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PROJECT MANAGEMENT COMPETENCE –
DEFINITIONS, MODELS, STANDARDS AND PRACTICAL IMPLICATIONS

PROJEKTMENEDZSMENT KOMPETENCIA –
DEFINÍCIÓK, MODELLEK, STANDARDOK ÉS A GYAKORLATI ALKALMAZÁS LEHETŐSÉGEI

The complex nature of project management competence has resulted in different definitions for the same concept in the academic literature. By placing a greater emphasis on the improvement of their project management performance, organisations try to stay competitive and relevant in today's increasingly complex business environment, where the required project management skills set is constantly changing. In order to be able to improve project managers' performance it is essential to understand, as such, the concept of project management competence. The present paper has a multifaceted aim. It: a) Provides a comparative review of the definitions of project management competence as given in the literature and in professional standards; b) provides a comparative analysis of the project management competence models published in literature focusing on the fundamental differences; c) provides a comparative analysis of professional project management competence standards based on the identified two main dimensions of project management competence; d) introduces a two-dimensional model which contributes to the better understanding of project management competence; e) highlights the practical implications as derived from the broader concept of project management competence.
The proposed two-dimensional model contributes to the better understanding of the holistic nature of this phenomenon, which, in turn, makes possible a more focused competency development of project management professionals.

Keywords: project management competence, project management standard, competence management, project competence model, integrated approach of competence

Komplex jellege miatt az akadémiai szakirodalomban eltérő definíciókat találhatunk a projektmenedzsment-kompetenciára. A szervezetek egyre nagyobb figyelmet fordítanak a projektvezetési teljesítményük javítására, hogy ezáltal versenyben maradhassanak napjaink egyre komplexebb üzleti környezetében, amelyben az elvárt projektvezetési képességek köre folyamatosan változik. A projektvezetők teljesítményének javításához elengedhetetlen a projektvezetési kompetencia fogalmának szélesebb körű megértése. A cikk célkitűzései a következők: a) összehasonlító áttekintést ad a projektmenedzsment-kompetencia szakirodalmi és szakmai standardokban fellelhető definícióiról, b) áttekinti a szakirodalomban megjelent projektmenedzsment-kompetencia modelleket a főbb különbségeikre rávilágítva, c) összehasonlítja a szakmai szervezetek projektmenedzsment-kompetencia standardjait az azonosított, két fő elemzési dimenzió alapján, d) bemutatja a projektmenedzsment-kompetencia új, kétdimenziós megközelítését, amely a fogalom jobb megértéséhez járul hozzá e) rámutat az új megközelítés gyakorlati alkalmazhatóságának lehetőségeire is.

Kulcsszavak: projektmenedzsment-kompetencia, projektmenedzsment-standard, kompetenciamenedzsment, projekt-kompetencia-modell, kompetencia integrált megközelítése

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Project management could be found in almost every sector of the global economy. The biggest professional project management association - the Project Management Institute -defined the so-called project-intensive industries as those *"in which occupational employment has a high level of project-oriented work* (Project Management Institute, 2013, p. 2)." These industries include manufacturing, business services, finance and insurance, oil and gas, information services, construction, utilities. Besides these sectors, project management has gained an increasing significance in other industries, as well, in the last decade e.g.: healthcare, publishing and professional services industries (Project Management Institute, 2017a). The World Bank's report of 2008 states that 22 % of the global aggregated GDP is spent on projects, and this proportion is even higher in the emerging countries: e.g. it is 39% in India and 43% in China (World Bank, 2008). The need for trained and experienced project managers is constantly increasing in the above-mentioned industries, thus companies are investing more and more to develop their project managers (Project Management Institute, 2018a). This emerging need results in creating more project roles that, of course, also have an impact on the labour market. The Job Growth and Talent Gap report predicts that organisations will need 87.7 million individuals working in project management-oriented job roles by 2027 (Project Management Institute, 2017a). Companies that wish to be champions of the global changes need to invest in project management talent. Moreover, the introduction of formal process is inevitable to develop project management competence such as the technical, leadership and business skills of project management (Project Management Institute, 2018a). Employers must place a greater emphasis on improving project management performance to be able to stay competitive and relevant in this new business environment, a constantly changing technical landscape, in which the required skill set and the way of learning will change. Researchers (e.g. Toney, 1997) pointed out the decisive role of skilled project management professionals and this was also reinforced by Crawford (2005), who not only highlighted the interrelationship between project performance of the project managers and their competence level, but also revealed the direct connection between project success and the organisational performance.

Nowadays, project management is a complex job. Having the classical project management technical skills is not sufficient anymore to achieve success on projects (Görög, 2013a). Beyond these skills there is a growing need for skills in leadership, strategic or business management.

The development of project management competence came to the forefront both in academia and in professional associations. The need for a everyday language in project management competence development first emerged approximately fifty years ago, when the Project Management Institute was established in 1969 (Project Management Institute, 2018c). International project management associations have also pointed out the need for a common project management vocabulary. Distinguishing project management competence from the general management competence accelerated the process that project management become a new profession, i.e. a *"distinctive compe-*

tence territory" (Winter et al., 2006). In order to satisfy the above-mentioned needs, the Project Management Institute published the first project management white paper called Ethics, Standards, and Accreditation Committee Final Report in 1983, with the aim to create a standardised knowledge base and framework of professional expertise (Seymour & Hussein, 2014). The first edition of the well-known Project Management Body of Knowledge or, as it is often referred to: the PMBOK Guide, was published in 1996. It was an extended version of the above-mentioned white paper. The related professional designation of Project Management Professional (PMP) was introduced in 1984. The International Project Management Association (IPMA) started the first individual certification and published the first edition of their standard "Individual Competence Baseline" in 1998. In the standards there are attempts to define "project management competence" and to create their own competence framework or competence model.

Different standards use different definitions for the term "project management competence". Unfortunately, due to the multifaceted nature of project management competence, the academic world also struggles with the problem. Even though numerous definitions can be found in the academic literature, there is no consensus in this respect. In many cases the same term is used with different meanings or the same phenomenon has different names. No comparative analysis regarding the project management competence could be found in the international academic literature. As a result of the above, the paper has a multifaceted aim. It proposes to a) provide a comparative review of the project management competence definitions given in both the literature and in professional standards; b) provide a comparative analysis of the project management competence models published in literature, focusing on the fundamental differences; and c) provide a comparative analysis of professional project management competence standards based on the two main dimensions of project management competence identified. It also intends to d) introduce a two-dimensional approach which contributes to the better understanding of project management competence; e) highlight practical implications derived from the broader concept of project management competence.

The author of this conceptual paper aims to introduce different project management competence definitions and models by means of highlighting the similarities and the differences. Further to comparing the theoretical models, the biggest project management competence standards will also be studied: e.g. the 2nd edition of the Project Manager Competency Development Framework (Project Management Institute, 2007), v4.0 of the Individual Competence Baseline for Project Programme & Portfolio Management (International Project Management Association, 2015a), APM Competence Framework (Association for Project Management, 2009) and AIPM Professional Competency Standards for Project Management (Australian Institute of Project Management, 2008; Australian Institute of Project Management, 2010). The paper is structured as follows. The next section will introduce the current literature on project management competence and the related most recognised models and the competency standards. The upcoming sec-

tion provides a detailed comparative analysis of four of the most recognised project management competency standards. The paper ends with highlighting the practical implications of the introduced comparative analysis.

Literature review – Current literature on project management competence

This section first focuses on the current literature on competence. This is followed by introducing the published models of project management competence and the project management standards. A special focus on their implied theoretical approach and their critical evaluation are presented. The review of the literature aims to introduce the different elements of the competence in general at first, as these elements also form part of the project management competence. Highlighting the general concept of competence is necessary to understand the phenomenon of project management competence.

Concept of competence

Competence is considered to be one of the most controversial terms in management literature because of its several meanings (Robotham & Jubb, 1996). The different interpretations and definitions present in the current literature could result in certain level of confusion and misunderstanding (Boak et al., 1991; Senghi, 2004).

Two basic approaches are evident in the literature on professional competence. The first is "the competency model" or the attribute-based approach of the competence, while the second "the competency standard" i.e. the demonstrable performance approach of the competence. According to the competency model approach, the competency derives from personal attributes, so it focuses on the origin-aspect of the competence. On the other hand, the competency standard approach places an emphasis on the performance aspect,

which is achieved in the possession of the competence, so it is a demonstrable performance approach (Crawford, 2005).

Spencer and Spencer (1993) pioneered the attribute-based approach and differentiated five main characteristics of competency. Two - knowledge and skills - are commonly referred to as surface competencies. Three - motives, traits and self-concept - are usually referred to as core personality characteristics. Unlike Spencer and Spencer (1993), Finn (1993) names knowledge and skill as input competencies. Heywood et al. (1992) defines experience as the element of the competence, while some authors consider it as a measure of competence (Lee-Kelley & Leong Loong, 2003; Dolfi & Andrews, 2006). Turner & Müller (2006) state that experience comes along with the growing confidence, which in turn results in better project performance. Pheng & Chuan (2006) underlined that the years of experience is less important in competence development than the level of complexity of the projects which were implemented by the project managers. Some researchers (Prabhakar, 2005; Lee-Kelley & Leong Loong, 2003) found a correlation between the experience of the project manager and the project success achieved. Because of this, the required level of professional project management experience is an inevitable element of the project management qualifications, as will be discussed later.

Quinn et al. (1996) introduced the model of professional intellect, distinguishing four levels of professional competence: cognitive knowledge (know what), advanced skills (know how), systems understanding (know-why), and self-motivated creativity (care-why). In line with this approach, Zack (1999) has divided competence into three knowledge related elements: declarative knowledge (knowledge about), procedural knowledge (knowledge how) and casual knowledge (knowledge why). The Table 1 provides a comparison of Quinn et al.'s and Zack's theory.

Table 1 The relationship between Quinn et al.'s, Zack's and competence model

	Zack (1999)		Quinn et al. (1996)	
	Competency components	Description	Competency components	Description
Elements (levels) of the competency	Declarative knowledge	*"Knowledge about something is called declarative knowledge. A shared, explicit understanding of concepts, categories, and descriptors. (Zack, 1999, p 46.)."*	Cognitive knowledge	*Cognitive knowledge (or know-what) is "the basic mastery of a discipline that professionals achieve through extensive training and certification. This knowledge is essential, but usually far from sufficient, for commercial success. (Quinn et al., 1996, p n.a.)*
	Procedural knowledge	*"Knowledge of how something occurs or is performed is called procedural knowledge. (Zack, 1999, p 46.)."*	Advanced skills	*Advanced skills (know-how) translate "book learning" into effective execution. The ability to apply the rules of a discipline to complex real-world problems is the most widespread value-creating professional skill level. (Quinn et al., 1996, p n.a.)*
	Casual knowledge	*"Knowledge of why something occurs is called causal knowledge (Zack, 1999, p 46.)."*	Systems understanding	*Systems understanding (know-why) is deep knowledge of the web of cause-and-effect relationships underlying a discipline. It permits professionals to move beyond the execution of tasks to solve larger and more complex problems—and to create extraordinary value. Professionals with know-why can anticipate subtle interactions and unintended consequences. The ultimate expression of systems understanding is highly trained intuition—for example, the insight of a seasoned research director who knows instinctively which projects to fund and exactly when to do so. (Quinn et al., 1996, p n.a.)*
			Self-motivated creativity	*Self-motivated creativity (care-why) consists of will, motivation, and adaptability for success. Highly motivated and creative groups often outperform groups with greater physical or financial resources. Without self-motivated creativity, intellectual leaders can lose their knowledge advantage through complacency. (Quinn et al., 1996, p n.a.)*

One of the most influential and generic competency typologies, known in the literature as Bloom's taxonomy, was developed by Bloom (1964). In the model, competency is divided into three domains: the cognitive, the affective and the psychomotor domain. The final one was added to the model later. (Simpson, 1972). The model became very famous at trainings and certifications, as well as in different fields of education. Cognitive domain refers to mental skills, and is often called the "knowledge level of the model". The affective domain includes feelings and the emotions, and is often called the "attitude level". The psychomotor focuses on manual or physical skills, often referred as skills. The model is mentioned as KSA in the everyday language (Table 2) (Winterton et al., 2006).

Dulewicz & Higgs (2003) divided competency into three groups. The first group - Intellectual (IQ) - includes the following competencies: (1) critical analysis and judgement, (2) vision and imagination, (3) strategic perspective. The Managerial (MQ) group includes the following competencies: (4) engaging communication, (5) managing resources, (6) empowering, (7) developing, (8) achieving. The Emotional (EQ) group includes the following competencies: (9) self-awareness, (10) emotional resilience, (11) motivation, (12) sensitivity, (13) influence, (14) intuitiveness, (15) consciousness. Blaskovics (2014) pointed out that while some of these competencies can be improved by training, others are congenital and innate personal characteristics.

Table 2
Bloom's taxonomy

Domain	Category
Cognitive (KNOWLEDGE) *"knowledge and the development of intellectual skills"* (Winterton et al., 2006, p. 18)	1. knowledge (recall of data); 2. comprehension (understand meaning, interpret); 3. application (use a concept in a new situation); 4. analysis (separate material into component parts); 5. synthesis (build a structure or pattern); 6. evaluation (make judgments) (Winterton et al., 2006, p. 18)
Psychomotor (SKILL) *"physical movement, coordination, and use of the motor-skill areas"* (Winterton et al., 2006, p. 18)	1. perception (using sensory cues to guide motor activity); 2. set (readiness to act); guided response (imitation, trial and error); 3. mechanism (intermediate stage in learning a complex skill); 4. complex overt response (skilful performance of motor acts that involve complex movement patterns); 5. adaptation (modify movement patterns to meet special requirements); 6. origination (developing new movement patterns to fit specific problem) (Winterton et al., 2006, p. 19)
Affective (ATTITUDE) *"the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes"* (Winterton et al., 2006, p. 18)	1. receiving phenomena (awareness and attention); 2. responding to phenomena (active participation); 3. valuing (acceptance and commitment); 4. organization (organizing values into priorities); 5. internalising values (having a value system that controls behaviour) (Winterton et al., 2006, p. 18)

Source: Winterton et al., (2006)

Concept of project management competence

Crawford (2005) introduced the first project management competence model, merging into an integrated one the previously mentioned two approaches to competence (competency model or the attribute-based approach) are. The following figure (Figure 1.) introduces Crawford's integrated model of competence, including the three main competence components: input, personal (which derive from the attribute-based approach) and output competencies (coming from the performance-based approach).

Görög (2013b) in his project management competence model distinguishes the project management competency from the project manager's competency. In his model, based on Cleland's (1994) approach, three components of the project management competence are considered: knowledge, skill and attitude. At the same time, the project manager's competency, beyond the project management competency, includes personal characteristics, as well as, the leadership style of project manager, which also influences the actual workplace performance of the project manager. Görög

Figure 1 Crawford's integrated model of competence
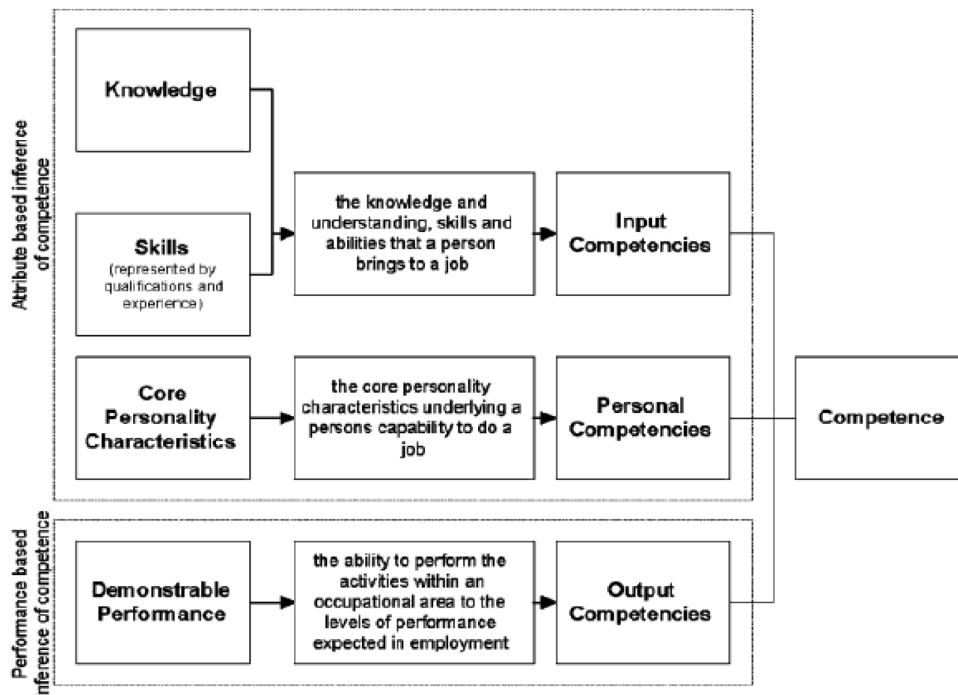
Source: Crawford, (2005, p. 9)

(2013b) identified the six most important personal characteristics of the project managers: optimism, emotional intelligence, team building, building trust, motivation and improvisation.

Görög's project management competence approach is in line with Zack's theory (1999). The Table 3 compares Zack's and Quinn et al.'s competency components and Görög's project management competence elements.

Both Crawford's and Görög's models adopt a vertical approach to explain project management competence, i.e. they focus on different levels/components of it. The following table highlights the interrelationship between the different vertical elements of the project management competence models. Based on this we can conclude that Görög's approach is in line with the attribute-based inference of competence and the demonstrable performance approach

Table 3 Relationship between Quinn et al.'s, Zack's and Görög's competence model

Quinn et al. (1996)	Zack (1999)			Görög (2013a)		
Competency components	Competency components			Competency components	Description	Example in project management context
Cognitive knowledge KNOW-WHAT	Declarative knowledge KNOWLEDGE ABOUT	PROJECT MANAGEMENT COMPETENCY	PROJECT MANAGER'S COMPETENCY	Knowledge	Familiarity with project management tools and techniques.	E.g. Ability to recognise and understand Gannt chart
Advanced skills KNOW-HOW	Procedural knowledge KNOWLEDGE OF HOW			Skill	Ability to use project management tools and techniques.	E.g. Preparing the Gannt chart
Systems understanding KNOW-WHY	Casual knowledge KNOWLEDGE OF WHY			Attitude	Approach to projects and project management.	E.g. Understanding why a Gannt chart is an appropriate tool in a certain project management context.
Self-motivated creativity CARE-WHY				Personal characteristics Leadership style of the project manager		

is not presented directly, while Crawford's model includes both the attribute-based and the demonstrable performance approached. The two model shows similarities regarding the interpretations of the input competencies (knowledge and skills), but neither of the models are mention the role of experience in the project management competency development directly and it is not a component of the models. Crawford'a personal competencies of are not part of Görög's project management competence definition, but are elements of his term of the project manager's competency. Attitude is part of Görög's model, but is not included in Crawford's. It is part of the affective domain and is *"the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes"* (Winterton et al. 2006, p 18). Crawford's model mentions ability instead of attitude.

To conclude: the models show similarities in many aspects, while at the same time there are differences, such as the application of the terms: attitude and ability (Table 4).

The previously discussed approaches to competence focus on the different levels and in depth components of the project management competence. Bearing in mind, however, the competency domain areas, i.e. the knowledge areas of project management competence, one can identify the horizontal aspects of project management competency, which might be referred to as content-related approach to competence. Knowledge areas of project management have always reflected the different development stages or, in other words, the evolution of the project management profession. From the 1950's to 1980's, projects were considered to be simple processes and the main task of the project managers was to implement them. At the time, project management was considered to be the application of the associated project management tools and techniques to implement a one-time, unique and complex task according to the predefined time, cost and quality constraints (Olsen, 1971). The most important capabilities of the project managers were the hard skills, or as one could call them, the technical skills (El-Sabaa, 2001).

Table 4 A comparison of the vertical components included in different project management competence model

Spencer & Spencer (1993) competency characteristics		Finn (1993)	Heywood et al. (1992) competence components	Crawford (2005) competence elements	Görög (2013a)
knowledge	input competencies	input competencies	knowledge	input competencies	knowledge
skills			skills		skills
			experience		
- motives - traits - self-concept	core personality characteristic		- attitudes - personality traits - behaviours	personal competencies	-attitudes -personal characteristics -leadership style of the project manager

Source: Horváth, (2018, p. 414.)

From the 1980's a new approach started to spread, which considered projects as temporary organisations (Lundin & Söderholm, 1995). In addition to the hard skills, human aspects of project management, i.e. soft skills or the human skills, received an ever growing attention (Kloppenborg & Petrick, 1999; Pinto, 2000). Gruden & Stare (2018) highlighted the relationship between the behavioural competencies of the project managers and the project success. Nowadays, projects are considered from a broader organisational perspective, and are defined as a building block of organizational strategy. The conceptual and organisational skills (El-Sabaa, 2001) enable project managers to understand how projects fit to the organisational strategic objectives, and how projects are embedded into the entire organisation.

El-Sabaa's project competency model (2001) focuses on the domain, i.e. knowledge areas of the project management competency. The author differentiated three competence areas, i.e. knowledge areas, which are: a) human; b) conceptual and organisational; and c) technical. These areas are further divided into 15 components in which a competent project manager should have appropriate skill (Table 5).

Görög (2013b) also identify three knowledge areas in project management, which he named as: technical, human and project capabilities. The only significant difference between the two approaches pertains to the definition of technical skills and capabilities. In Görög's typology, technical capability includes familiarity with the domain context of the project outcome, and also that of the implementation process. El-Sabaa's technical skills are in line with Görög's project capabilities which include familiarity with the project management tools and methodology.

Reich & Wee (2004) also distinguished project management knowledge and project domain knowledge. Project management knowledge is defined as the "knowledge about the project management process (e.g., roles, tasks, and time frames) in se during the project" (Reich & Wee, 2004, p. 13. referring to Reich & Wee, 2006), while project domain knowledge "the knowledge about the project domain (e.g., general business, industry, company, product, and technical knowledge) of an application area in use during the project (Reich-Wee, 2004, p. 13. referring to Reich & Wee, 2006),". In PMBOK Guide, domain knowledge is called application area-specific knowledge.

Table 5 Project manager skill areas

Human skill	Mobilizing: Project manager is able to mobilize the mental and emotional energy of his subordinate
	Communication: Project manager is able to listen, persuade, and understand what others mean by their behavior
	Coping with situations: Project manager is flexible, patient, and persistent
	Delegating Authority: Project manager is able to give people the opportunity as group members to participate in making decisions
	Political sensitivity
	High self-esteem
	Enthusiasm
Conceptual and organizational skill	Planning
	Organizing
	Strong goal orientation
	Ability to see the project as a whole
	Ability to visualize the relationship of the project to the industry and the community
	Strong problem orientation
Technical skill	Special knowledge in the use of tools and techniques
	Project knowledge
	Understanding methods, processes, and procedures
	Technology required
	Skills in the use of computer

Source: El-Sabaa (2001, p. 4)

The literature of project management competence distinguishes three main knowledge areas. The components of this triple division focus on the context, the project management tools and techniques, and the human aspect.

Literature on project management standards and their competence approach

In this section I discuss the general definition of the project management standards. The Project Management Institute, acknowledged as the biggest and most well-known project management professional association, sets the requirements of project management standard (Project Management Institute, 2018b). These requirements are as follows: a) the standard should be published by an internationally acknowledged professional association, b) the content should be based on professional consensus, c) the standard should prescribe the rules, guidelines and detailed description about the processes and tasks within project management, d) it should also aim to contribute to and ensure the optimal workplace performance in project environment. Bearing in mind their content, professional standards can be categorised as follows:

I. foundation standards – these are not industry or sector specific, applicable for all kinds of projects and introducing the most important knowledge areas, and processes belonging to a certain profession (e.g.: A Guide to the Project Management Body of Knowledge - PMBOK Guide),

II. standard extensions – tailor fitted to a special industry or sector (e.g. Construction Extension to the PMBOK Guide),

III. practice standards – introducing a certain project management tool or methodology (e. g. Practice Standard for Work Breakdown Structures),

IV. frameworks or competency standards – these focus on more competence levels than the foundation standards.

The latter are more knowledge focused and less attention is given to the skills and abilities, and to the core personality competencies. Competency standards enable professionals to measure their professional competency, by serving as a base for professional certification systems (e.g. Project Manager Competency Development Framework),

V. glossaries – focusing on the vocabulary related to a certain profession (e.g. Combined Standards Glossary).

Based on their main approach of the competence, project management standards could be divided into three main categories: input, process and output approached standards (Song, 2006). Professional standards having an *input approach* mainly focus on the attributes of the individual and usually describe the necessary surface competences (knowledge, skills) and the core personality characteristics of the competence.

Standards following *process approach* emphasise the implementation process side of the project management and give a detailed description of the main functions and tasks of the project management process.

The third type is the professional standard with an *output approach,* which focuses on the measurable performance part of the tasks and on the result of the actions. Alam et al. (2008) categorized the three most widely acknowledged project management foundation standards into these competence-approach categories. They concluded that the Project Management Institute's PMBoK (Project Management Body of Knowledge) standard belongs to the input approach category. The International Project Management Association's (IPMA) Individual Competence Baseline is a process focused professional standard, while Australian Institute of Project Management's (AIPM) standard is an output approached standard.

Crawford (2005) used a different categorization. She divided the standards into knowledge-focused and performance-focused categories. The Project Management Institute's PMBoK belongs to the first group together with the International Project Management Association's IPMA ICB and the APM Body of Knowledge, while the Australian National Competency Standards for Project Management belong to the demonstrable performance-focused category (Table 6).

Criticism of the classical project management foundation standards in the literature

Project management foundation standards, primarily the Guide to the Project Management Body of Knowledge (PMBOK® Guide), the Association for Project Management - APM Body of Knowledge and the Australian Institute of Project Management (AIPM) standard serve as handbooks for the professional community and provide a knowledge base for the international project management

Table 6 Different competency approaches at project management standards

Competency approach of the standard (Song, 2006)	Crawford (2005) categorisation	Alam et al. (2008) categorisation
INPUT APPROACH	Project Management Institute PMBoK (Project Management Body of Knowledge) és International Project Management Association (IPMA) International Competence Baseline és Association for Project Management - APM Body of Knowledge	Project Management Institute PMBoK (Project Management Body of Knowledge)
PROCESS APPROACH	-	International Project Management Association (IPMA) International Competence Baseline
OUTPUT APPROACH	Australian Institute of Project Management (AIPM) standard	Australian Institute of Project Management (AIPM) standard

Source: Crawford (2005); Song (2006); Alam et al. (2008) (in Horváth, 2018, p. 416)

certifications. As a result, the critical remarks will be focused on this group of foundation standards.

In comparison with the other two standards (APM and AIMPT), the PMBOK® Guide is considered to be the most globally influential foundation standard amongst project managers today. Most of the criticism associated with PMBoK can also be relevant in case of the other two project management foundation standards.

The PMBoK standard was criticised because it has a strong bias toward the explicit, i.e.: it is formally articulated, easy to codify, document and share, and favours declarative knowledge over the tacit, i.e.: it is difficult to articulate, derived from experience, difficult to share, and is casual knowledge. Overall it pays larger attention to the "know what" over the "know why" competence (Reich-Wee, 2006). The fifth edition of the PMBOK®

Guide tries to overcome the shortages of the previous editions and includes a brief appendix on interpersonal skills, such as: (1) team building, (2) motivation, (3) communication, (4) influencing, (5) decision making, (6) political and cultural awareness, (7) negotiation, (8) trust building, (9) conflict management and (10) coaching (Project Management Institute, 2015a).

At the same time, the PMI Talent Triangle introduced a new triple skill set, a successful project manager should possess (Project Management Institute, 2015b): technical, leadership and strategic, and business management expertise. The implied approach of this Triangle is in line with the earlier findings of the academic literature (El-Saaba, 2001; Görög, 2013b), which also revealed the three horizontal competency knowledge areas. The Table 7 encapsulates different elements of the competence categories included in the PMI Talent Triangle.

Table 7 The PMI Talent Triangle

STRATEGIC & BUSINESS MANAGEMENT *(Business oriented skills, applies to all certifications)*	TECHNICAL *(Domain expertise, certification specific)*	LEADERSHIP *(Competency in guiding and motivating; applies to all certifications)*
1. Benefits management and realization	1. Agile practices	1. Brainstorming
2. Business acumen	2. Data gathering and modelling	2. Coaching and mentoring
3. Business models and structures	3. Earned value management	3. Conflict management
4. Competitive analysis	4. Governance (project, program, portfolio)	4. Emotional intelligence
5. Customer relationship and satisfaction	5. Lifecycle management (project, program, portfolio, product)	5. Influencing
6. Industry knowledge and standards	6. Performance management (project, program, portfolio)	6. Interpersonal skills
7. Legal and regulatory compliance	7. Requirements management and traceability	7. Listening
8. Market awareness and conditions	8. Risk management	8. Negotiation
9. Operational functions (e.g. finance, marketing)	9. Schedule management	9. Problem solving
10. Strategic planning, analysis, alignment	10. Scope management (project, program, portfolio, product)	10. Team building
	11. Time, budget and cost estimation	

Source: Project Management Institute (2015b)

Turner (2016) considers the PMI new Talent Triangle to be an updated skill set which reflects on the increasing complexity and uncertainty level of the global business environment. *Turner* (2016) also points out that focus from the technical skills, which put emphasis mainly on the iron triangle, moves to new areas, namely interpersonal skills and project context. *Turner* (2016) also highlights that leadership and generally the project- related soft skills were outlined from the previous editions of the PMBoK and limited resources are available in the academic literature on soft-skills. The Table 8 summarizes the knowledge areas of PM-BOK 6th edition, which justifies Turner's critical remarks.

At the same time, the PMI Talent Triangle was built into the 6th edition of PMBoK and the following definitions were given to the three competence areas:
▪ *"Technical project management.* The knowledge, skills, and behaviours related to specific domains of project, program, and portfolio management. The technical aspects of performing one's role.
▪ *Leadership.* The knowledge, skills, and behaviours needed to guide, motivate, and direct a team, to help an organization achieve its business goals.
▪ *Strategic and business management.* The knowledge of and expertise in the industry and organization that

Table 8 Project management process groups and knowledge areas in PMBOK® Guide

	Phases	Initiation	Planning	Execution		Close-out
Process Groups		**1. Project initiation**	**2. Project planning**	**3. Project execution**	**4. Monitoring & Controlling**	**5. Project closing**
PROJECT MANAGEMENT KNOWLEDGE AREAS	1. Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work --- Manage Project Knowledge	Monitor and Control Project Work --- Perform Integrated Change Control	Close project of Phase
	2. Project Scope Management		Plan Scope Management Collect Requirements Define Scope Create WBS		Validate Scope Control Scope	
	3. Project Time Management		Plan Schedule Management Define Activities Sequence Activities Estimate Activity Durations Develop Schedule		Control Schedule	
	4. Project Cost Management		Plan Cost Management Estimate Costs Determine Budget		Control Costs	
	5. Project Quality Management		Plan Quality Management	Manage Quality	Control Quality	
	6. Project Resource Management		Plan Resource Management Estimate Activity Resources	Acquire Resources Develop Team Manage Team	Control Resources	
	7. Project Communications Management		Plan Communications Management	Manage Communications	Monitor Communications	
	8. Project Risk Management		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses	Implement Risk Responses	Monitor Risks	
	9. Project Procurement Management		Plan Procurement Management	Conduct Procurement	Control Procurements	
	10. Project Stakeholder Management	Identify Stakeholders	Plan Stakeholder Engagement	Manage Stakeholder Engagement	Monitor Stakeholder engagement	
Total number of processes:		**2**	**10**	**12**	**1**	
		24				
			49			

Source: Project Management Institute (2017b)

enhanced performance and better delivers business outcomes" *(Project Management Institute, 2017b, p. 56).*

Taking into consideration the previously introduced development regarding the horizontal aspect of the project management competence, one could see that there is a certain kind of shortage as to understanding the vertical aspects of competency. Even the latest issue of PMBoK focuses mainly on the knowledge level of competency, and significantly less attention is given to the skills and attitudes, and even less to the core personality competencies.

The project management *competency* standards tried to fill this gap by focusing on wider range of competence levels than the classical foundation standards like the PMBoK, so they enable professionals to measure their professional competency in a much more detailed manner. They place a higher emphasis on the human skills, so they could serve (together with the foundation standards) as the study handbook for the different project management qualifications. The Table 9 lists the most important project management competency standards. The comparative analysis of four selected project management competency standards based on the vertical and the horizontal dimensions of the competence will be introduced later on in the paper.

Comparative analysis of the project management competency standards

Section II. of this paper provided an introduction to the four internationally acknowledged project management competency standards focusing on their origin. In this section these standards will be further analysed in a comparative manner based on the following aspects;

1) adopted competency definition and the vertical dimension of competency - *the levels (depth) of the competence and its effect on the structure of the standard,*
2) horizontal competency dimension – *the content of the competence elements and the applied certification systems and competency development methodology,*

1) The adopted competency definition and the vertical dimension of competency in the project management competency standards

This section aims to provide a comparative overview on the competency definitions and on the major components of the competency used by the four most important project management competency standards (Table 10).

Table 9 The four selected project management competency standards

PROJECT MANAGEMENT ASSOCIATION			STANDARD	
Name	**Abbreviation**	**Headquarter**	**Name**	**Abbreviation**
Project Management Institute	PMI	USA	**Project Manager Competency Development Framework**	PMCDF
International Project Management Association	IPMA	Netherlands	**Individual Competence Baseline for Project, Programme & Portfolio Management**	IPMA ICB
Association for Project Management	APM	UK	**APM Competence Framework**	APMCF
Australian Institute of Project Management	AIPM	Australia	**AIPM Professional Competency Standards for Project Management PART A – Introduction and PART C – Certified Practising Project Manager (CPPM)**	AIPM PCSPM PART C

Source: Horváth (2018, p. 416)

Table 10 Competence definitions in the project management competency standards

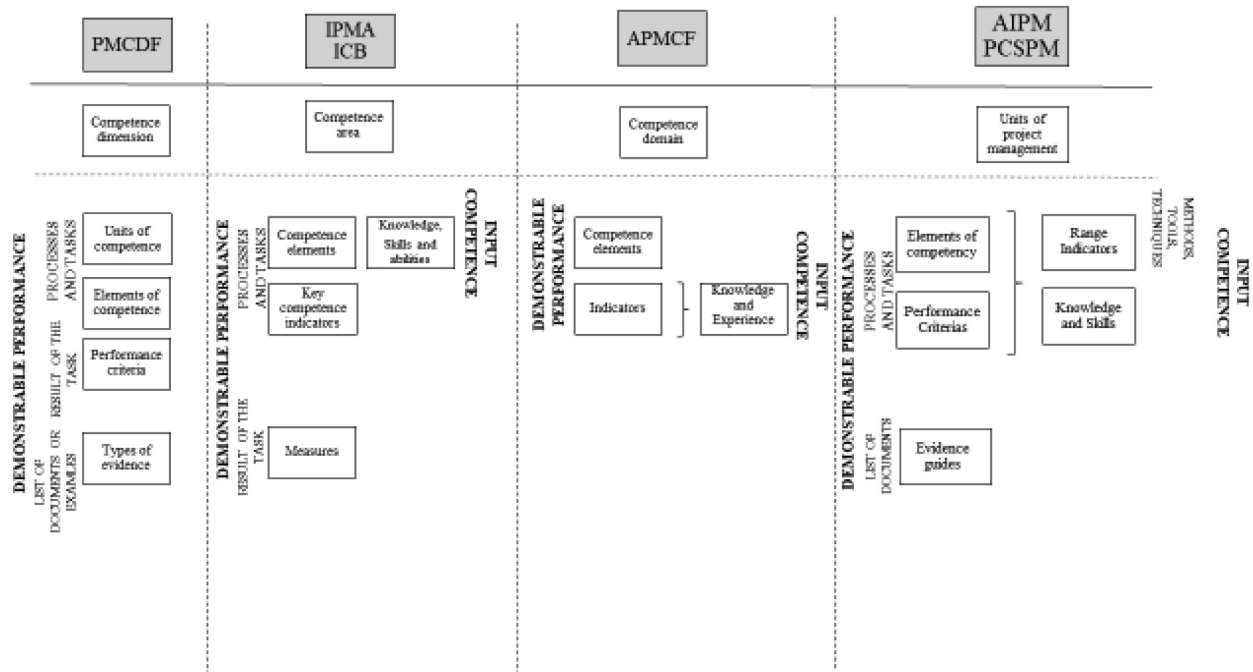| Standard	Competence definition in project management competency standards	Definition of the major components of the competency
PMCDF	*"A cluster of related **knowledge, attitudes, skills,** and other **personal characteristics** that affects a major part of one's job (i.e., one or more key roles or responsibilities), correlates with performance on the job, can be measured against well-accepted standards, and can be improved by means of training and development.* *Major components of competencies include:* ▪ *Abilities* ▪ *Attitudes* ▪ *Behavior* ▪ *Knowledge* ▪ *Personality* ▪ *Skills"* *(Project Management Institute, 2007, p. 73)*	**Knowledge**: *"Knowing something with the familiarity gained through experience, education, observation, or investigation, it is understanding a process, practice, or technique, or how to use a tool." (Project Management Institute, 2007, p. 74)* **Attitudes**: *"Relatively lasting feelings, beliefs, and behavior tendencies directed toward specific persons, groups, ideas, issues, or objects. They are often described in terms of three components: (a) an affective component, or the feelings, sentiments, moods, and emotions about some person, idea, event, or object; (b) a cognitive component or the beliefs, opinions, knowledge, or information held by the individual; and (c) a behavioural component or the intention and predisposition to act." (Project Management Institute, 2007, p. 73)* **Skills**: *"Ability to use knowledge, a developed aptitude, and/or a capability to effectively and readily execute or perform an activity." (Project Management Institute, 2007, p. 75)* **Personality**: *"A unique organization of a relatively stable set of characteristics, tendencies, and temperaments that define an individual and determine that person's interaction with the environment." (PMI, 2007, p. 74)* **Ability**: *"The quality of being able to do something; the physical, mental, financial, or legal power to perform; a natural or acquired skill or talent." (Project Management Institute, 2007, p. 73)* **Behavior**: *"The manner in which an individual acts or conducts oneself under specified circumstances." (Project Management Institute, 2007, p. 73)*
IPMA ICB	*"Individual competence is the application of **knowledge, skills** and **abilities** in order to achieve the desired results." (International Project Management Association, 2015a, p. 15)*	*"**Knowledge** is the collection of information and experience that an individual possesses. For example, understanding the concept of a Gantt chart might be considered knowledge." (International Project Management Association, 2015a, p. 15)* *"**Skills** are 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." (International Project Management Association, 2015a, p. 15)* *"**Ability** is 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." (International Project Management Association, 2015a, p. 15)*
APMCF	*"A competence articulates the expected outcome or performance standard that is achieved as a result of applying a combination of knowledge, personal attitude, and skills and experience in a certain function.* *It can be understood to represent the language of performance in an organisation, articulating both the expected outcomes of an individual's efforts and the manner in which these activities are carried out." (Association for Project Management, 2009, p. 1)*	
AIPM PCSPM	*"Competency encompasses the specification of **knowledge** and **skill** and the application of that knowledge and skill to the standard of **performance** required in the workplace."* *The broad concept of professional competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency in this context is far more than the skills an individual is able to perform in an industry or enterprise; it is equally about the knowledge that an individual brings to the application of those skills. This approach encourages multi-skilling and the ability to transfer competency to new situations leading to improved portability of skills across the workforce. (Australian Institute of Project Management, 2008, p. 6)* *The concept of competency focuses on what is expected of an employee in the workplace rather than on the learning process; and embodies the ability to transfer and apply **skills** and **knowledge** to new situations and environments. (Australian Institute of Project Management, 2008, p. 11)*	*"**Core Competencies** are a group of units of competency within a competency standard that an industry has agreed are essential to be achieved if a person is to be accepted as competent at a particular level or standard. All units may be core, but in many cases competency at a level will involve core units plus optional or specialisation units of competency. Core competencies are normally those central to work in that industry." (Australian Institute of Project Management, 2008, p. 11)* *"**Knowledge** (…)* ▪ *Cognitive skills involved in processes such as judgement, thinking and understanding;* ▪ *Information, which is the base of factual and theoretical material that is accessed, manipulated and used cognitively." (Australian Institute of Project Management, 2008, p. 11)* *"**Skill**: may be intellectual, manual, motor, perceptual, or social. The nature of tasks usually requires a combination of these and usually involves the application of cognitive and psychomotor functions, together with appropriate knowledge" (Australian Institute of Project Management, 2008, p. 17)* *"**Performance**: The calculation of achievement used to measure and manage project deliverables." (Australian Institute of Project Management, 2008, p. 14)* *"**Attributes and Behaviours**: A range of attributes and behaviours that are requirements for project managers, particularly at the higher competence levels. They include wisdom, action and outcome orientation, leadership, innovation, focus, courage, and the ability to influence. (Australian Institute of Project Management, 2008, p. 10)*

Source: Horváth (2018, p. 417-419)

The structure of the competency standards follows the classical structure in each case. Competency standards identify the (professional) project management competence in a slightly different way, but it could be seen that all of the definitions fit into Crawford's (2005) integrated model by mentioning the input competencies (knowledge and skill) and also considering the personal competencies. Standards define the different components, elements of the competence. The classical KSA – knowledge, skill, attitude or ability - division plays a very important role in each of them. The 4th version of the Individual Competence Baseline directly refers to the cognitive domain of Bloom's taxonomy: knowledge, comprehension, application analysis, synthesis and evaluation (Bloom et al., 1964; Bloom & Krathwohl, 1984; Winterton et al. 2006). The structure of the standards reflects the competency model or the demonstrable performance approach (Crawford, 2005), because they all place a bigger emphasis on the description of the demonstrable performance, than on the description of the related input competence (Figure 2).

Horizontal dimension of competence in the project management competency standards

The knowledge areas in the project management standards were checked based on the content categories of the literature. It could be seen that they follow the triple division. Although the Project Manager Competency Development Framework merged the technical and the conceptual and organizational skills into the performance category, the AIPM standard focuses only on the technical skills. In harmony with the classical triple classification, the Project Management Institute (2015b) issued the PMI's Talent Triangle which introduces the triple skill set that a successful project manager should possess: technical, leadership and strategic, and business management competency. This triple division could also be seen in the International Project Management Institute's Individual Competence Baseline for Project, Programme & Portfolio Management and in APM Competence Framework.

Figure 2 The structure of the project management standards

Source: Horváth (2018, p. 420)

The Table 11 summarizes the horizontal dimension of competence in project management competency standards focusing only on the knowledge areas and not mentioning their single competence elements. It also provides an overview on their relationship with the related horizontal competency.

A proposed project management competency model

Summarising the literature on project management competency we could see in section II that neither of the introduced models or approaches are able to represent both the vertical and the horizontal dimensions of the project management competence in an integrated model.

Based on the review of the literature the author of this paper concludes that the introduction of an integrated mod-el could contribute to a better understanding of the holistic nature of the project management competence. This two-dimensional matrix provides a guideline to visualise project management competency in a new way. The Table 12 introduces the proposed project management competency model reflecting on the previous models, approaches and definitions of the academic literature.

The horizontal dimension (focusing on the content) of the project management competence model can be divided into the (1) technical, (2) human and (3) the conceptual and organizational competency elements (based on El-Sabaa, 2001). These elements can be broken down further. The vertical dimension (focusing on the level) of competence are broken down into four different levels (1) knowledge,

Table 11 Horizontal dimension of competence in project management competency standards

Talent Triangle (Project Management Institute, 2015b)	Görög (2013a)	El-Saaba (2011)	Project Manager Competency Development Framework (PMI, 2007)	Individual Competence Baseline for Project, Programme & Portfolio Management (IPMA, 2015a)	APM Competence Framework (APM, 2009)	AIPM Professional Competency Standards for Project Management PART A – Introduction (2008) *and* PART C – Certified Practising Project Manager (CPPM) AIPM (2010)
Strategic & business management *(Business oriented skills, applies to all certifications)*	Technical capabilities	Conceptual and organizational skill	*(Knowledge - in PMBOK Guide)* Performance	Perspective	Contextual	9 competence units mainly focusing on technical elements,
Technical *(Domain expertise, certification specific)*	Project management capabilities	Technical skill		Practice	Technical	
Leadership *(Competency in guiding and motivating; applies to all certifications)*	Human capabilities	Human skill	Personal	People	Behavioural	

(2) skill, (3) attitude and (4) personal features and leadership styles. The project manager's competence and project management competence are separated based on Görög (2013b).

The model integrates both the horizontal and vertical elements of project management competency. Unlike to the previously introduced one-dimensional models, the proposed model provides a more comprehensive approach to understanding the nature of project management competency.

In the proposed model the personal features and the leadership styles are understood to be the highest level of the vertical competency dimension, however, it serves a bridge by means of which any project management competency can be demonstrated.

Table 12 The integrated model of project management competency

				HORIZONTAL DIMENSION of project management competence		
				Technical	**Human**	**Conceptual and organizational**
VERTICAL DIMENSION of project management competence	THE PROJECT MANAGER'S COMPETENCE	PROJECT MANAGEMENT COMPETENCE	**Knowledge**	E.g. Understand MPM network diagram	E.g. Understanding the bonus system and regulation at the company.	E.g. Being familiar with the corporate politics
			Skill	E.g. Preparing the MPM network	E.g. Applying the bonus system	E.g. Utilizing the corporate politics
			Attitude	E.g. Understanding why a MPM chart is an appropriate tool in a certain project management context.	E.g. Understanding the context in which bonuses are used	E.g. Excepting the importance of corporate politics
		PERSONAL FEATURES AND LEADERSHIP STYLE				

DEMONSTRABLE COMPETENCY

Practical implications of the proposed broader and integrated approach to project management competence model

It could be seen that neither former project management competency models were complete, and consensus in the standards there could not be found, resulting in a need for an integrated approach of the project management competence. The new model introduced the vertical and the horizontal dimensions of the competence. The proposed model has a twofold outcome. One is the contribution to the current literature, the other is the actual managerial or practical implication. In the current literature there is no single one perception regarding the structure of project management competence. This article introduces a new two-dimensional model in which the vertical and the horizontal dimensions of the project management competence are integrated into a single model. Based on this, a two-dimensional analysis of the internationally used project management competency standards was conducted, providing a more comprehensive basis for a systematic comparative analysis of the project management competence standards. Comparing the standards based on the vertical dimension highlighted the similarities and the differences regarding the structural design of the standards. It showed how many competency levels, competency elements (in-depth levels within competency) they distinguish and how they adjust the whole design of the standard to this structure. The comparison made by the horizontal dimension highlighted the different content elements of the project management competency and, based on that, the overlaps and deviations could be identified.

Beyond contributing to the current literature, these findings have managerial, i.e. practical implications, as well. One of these practical implications is the potential for developing more appropriate training programs for professionals. In the course of developing such programs, based on the proposed model, it becomes possible to consider both the vertical and the horizontal aspects. Another practical implication is the potential for developing both the qualification and certification system of practitioners to be in line with the associated training programs. The improvement of training programs and qualifications and certifications might result in better prepared project managers. A more skilled project management society might contribute to achieving a higher success rate on projects in different organisations. The proposed integrated model of project management competency could embed to the rethinking of the project manager's career path by introducing a more precise competency assessment at different stages of the employment (hiring, junior and senior levels). It could also serve as a base for a more precise career planning system by determining new KPI's for the project managers.

Limitations and further research

The paper does not focus on every project management standard. Only the four most widely known, internationally used project management competency standards were used in the comparative analysis. It could be seen that the digital transformation has a major impact on the competencies of the future project managers. The new technologies are spreading, big data analysis and artificial intelligence effects our daily work. Thus, today's working environment requires a completely new mindset from managers and it significantly affects the required skill-set and the learning processes of future professional project managers. The current paper has not put this question in the forefront, although this topic could serve as the basis for a future research. Opinions are divided on whether the successful application of the digital tools could be considered as a separate managerial competency, or whether it could be seen as a simple tool. A future empirical study could analyse the impact of the skills related to the workplace performance of the project managers and its contribution to the actual project success.

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