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THE EVOLUTION OF THE PROJECT MANAGEMENT COMPETENCE CONCEPT – A SYSTEMATIC LITERATURE REVIEW

A PROJEKTMENEDZSMENT KOMPETENCIAKONCEPCIÓJÁNAK FEJLŐDÉSE – SZISZTEMATIKUS SZAKIRODALMI ÁTTEKINTÉS

This research aims to get closer to the definition of project management (PM) competence and understand its models by conducting a systematic literature review (SLR). The focus of this study is on the individual level PM competence of the project manager and the project team members. The paper introduces the competence models of the most important project management standards, which provide a guideline for professionals and serve as a base for the different PM qualifications. The literature review reveals which PM competence groups and elements have become the focus of attention in certain periods, which new competences have been uncovered, how the concept models have changed (in their professional content and regarding their structure), and how these results could be built into the upcoming standards and how they could shape the concept of project management competence in the future and serve as a basis for new research.

Keywords: **project management, project management competence, systematic literature review**

Jelen kutatás célja, hogy közelebb kerüljön a projektmenedzsment (PM) kompetencia definíciójához és modelljeinek megértéséhez egy szisztematikus szakirodalmi áttekintés (SLR) elvégzésével. A tanulmány fókuszában a projektmenedzser és a projektmenedzsment-csapat egyéni szintű PM-kompetenciájának vizsgálata áll. A cikk bemutatja a legfontosabb projektmenedzsment-szabványok kompetenciamodelljeit, amelyek iránymutatást adnak a szakemberek számára, és egyben a különböző PM-képesítések alapjául is szolgálnak. A szakirodalom-elemzés rávilágít arra, hogy bizonyos időszakokban mely PM-kompetenciacsoportok, kompetenciaelemek kerülnek a figyelem középpontjába, melyek új kompetenciákra hívják fel a figyelmet, hogyan változnak a koncepciómodellek (szakmai tartalmukban és szerkezetükben), és ezek az eredmények hogyan építhetők be a készülő standardokba, és hogyan formálhatják a projektmenedzsment-kompetencia fogalmát a jövőben és szolgálhatnak alapul a jövőbeli, új kutatásokhoz.

Kulcsszavak: **projektmenedzsment, projektmenedzsment-kompetencia, szisztematikus irodalmi áttekintés**

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The competence of the project manager has a major influence on the project performance and through this, it indirectly contributes to the business performance of the whole organisation (Pinto & Kharbanda, 1995; Crawford, 2005). Some researchers have made attempts to establish a coherent competence terminology (Boak, 1991; Woodruffe, 1991; Winterton & Winterton, 1999) or compared its definitions (Szabó & Csepregi, 2011). Some authors refer to it as a "*fuzzy concept*", which is also a useful term, because it connects education and job requirements (Boon & van der Klink, 2003). The concept of competence is considered to be a diffuse term in the organizational and occupational literature because several different meanings are associated with it (Robotham & Jubb, 1996). Although providing a theoretical definition of competence may be challenging, there is a practical

and functional need for that, because competence plays an important role in personal-, output-, and educational models or standards (Mangham, 1986). Especially understanding project management competence is essential for project success (Berényi, Blaskovics & Deutsch, 2017).-, output-, and educational models or at standards (Mangham, 1986).

At first, the term competence should be distinguished from competency, which are incorrectly used as synonyms in the common language. Competency is the behaviour someone must display for effective workplace performance, while competence is an aspect of the job (sets of deliverables, output of roles), this confusion derives from the fact that the two are often put together (what should be done/competence and what need people to do it effectively/competency), which results in competency dimensions where the two are inseparable (Woodruffe, 1993). Dealing with this topic, certain sources focus on the project managerial role's outputs, others on behavioural aspects, so both terms (competence and competency) will be used in this article adopting the form used by the primary sources.

It is important to mention that Woodruffe (1993) distinguishes technical skills (focusing on the professional components of a job) from the behavioural competency.

Le Deist & Winterton (2005) identified three competence approaches: the behavioural (US tradition); the functional (UK tradition) and the multi-dimensional and holistic (France, Germany, and Austria). Table 1. provides an overview of the competence and the competency definitions.

Table 1.

Competence and competency definitions in the literature

Competence	Competency
White (1959); personality characteristics which result in superior performance	Boyatzis (1982) and Spencer & Spencer (1993); it is underlying characteristics casually related to superior performance
McClelland (1976); it is the underlying characteristics and attributes that lead to effective task execution	Birkett (1993); individual attributes such as knowledge, skills, and attitudes needed to perform a task in a particular context
Faerman, Quinn, Thompson & McGrath (1990); it is the knowledge and skills necessary for carrying out a project	Parry (1996); is the cluster of related knowledge, skills, and attitudes that affect a significant part of one's job
Manpower Services Commission (1986); it is the use of behavioral characteristics to perform activities to the job standard	New Zealand Qualification Authority (1997); it is the ability to use knowledge, skills, and attitudes in carrying out a task according to the set the standards in a specific context

Source: Salman, Ganie & Saleem (2020, p. 721)

In 2018, a comparative systematic literature review highlighted the most important problems related to the project management competence concept, namely: a complete and uniform competence list is lacking, there are problems with the taxonomy, and competences are not ranked based on their importance (Nijhuis, Vrijhoef & Kessels, 2018). This literature review is limited only to qualitative or quantitative research studies from the year 2000, which provide an order of competencies. Besides, Horváth (2019) provided an overview of the definitions of project management competence within the literature and the professional standards and created a two-dimensional model (focusing on the content and structural composition of the competence), which contributed to a better understanding of this topic.

In academic discourse, there is currently a lack of comprehensive literature reviews that exclusively rely on publications from Q1-ranked project management journals (cf. Crawford, 2005; Horváth, 2019). This gap particularly affects the analysis of research trends and thematic patterns present in the competence definitions employed by researchers within this specific field. Such a review would aid scholars and decision-makers in staying abreast of the latest and most reliable scientific findings, thereby contributing to the advancement of scholarly discourse and progress. This gap particularly affects the analysis of research trends and thematic patterns present in the competence definitions employed by researchers within this specific field. Such a review would aid scholars and decision-makers in staying abreast of the latest and most reliable scientific findings, thereby contributing to the advancement of scholarly discourse and progress.

Based on the aforementioned gap, our research aims to reveal how project management competence is represented in the articles of the selected Q1 ranked project management journals (namely the International Journal of Project Management, Project Management Journal) and based on their content analysis understanding /revealing how could the findings be integrated into the future issues of the PM competence standards or how could they contribute to the further development of the project management competence concept.

Project management competence in standards

The project management standards serve as a basic knowledge repository for the professional community, and they are used for associated certification programs as well. As Eraut (1994) describes the formation of a professional association was highly dependent on the distinctive "competence territory" which determines an exclusive area of the practice. The standards of this distinctive knowledge as reference works that could be used for the certification (Morris, Crawford, Hodgson, Shepherd & Thomas, 2006), so they are able to assess the PM competence and could also serve as a base for competence development. "*A standard is a document, established by consensus and approved by a recognized body, which provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given*

context "(Project Management Institute, 2018, p. n.a.). Project Management Institute applies the following typology for its standards on its webpage (www.pmi.org): (1) foundational standards – foundation of PM knowledge, (2) practice standards & frameworks – which introduce how the tools and techniques introduced in a foundational standard should be applied, (3) practice guides – additional guide and information to the previous standards, (4) PMI standards+, (5) and the PMI Lexicon of Project Management Terms – definitions of PM-related terms. Practice standards and industry-specific extensions – e.g. Software Extension to PMBOK® Guide – Fifth Edition (Project Management Institute, 2013) or the Construction Extension to the PMBOK Guide Third Edition (Project Management Institute, 2008) – could be built on the foundational standards.

Both the 6th and the 7th editions of the PMBOK Guide are involved in our study because the newest issue of the standard does not invalidate the previously issued version (Amaro & Domingues, 2023). The *PMBOK® Guide* (6th ed.) describes competence as "*the skill and capacity required to complete assigned activities within the project constraints*" (Project Management Institute, 2017a, p. 319), while the 7th edition defines it as "*the combination of ability, knowledge, and skill*" (Project Management Institute, 2021, p. 156). PMCD is considered to be a framework standard that could be used for personal PM competency evaluation and development purposes. It describes the competent project manager, who can "*consistently apply their management knowledge and personal behaviors to increase the likelihood of delivering portfolios/programs/projects that meet stakeholders' requirements*" (Project Management Institute, 2017b, p. 3.) and competency is described here as "*the demonstrated ability to perform activities within a ... project environment that leads to expected outcomes based on defined and accepted standards*" (Project Management Institute, 2017b, p. 3.)." (Project Management Institute, 2017a, p. 319), while the 7th edition defines it as "*the combination of ability, knowledge, and skill*" (Project Management Institute, 2021, p. 156).

In this framework, standard competency is broken down into three dimensions: (1) *knowledge competence* focuses on what the project manager knows about the application of the processes, tools, and techniques related to the project activities; (2) *performance competence* describes how the project manager apply the project management knowledge to successfully complete the project; (3) *personal competence* describes how the project manager behaves during the implementation of the project management activities and the attitudes and core personality characteristics (Project Management Institute, 2017b).

In the case of the performance competencies the ten knowledge areas of the 6th PMBOK serve as competence units and the processes of these knowledge areas are the elements of the competence.

Besides these standards, PMI developed a related model, the so-called Talent Triangle for project professionals to provide a guide for the Project Management Professional (PMP)® credential holders to plan their future competence development and education in the field of project management. It has undergone some structural changes in the last years and the current version consists of the following three skill areas (also referred to as strategic knowledge areas):

1. Ways of Working (formerly Technical Project Management) – including skills that are connected to tools and techniques of the different project management approaches,
2. Power Skills (formerly Leadership) – including interpersonal skills which are required to influence stakeholders and manage the project team,
3. Business Acumen (formerly Strategic and Business Management) – including skills that help to understand the organisational-, sectoral- and business environment of the project, the micro and macro influences, and the function-related and domain-related aspects of the project (Project Management Institute, 2022).

Parallel with the PMI, the International Project Management Association also defined the set of required competencies. The IPMA ICB 4.0 standard includes the IPMA "Eye of Competence" model, which divides the project management competences into three competence areas (perspective competences, people competences, and practice competences).

The IPMA defines competence as "*the application of knowledge, skills, and abilities in order to achieve the desired results*" (International Project Management Association, 2015. p. 15.). The terms used in this definition are introduced in Table 2.

Table 2.

Terms related to the IPMA competence definition

Knowledge	„the collection of information and experience that an individual possesses." (p.15)
Skills	"specific technical capabilities that enable an individual to perform a task. For example, being able to build a Gantt chart might be considered a skill." (p.15)
Ability	„the effective delivery of knowledge and skills in a given context. For example, being able to devise and successfully manage a project schedule might be considered ability." (p.15)

Source: own compilation based on International Project Management Association (2015)

Based on the overview of the standards, certain similarities regarding the PM competence concept could be identified. Three main categories could be distinguished: (1) the first category focuses on personal and social competences (interpersonal skills), (2) the second includes competences related to the project management technical tools and techniques, (3) the third consists of competences required to understand the business and operational environment of the project.

Research methodology of the literature research (SLR)

The literature on competencies is considered to be abundant. There are numerous papers focusing on identifying the required competencies both in general or sector specifically, and the number of those papers is also high which aims to summarize, collect, or provide a framework for competencies (see e.g., Crawford, 2005; Müller & Turner, 2007). Researchers carried out literature reviews as well, however, the above-mentioned one has a crucial limitation, because it analysed only those research-based papers that ranked the competencies (Nijhuis et al., 2018). Thus, this paper aims to provide a comprehensive systematic literature review analysing competencies in both theoretical and research-based papers and the focus is on the individual level of project management competence.

Systematic Literature Reviews (SLR) could be used when we would like to (1) summarize empirical evidence of a phenomenon (treatment or technology), (2) identify gaps in the current literature, (3) create a framework, that could serve as a base for further investigation (Kitchenham, 2004). An eight-step guide is provided to conducting a successful SLR, which includes the upcoming elements: (1) identify the purpose, (2) draft protocol and train the team, (3) apply practical screen, (4) search for literature, (5) extract data, (6) appraise quality, (7) synthesize studies, (8) write the review (Okoli, 2015, p. 884), which could be divided into four phases: planning (1-2), selection (3-4), extraction (5-6) and execution (7-8) (Okoli & Schabram, 2010).

The Scimago Journal & Country ranking page's (https://www.scimagojr.com/) publications database served as a starting point for the journal selection. The newest list available was the 2022 publication list at the time of our research (as of November 2023). The following filtering criteria were specified to narrow down the publication database: only journals were involved in our review, the word "project" should be a part of the journal title, the journal should fall into the SJR (SCImago Journal Rank) Best Quartile (Q1), and the category of the journal should be Business and International Management or Management of Technology and Innovation or Strategy and Management or Management, Monitoring, Policy and Law (Q1). As a result of this screening, two journals remain the focus of our investigation: the International Journal of Project Management, and Project Management Journal.

Limited to the two selected professional project management journals, the process of selecting articles dealing with project management competence continued on the following websites' advanced search interface: IJPM – https://www.sciencedirect.com/journal/international-journal-of-project-management, PMJ – https://journals.sagepub.com/search/advanced?SeriesKey=pmxa. The search for the terms "*competence*" and "*competency*" was conducted in the title, abstract, and keywords. No limitation regarding the year or publication was determined. The primary screening resulted in 145 records, (89 papers in IJPM and 56 papers in PMJ). After checking the list, 6 records were excluded because the search words ("*competence*" or "*competency*") could not be found in the title/abstract/keywords, which modified the number of records to 139 (87 papers in IJPM and 52 papers in PMJ).

The rigor of the search process has a significant effect on the literature review's quality (Vom Brocke et al., 2009), so the selection criteria were determined in advance, based on which the primary list was narrowed down to the final sample. The full text of the selected 139 records was screened based on applied content selection criteria (Table 3.).

Table 3.

The selection criteria for journal articles

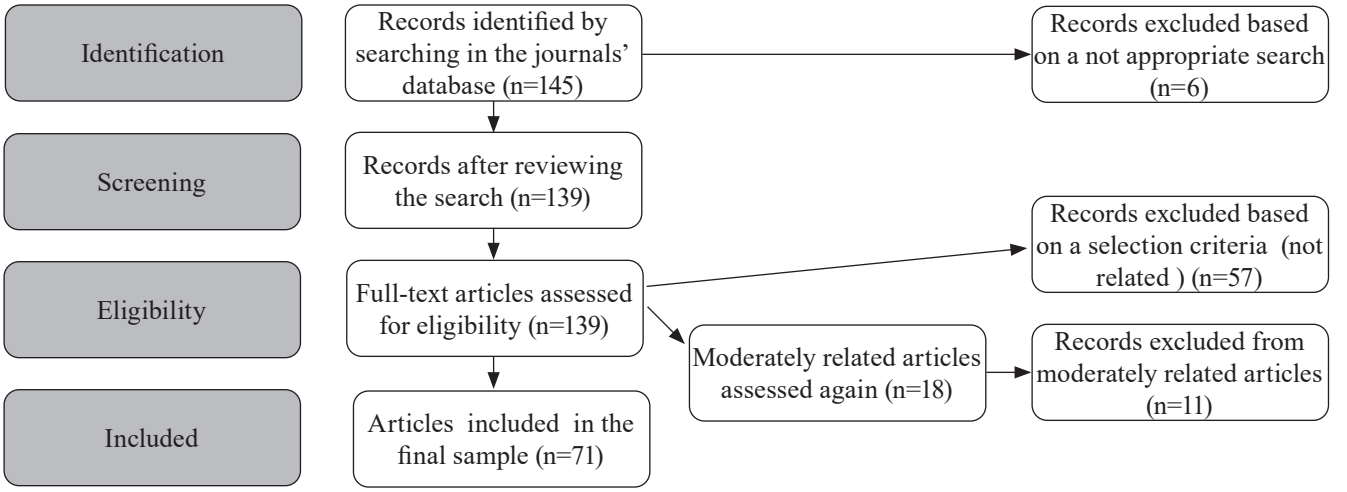
Selection criteria	Description of the selection criteria
Closely related to the research aim	Focus on individual (level) project management (PM) competence focusing on the project manager or the project team members Focus on individual competencies at special project types Focus on certain elements of the project management competence
Moderately related to the research aim	Competency standards are the focus Focus on competence development Focus on educational activity
Not related to the research aim	Focus on the competence of the sponsor / functional management (or other special stakeholders e.g., management consultant, principal contractors) Focus on organisational PM competence (organisational competence goals, competence assessment, career planning, HR strategies, competitive advantage, organisational competence development, competencies focusing on project partnerships and contractors) Focus on the PMO's (project management office) competence Focus on project maturity Focus on PM research methodology or new research approach Focus on collective PM competencies Competence is used in the journal article with different meanings/or generally talks about competence Focuses on program management or portfolio management competencies

Source: own compilation

64 records met our primary selection criteria (closely related). In the case of those articles, that were moderately related to our aims (18 records), a second content screening was conducted, and those articles which analysed the competence development and the educational activity from an organisational perspective (including topics like career planning, competence assessment techniques, organisational key performance indicators KPIs) were also excluded from the final sample (11 out of the 18 records were eliminated and 7 was selected to the sample). As a result, the final sample consisted of 71 records (41 papers in IJPM and 30 papers in PMJ). Figure 1. introduces the flow chart of the article selection.

Figure 1.

PRISMA flow chart of journal article selection



Source: own compilation based on Nuti et al. (2015)

Following the research aim, the papers were analysed based on fourteen content-related questions to define clusters and identify which topics are the most relevant and addressed. These fourteen questions can be summarized into three categories which are as follows:

- (Project management) competency related: meaning whether the author or authors gave definitions or approaches to competencies. This category encompassed three questions (defining competency, defining project management competency, and identifying problems addressing the previous two).
- Research methodology and focus: meaning based on which aspect(s) the authors analysed the papers. This category encompassed five questions (industry, geographical location, project type, framework, type of research).
- Context: meaning the primary focus of the article. This encompassed six questions (standards, age, gender, experience, qualification, theoretical subject area).

Results

Descriptive analysis

The earliest article in the literature selection was published in 1991 in PMJ. One more paper was listed from the 1990s, the rest of the articles involved in the analysis were published after 2000. As Figure 2. demonstrates, between 2001 and 2004 there was a lack of selected publications in the sample, after 2007 a steadily increasing trend could not be seen, but there was an increasing number of years with a medium-high number of publications in the subject area in the journals studied. Regarding this, the years 2007, 2008, and 2015 can be highlighted with 5-5 articles, in 2010 we counted 7, but the largest number of relevant papers in the period under review, ending in 2023, is in 2013 with 11 articles most of which were related to education, learning, training.

Concerning the geographic scope of the studies under analysis, a notable characteristic within the sampled articles is the limited direct specification of geographical locations by authors, with a significant portion remaining ambiguous and challenging to infer indirectly. Nevertheless, within the subset of articles wherein authors explicitly delineate the geographical parameters of their research, the United Kingdom, Australia, and Sweden emerge as prominent focal points. An evident parallelism surfaces between the nationality of the primary authors, as previously examined, and the geographical locales delineated within the studies under consideration.

Following the examination of geographical parameters, the predominant sectors of focus were the construction and information and communication sectors. While the engineering sector also featured prominently in the retained sample, the majority of articles exhibited a more generalized sectoral perspective.

The categorization of articles within the sample, distinguishing between research articles and literature review articles, reveals a prevalent predominance of research articles.

Examining the citation numbers (considering Google Scholar citation numbers), it can be ascertained that within the analysed articles, the lowest citation count is 0 (this is connected to recently published articles), while the highest reaches 1586. The top three referenced articles sequentially comprise a literature review authored by Turner and Müller (2005) with 1586 citations, examining the leadership style of project managers as a success factor. Following this, from the same authors, is a 2010 article investigating the leadership competency profile of successful project managers, accruing 1232 citations.

A challenge encountered in the analysis of the 71 articles was the diverse nature of the samples they encompassed. The authors used a wide range of tools and techniques such as interviews, questionnaires, video diaries, and observation. Besides this the research subjects or people involved in the research were difficult to identify in several cases, several articles used a wide range of project members or stakeholders not treating project managers as

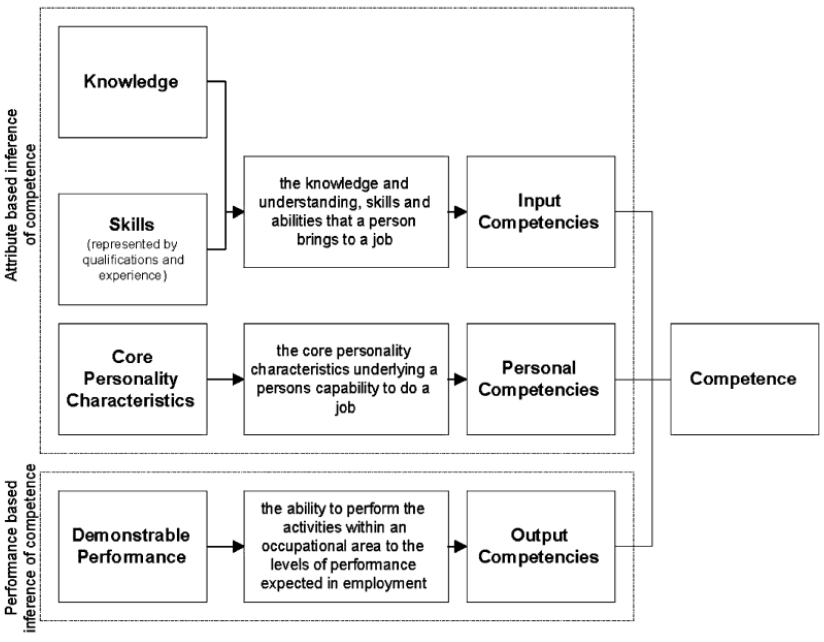
clearly separated. From the point of view of our research, we can mainly start from the interview and questionnaire-based sample articles, the approximate interval of the interview-based sample size is 3 – 30 interviewees per article, and the maximum number of usable questionnaire results ranged from circa 400 to 435 per person per study.

Content analysis

For the sample of 71 articles, we examined whether each article described competence in the context of project management standards. For the articles in the sample, only 38 papers discuss competencies concerning standards, while 33 articles do not. This also indicates that in nearly half of the published articles, there is a specific reference to standards, although direct linkage between research findings and application in standards is relatively rare. Standards mostly feature in literature reviews, and there is much less emphasis on authors bridging research outcomes back to standards.

When examining the relationship between competence and age (n=71), it can be observed that 13 papers address this relationship, while 58 papers do not consider it as a topic. The analysis shows that 12 papers discuss competence about gender, while 59 papers do not discuss age with competence. 36 articles examine competence concerning project manager experience, while 35 do not link these concepts. Of the articles in the sample, 29 examine competence in the context of project managers' qualifications (academic or professional association qualifications), while 42 do not link the two.

Figure 2. **The integrated model of competence identifying components of the overall construct**



Source: Crawford (2005, p. 9).

Among the articles that remain in the sample, we should highlight the work of Crawford (2005), who presents an integrated model of competence, listing its different components, highlighting two broad categories at the first level, namely the attribute-based inference of the competence and the performance-based inference of the competence. We consider this article and the model presented therein as foundational literature for the examined topic; therefore, we deem it important to provide a more detailed description of it.

These two groups are further subdivided into two subcategories, the attribute-based category consists of knowledge and skills, which together are referred to by the author as input competences, and the third element within the group is personality traits, from which the author refers to personal competences (Crawford, 2005). One element within the performance-based category is demonstratable performance, from which we can infer output competences. (Crawford, 2005). Based on this model, taking into account the competency frameworks of professional organizations discussed by the systematic literature review, listing 3 levels, which are individual, collective, and organizational level competencies. In their article, Havila, Medlin & Salmi(2013) consider competences in the project closure phase, which could be further interpreted based on the model presented by Crawford (2005) by assigning each element of the model to each phase of the project, possibly highlighting the importance of their existence and their different roles according to the function and content of the phases, although not included in the sample articles, following a similar path taken by Skulmoski & Hartman (2010) and Wen & Quiang (2019).

One-third of the analysed papers define competencies, the remaining papers investigate this phenomenon in an inherent manner. Thus, out of the 71 papers, only 23 gave an approach or definition towards general competencies, and 20 for project management competencies (and the other 2 dealt with them indirectly). Out of these 20 papers, 17 considered competencies and project management competencies separately, providing an approach or definition for both. Altogether 17 papers identified problems related to defining or analysing competencies. It is worth mentioning, that 8 papers only identified problems without defining any of the competencies (and the sixth defined only competencies in general, however, the authors did not separate project management competencies and competencies in general). Altogether 39 papers were suitable for analysis (considering the overlaps among the categories). Examining the content of the 39 articles included in the sample, we initially created subcategories. These subcategories were not based on the attribute-based and performance-based schools (based

on Crawford, 2005), which researchers have traditionally used to categorize articles. Instead, we introduced a new tripartite classification, highlighting publications aiming to apply and adapt theories previously developed (typically in other disciplines) to the project management context (theory-based). Additionally, we differentiated articles that originated from a project management perspective, where the analysis of the environment was based on individual or situational factors. These can be heterogeneous based on the approach towards competencies, and because of this, one single definition or guideline cannot be identified. However, there are certain patterns which the authors follow if they tend to describe competencies, and based on that, three separate categories can be identified (Table 4.):

1. INDIVIDUAL perspective of the competency: The first category approaches from an individual perspective, e.g., they focus on the inherent characteristics of the person possessing the competencies.
2. SITUATIONAL perspective of competency: The second category broadens this perspective and considers the competent individual as a part of a complex set of people, so competencies can be considered situational.
3. THEORY-BASED perspective of the competency: the third category considers competency from a theoretical approach and defines them from the perspective of a related theory (e.g., behavioural theory or interpretative approach). There could be potential overlaps between categories (when one article belongs to more than one cluster), in these cases the main approach of the original paper was considered in the classification (e.g., those papers that were focused on the individual perspective directly and adapted the behavioural approach indirectly, were classified as papers belonging to category one).

The *Individual* category can be divided into two subcategories:

1. *Intelligence, power, and efficacy* has characterised by the triad of, in which ideas identifying deeper characteristics associated with the individual and causal links to the successful performance of each task are displayed, closely related to the individual's performance and the personal competences required to perform it (c.f. Alam et al., 2008; Pinto et al., 2017; Ballesteros-Sánchez et al., 2019).
2. *Knowledge, skill, attitude, or equivalent with this (knowledge, skill, attribute)* consists of the items, which are related to the individual, focusing on the combination of knowledge, on the ability to do a task, and on core personality characteristics and a behavioural (c.f. Blackburn, 2002; Buganza et al., 2013; Mazur et al., 2014).

The *Situational* category, extended to include environmental elements beyond the individual, could also be divided into three subcategories:

Table 4.

Competency definition clusters in the investigated articles

Nr.	Category	Subcategory	No.	Author(s)
1.	INDIVIDUAL	Intelligence, power, efficacy	3 papers	Alam, Gale, Brown & Kidd (2008)
				Pinto, Patankul & Pinto (2017)
				Ballesteros-Sánchez et al. (2019)
		Knowledge, skill, attitude, or equivalent with this (knowledge, skill, attribute)	3 papers	Buganza, Ortiz-Marcos & Rodríguez-Rivero (2013)
				Mazur, Pisarski, Chang & Ashkanasy (2014)
				Blackburn (2002)
2.	SITUATIONAL	Abilities to complete tasks	2 papers	Lin, Chen, Hsu & Fu. (2015)
				Gruden & Stare (2018)
		Ensure and develop adequate performance in the workplace completed with personality traits, attitudes, and behaviours	7 papers	Stretton (2007)
				Loufrani-Fedida & Missonier (2015)
				Córdoba & Piki (2012)
				Li, Sun, Shou & Sun. (2020)
				do Vale, Nunes & de Carvalho. (2018)
				Dainty, Cheng & Moore (2005)
				Skulmoski & Hartman (2010)
		Input, personal, and output competencies	2 papers	Bredillet, Tywoniak & Dwivedula (2015)
				Crawford (2005)
3.	THEORY-BASED	Integrated concept of job competency	2 papers	Skulmoski & Hartman (2010)
				Dillon & Taylor (2015)
		Personality characteristics	2 papers	Mazur & Pisarski (2015)
				Chen & Partington (2006)
		Standard-based	2 papers	Chen, Partington & Wang(2008)
				Ahsan, Ho & Kahn (2013)

Source: own compilation

1. *Abilities to complete tasks*: The authors investigate the task-solving aspect of the competency. They argue that a specialized system of abilities should be understood at the individual and team level, complemented by experience in complex situations and the use of existing knowledge and skill sets, as well as personal characteristics (c.f. Lin et al., 2015; Gruden & Stare, 2018).
2. *Ensure and develop adequate performance in the workplace completed with personality traits, attitudes, and behaviours*: this subcategory contains the most significant number of articles due to its multiple definitions of competency. The authors placed workplace contribution at the centre of the competence definitions. To perform and develop the activity at the expected level of performance at work, at individual and team levels, while achieving appropriate attitudes and behaviours, requires both relevant experience and personal attitudes, as well as personal qualities that make the person accepted in the field of project management (c.f. Dainty et al., 2005; Stretton, 2007; Skulmoski & Hartman, 2010; Córdoba & Piki, 2012; Loufrani-Fedida & Missonier, 2015; do Vale et al., 2018; Li et al., 2020).
3. *Input, personal, and output competencies*: the third subcategory synthesizes and summarizes competencies at a high level in the form of "Input, personal, and output competencies". The threefold decomposition in Crawford's (2005) model, which pioneered this approach, has been extended by Bredillet et al. (2015), whereby personality traits, attitudinal characteristics, and behaviours appear alongside knowledge, skills, and experience.

Theory-based, which is the third main category, focuses on general theoretical approaches in the articles and it can be broken down into three subcategories:

1. *Integrated concept of job competency*: authors identify competency and its elements (e.g. declared knowledge, skills, problem-solving, etc.) and related knowledge as a necessary element to perform a job (c.f. Skulmoski & Hartman, 2010; Dillon & Taylor, 2015).
2. *Personality characteristics*: authors approach the concept of competence from the perspective of theories on the core characteristics of individuals (c.f. Mazur & Pisarski, 2015; Chen & Partington, 2006).
3. *Standards-based*: authors have used a theoretical approach based on interpreting competence as captured in different project management standards to define competence (c.f. Chen et al., 2008; Ahsan et al., 2013).

Based on the conducted analysis, two competency definition approaches emerge. In the first case, the general competency approach is considered, and derive the project management competence definition from this general concept and applied in the project management context and then broken down into competence elements. In the second case, the authors start to identify elements of the project management competency, which could form part of a general PM competence concept.

Summary

Our research aimed to reveal how project management competence is represented in our sample. It could be seen from our analysis that a bit more than half of the papers involved in the sample (38 out of 71) tried to connect the concept of competence to (at least) one of the project management standards, so it was confirmed that the standards serve as a base for the academic community when they deal with competence. Although it also could be seen that the findings of the papers usually do not aim to form a direct link to the standards (neither to its competence areas nor to its competence structure), so our primary goal that we could identify how the standards will be modified in the future based on the investigated articles could not be revealed from this analysis. The analysis was conducted to shed light on the fact that researchers use standards as a reference in the literature review part of the articles but rarely examine the results obtained in the context of competency frameworks presented in standards. Indirectly, research findings can be incorporated into standards in the future, but generally, it is evident that research results are not directly integrated into the further development of standards. The evolution of the project management profession is continually accompanied by the emergence of new competency elements, which provide a suitable platform for research and presentation in these journals. However, these must be consciously linked to the content and structural categorization of standards more deliberately than at present-use standards as a reference in the literature review part of the articles but rarely examine the results obtained in the context of competency frameworks presented in standards. Indirectly, research findings can be incorporated into standards in the future, but generally, it is evident that research results are not directly integrated into the further development of standards. The evolution of the project management profession is continually accompanied by the emergence of new competency elements, which provide a suitable platform for research and presentation in these journals. However, it is important that these are consciously linked to the content and structural categorization of standards in a more deliberate manner than at present.

Based on our research, we considered Crawford's integrated academic PM competence model (Crawford, 2005) as one of the most significant academic concept models in this topic area, because the constructed PM competence model reflects the international competence schools and tries to integrate them. It was the fourth most cited article in the sample. The first three most cited articles focused on the relationship between leadership and PM competence based on the work of Müller and Turner (Turner & Müller, 2005; Müller & Turner, 2007; Müller & Turner, 2010).

Our analysis confirmed that project management competence is still a fuzzy concept, but our research con-

tributes to the theory of the project management competence concept by identifying new competence definition clusters, which could help researchers and practitioners approach the different aspects of competence. 31 of the examined articles (n=71) provided an understanding or definition of competencies, and based on these papers, three categories can be formulated. The first contains the research which considers competencies as an inherent characteristic of the project manager. The second considers competencies as situational, i.e. as a phenomena understood in terms of the surrounding set of people. The third category encompasses those papers, where the researchers deducted the understanding of competencies from a (broadly) accepted organizational theory. Moreover, 38 authors considered their researchers in terms of one of the competency frameworks mentioned earlier (PMI, IPMA), while the other authors of the sample formulated their findings based on other approaches. Based on the aforementioned findings, this research contributed to the literature through classifying the different, competency-based literature and could provide a solid for further developing the current competency frameworks (see e.g., Berényi et al., 2017; Project Management Institute, 2018).

Limitations and further research

While the quality of the studies of the sample was ensured by choosing high-ranking journals, limiting the selection to two Q1 journals recognized the challenges of researching emerging topics, often delayed in quality journal publication. Challenges in obtaining empirical samples and shortages of literature obstruct a comprehensive investigation. Forthcoming topics are commonly found in online articles or conference papers, reinforcing challenges due to the accelerated pace of change. This temporal gap between practical issues and representation in Q1 journals may hinder standard-setting and influence in education. Notwithstanding, an expanded sample is vitally important for robust research, the choice of two Q1 journals is justified by the unique challenges of investigating nascent themes. Several research articles concentrating on PM competencies may use words and expressions like skill or capability, these articles could be omitted from our investigation as our scope of keywords did not include, for example, the terms skill and capability. The heterogeneity of the studies was also a main obstacle for example during the determination of the level of the competence and the target person or research subject whose competence was analysed in the articles, the wide range of study types also hindered the clarification.

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Appendix 1.

IJPM and PMJ articles:

International Journal of Project Management			
Author(s)	**Year**	**Title**	**DOI**
Adenfelt, M., & Lagerström, K.	2006	Enabling knowledge creation and sharing in transnational projects	https://doi.org/10.1016/j.ijproman.2005.09.003
Alam, M., Gale, A., Brown, M., & Kidd, C.	2008	The development and delivery of an industry led Project Management Professional Development Programme: A case study in Project Management Education and Success Management	https://doi.org/10.1016/j.ijproman.2007.12.005
Anglani, F., Pennetta, S., Reaiche, C., & Boyle, S.	2023	Crossing digital frontiers with cultural intelligence-a new paradigm for project managers	https://doi.org/10.1016/j.ijproman.2023.102543
Blackburn, S.	2002	The project manager and the Project-Network	https://doi.org/10.1016/s0263-7863(01)00069-2
Blomquist, T., Farashah, A.D., & Thomas, J.	2018	Feeling good, being good and looking good: Motivations for, and benefits from, project management certification	https://doi.org/10.1016/j.ijproman.2017.11.006
Bredillet, C., Tywoniak, S., & Dwivedula, R.	2015	What is a good project manager? An Aristotelian perspective	https://doi.org/10.1016/j.ijproman.2014.04.001
Bredin, K., & Söderlund, J.	2013	Project managers and career models: An exploratory comparative study	https://doi.org/10.1016/j.ijproman.2012.11.010
Buchanan, D.A.	1991	Beyond content and control: project vulnerability and the process agenda	https://doi.org/10.1016/0263-7863(91)90032-Q
Buckle, P., & Thomas, J.	2003	Deconstructing project management: a gender analysis of project management guidelines	https://doi.org/10.1016/S0263-7863(02)00114-X
Buganza, T., Kalchschmidt, M., Bartezzaghi, E., & Amabile, D.	2013	Measuring the impact of a major project management educational program: The PMP case in Finmeccanica	https://doi.org/10.1016/j.ijproman.2012.07.003
Cerić, A., Vukomanović, M., Ivić, I., & Kolarić, S.	2021	Trust in megaprojects: A comprehensive literature review of research trends	https://doi.org/10.1016/j.ijproman.2020.10.007
Chen, P., & Partington, D.	2006	Three conceptual levels of construction project management work	https://doi.org/10.1016/j.ijproman.2006.02.009
Chen, P., Partington, D., & Wang, J.N.	2008	Conceptual determinants of Construction Project Management Competence: A Chinese perspective	https://doi.org/10.1016/j.ijproman.2007.09.002
Clarke, N.	2010	The impact of a training programme designed to target the emotional intelligence abilities of project managers	https://doi.org/10.1016/j.ijproman.2009.08.004
Córdoba, J.R., & Piki, A.	2012	Facilitating project management education through groups as Systems	https://doi.org/10.1016/j.ijproman.2011.02.011
Crawford, L.	2005	Senior management perceptions of project management competence	https://doi.org/10.1016/j.ijproman.2004.06.005
Crawford, L., & Nahmias, A.H.	2010	Competencies for managing change	https://doi.org/10.1016/j.ijproman.2010.01.015
Hartman, F., & Ashrafi, R.	2004	Development of the SMARTTM Project Planning framework	https://doi.org/10.1016/j.ijproman.2003.12.003
Havila, V., Medlin, C.J., & Salmi, A.	2013	Project-ending competence in premature project closures	https://doi.org/10.1016/j.ijproman.2012.05.001
Henderson, L.S.	2004	Encoding and decoding communication competencies in project management–an exploratory study	https://doi.org/10.1016/j.ijproman.2004.01.004
Hodgson, D.E., & Paton, S.	2016	Understanding the professional project manager: Cosmopolitans, locals and identity work	https://doi.org/10.1016/j.ijproman.2015.03.003
Iyer, K.C., & Jha, K.N.	2005	Factors affecting cost performance: evidence from Indian construction projects	https://doi.org/10.1016/j.ijproman.2004.10.003
Lin, T.C., Chen, C.M., Hsu, J.S.C., & Fu, T.W.	2015	The impact of team knowledge on problem solving competence in information systems development team	https://doi.org/10.1016/j.ijproman.2015.07.007
Loufrani-Fedida, S., & Missonier, S.	2015	The project manager cannot be a hero anymore! Understanding critical competencies in project-based organizations from a multilevel approach	https://doi.org/10.1016/j.ijproman.2015.02.010
Marzagão, D.S.L., & Carvalho, M.M.	2016	Critical success factors for Six Sigma projects	https://doi.org/10.1016/j.ijproman.2016.08.005
Mazur, A.K., & Pisarski, A.	2015	Major Project Managers' internal and external stakeholder relationships: The development and validation of measurement scales	https://doi.org/10.1016/j.ijproman.2015.07.008
Mazur, A., Pisarski, A., Chang, A., & Ashkanasy, N.M.	2014	Rating defence major project success: The role of personal attributes and stakeholder relationships	https://doi.org/10.1016/j.ijproman.2013.10.018
Morris, P.W., Crawford, L., Hodgson, D., Shepherd, M.M., & Thomas, J.	2006	Exploring the role of formal bodies of knowledge in defining a profession–The case of project management	https://doi.org/10.1016/j.ijproman.2006.09.012
Müller, R., & Turner, J.R.	2007	Matching the project manager's leadership style to project type	https://doi.org/10.1016/j.ijproman.2006.04.003
Müller, R., & Turner, R.	2010	Leadership competency profiles of successful project managers	https://doi.org/10.1016/j.ijproman.2009.09.003

Ogunlana, S.O.	2008	Critical COMs of success in large-scale construction projects: Evidence from Thailand construction industry	https://doi.org/10.1016/j.ijproman.2007.08.003
Omorede, A., Thorgren, S., & Wincent, J.	2013	Obsessive passion, competence, and performance in a project management context	https://doi.org/10.1016/j.ijproman.2012.09.002
Palacios-Marqués, D., Cortés-Grao, R., & Carral, C.L.	2013	Outstanding knowledge competences and web 2.0 practices for developing successful e-learning project management	https://doi.org/10.1016/j.ijproman.2012.08.002
Pinto, J.K., Patanakul, P., & Pinto, M.B.	2017	"The aura of capability": Gender bias in selection for a project manager job	https://doi.org/10.1016/j.ijproman.2017.01.004
Sense, A.J.	2007	Structuring the project environment for learning.	https://doi.org/10.1016/j.ijproman.2007.01.013
Sense, A.J.	2013	A project sponsor's impact on practice-based learning within projects	https://doi.org/10.1016/j.ijproman.2012.06.007
Stevenson, D.H., & Starkweather, J.A.	2010	PM critical competency index: IT execs prefer soft skills	https://doi.org/10.1016/j.ijproman.2009.11.008
Stretton, A.	1995	Australian competency standards	https://doi.org/10.1016/0263-7863(94)00012-2
Sundström, P., & Zika-Viktorsson, A.	2009	Organizing for innovation in a product development project: combining innovative and result oriented ways of working–a case study	https://doi.org/10.1016/j.ijproman.2009.02.007
Verburg, R.M., Bosch-Sijtsema, P., & Vartiainen, M.	2013	Getting it done: Critical success factors for project managers in virtual work settings	https://doi.org/10.1016/j.ijproman.2012.04.005
Vukomanović, M., Young, M., & Huynink, S.	2014	IPMA ICB 4.0 — A global standard for project, programme and portfolio management competences	https://doi.org/10.1016/j.ijproman.2016.09.011

Source: own compilation

Project Management Journal			
Author(s)	**Year**	**Title**	**DOI**
Ahsan, K., Ho, M., & Khan, S.	2013	Recruiting project managers: A comparative analysis of competencies and recruitment signals from job advertisements	https://doi.org/10.1002/pmj.21366
Aubry, M., & Lièvre, P.	2010	Ambidexterity as a competence of project leaders: A case study from two polar expeditions	https://doi.org/10.1002/pmj.20183
Augner, T., & Schermuly, C.C.	2023	Agile project management and emotional exhaustion: a moderated mediation process	https://doi.org/10.1177/87569728231151930
Ballesteros-Sánchez, L., Ortiz-Marcos, I., & Rodríguez-Rivero, R.	2019	The impact of executive coaching on Project Managers' personal competencies	https://doi.org/10.1177/8756972819832191
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