]; [95]-[96]; [115]-[116]; [129]; [131]; [134]
Initiative	[14]; [16]; [31]; [35]; [37]; [51]; [70]-[71]; [88]; [92]; [94]; [96]; [99]; [115]-[116]; [158]
Innovation	[16]; [31]; [35]; [51]; [88]; [71]; [92]; [96]; [99]; [116]; [158]-[160]
Inspiration	[89]
Integration Management	[71]; [77]-[78]; [82]; [88]; [92]; [97]; [151]
Integrative Thinking	[161]; [162]
Intellectual Skills	[157]
Interpersonal Relationship	[7]; [14]; [16]; [22]; [31]; [35]; [37]; [55]; [65]; [68]-[73]; [77]-[78]; [88]; [91]-[92]; [94]; [95]; [99]-[100]; [112]; [135]; [139]; [142]
Interpersonal Skills	[51]; [88]
Intuition	[37]; [88]; [100]-[101]
Inventory Management	[77]
Knowledge Management	[31]; [37]; [71]; [94]; [98]; [112]
Leadership	[1]; [4]; [7]; [12]; [14]; [16]; [22]; [32]; [35]; [37]; [49]; [53]; [60]; [62]; [65]; [70]-[71]; [74]; [77]-[78]; [82]; [88]-[89]; [91]-[94]; [101]; [112]; [114]-[117]; [120]; [122]; [128]; [131]; [141]; [143]-[144]; [154]; [163]
Lean Competence	[84]
Legal Skills	[16]; [31]; [55]; [71]; [77]; [91]-[92]; [156]; [164]
Local Skills	[77]; [99]
Logical Reasoning,	[12]
Loyalty	[69]
Manage Ambiguity	[117]

Competence	Authors
Management of Roles and Responsibilities	[1]; [88]; [165]
Management skills	[72]; [99]; [115]
Marketing Skills	[22]; [77]
Mentoring	[51]; [77]; [88]
Merge and Acquisition	[97]
Meticulous	[7]; [31]; [71]; [78]; [92]; [115]
Monitoring and Control	[16]; [31];]69]; [70]-[71]; [73]; [75]; [77]-[78]; [88]; [90]; [97]; [116]; [122]; [129]; [131]; [140]; [142]
Motivation	[4]; [7]; [12]; [71]; [75]; [77]-[78]; [88]; [91]; [95]; [100]; [133]-[134]
Multiple Project Management	[161]
Multitask	[78]; [122]
Negotiation	[1]; [7]; [16]; [22]; [37]; [43]; [49]; [51]; [55]; [70]-[71]; [77]; [80]; [88]; [91]-[92]; [95]; [97]; [114]-[116]; [122]; [127]; [136]; [152]
Open to New Experiences	[12]; [35]; [70]; [88]; [92]; [115]; [119]
Operational View	[137]
Operations Research Skills	[77]
Optimism	[14]; [31]; [78]; [166]
Organizational Skills	[12]; [16]; [51]; [65]; [69]; [71]; [75]; [77]; [78]; [101]; [115]; [128]; [134]; [152]; [167]
Passion	[121]
Patience	[12]
People Management	[7]; [16]; [35]; [49]; [51]; [69]; [71]; [80]; [92]; [96]; [114]; [142]; [151]; [156]
Persistence	[12]; [134]; [168]
Persuasion	[22]; [93]-[94]; [112]; [154]
Phronesis	[39]; [44]
Planning Skills	[16]; [65]; [69]; [70]-[71]; [75]; [77]; [97]; [116]; [129]; [132]; [138]-[139]; [156]
Proactivity	[16]; [78]; [93]-[94]; [133]; [143]
Problem Management	[77]; [96]; [138]; [165]
Problem-Solving	[12]; [16]; [31]; [35]; [37]; [50]-[51]; [62]; [65]; [78]; [92]; [95]; [114]; [116]; [122]; [129]; [131]; [145]; [147]-[148]; [169]-[170]; [172]
Processual View	[37]
Professionalism	[7]; [90]; [116]
Project Management	[16]; [31]; [49]; [55]; [58]; [71]; [77]; [80]; [82]; [92]; [120]; [146]; [152]; [171]; [173]
Project Management Routine	[174]
Project Management Skills	[22]; [152]
Purchasing Management	[174]
Quality Management	[12]; [31]; [71]; [77]; [79]; [92]; [94]-[98]; [116]; [142]; [156]; [175]
Recruitment Skills	[77]
Reflection	[49]; [153]
Relational Competence	[171]
Reliability	[1]; [4]; [12]; [14]; [31]; [37]; [54]; [71]; [88]; [92]; [94]; [60]; [129]; [157]; [131]; [134]; [141]; [154]; [176]
Resilience	[14]; [35]; [78]; [88]; [95]; [100]; [116]; [122]; [157]; [166]
Resource Management	[12]; [70]; [77]; [79]; [88]-[89]; [96]-[97]; [100]; [115]-[116]; [133]-[134]
Respect	[162]
Responsibility	[14]; [69]; [37]; [78]; [136]; [144]
Results Orientation	[1]; [4]; [14]; [22]; [31]; [35]; [55]; [88]-[89]; [93]-[94]; [134]
Results Oriented	[4]; [70]; [127]; [143]; [156]-[157]; [167]
Risk and Uncertainty Management	[7]; [12]; [16]; [31]; [49]-[50]; [55]; [71]; [79]; [92]; [96]; [98]; [101]; [114]; [125]; [151]; [154]; [177]
Schedule Management	[7]; [31];]43]; [49]; [79]-[80]; [94]; [96]-[98]; [114]; [140]; [151]; [177]; [154]; [156]
Scope Management	[7]; [12]; [31]; [70]; [77]; [82]; [92]; [97]; [125]; [175]; [127]; [151]
Self-awareness	[14]; [31]; [37]; [71]; [88]; [133]; [135]; [137]
Self-confidence	[79]; [132]
Self-control	[12]
Self-management	[135]
Self-taught	[88]; [94]; [100]; [114]; [128]

Competence	Authors
Sensibility	[35]; [71]; [75]; [88]; [133]
Social responsability	[174]
Social Skills	[1]; [37]; [135]; [137]
Stakeholder Management	[4]; [7]; [12]; [31]; [43]; [49]; [65]; [68]; [71]; [73]; [88]; [94]; [96]-[97]; [112]; [119]; [151]
Strategic Planning	[91]
Strategic Thinking	[7]; [49]; [54]; [55]; [70]-[71]; [77]; [88]-[90]; [92]; [112]; [116]; [137]
Strategic View	[77]; [100]
Structured Thinking	[90]
Supplier Management	[78]; [97]; [116]; [177]
Supply Chain Management	[77]; [94]; [96]; [98]; [175]
Supply Management	[12]; [16]; [77]; [80]; [96]-[97]; [114]; [142]; [151]
Systemic View	[14]; [31]; [35]; [37]; [77]; [82]; [92]; [130]; [142]
Systems Thinking	[1]; [31]; [77]; [99]
Team management	[7]; [31]; [51]; [55]; [71]; [74]-[75]; [82]; [92]; [94]; [98]; [122]; [129]; [133]-[134]; [138]-[139]; [152]
Team work	[4]; [12]; [32]; [37]; [60]; [74]; [77]-[79]; [88]; [91]-[92]; [95]; [112]; [114]; [135]; [143]; [145]; [148]; [157]
Technical Abilities	[12]; [16]; [22]; [37]; [49]; [50]-[51]; [62]; [65]; [69]; [72]-[74]; [77]-[78]; [82]; [88]; [91]-[92]; [112]; [116]; [120]; [131]-[132]; [134]; [139]; [143]; [146]; [152]; [185]
Time Management	[16]; [65]; [72]; [77]-[78]; [91]-[92]; [97]; [101]; [116]
Training Abilities	[82]; [129]
Transparency	[22]; [80]; [37]
Vision	[22]; [37]; [71]; [77]
Vision and Imagination	[89]; [115]
Witty	[37]

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