URSZULA ZEMLIŃSKA-SIKORA*

IT PROJECT MANAGER'S COMPETENCIES – SYSTEMATIC LITERATURE REVIEW

Introduction

Digital transformation significantly influences numerous processes in contemporary organizations, with IT projects playing a pivotal role in this rapidly changing environment. The field of project management has been undeniably impacted by digital transformation, particularly through the increased usage of technology and supportive tools. The onset of the COVID-19 pandemic, beginning in late 2019 and escalating globally by March 2020, accelerated these ongoing changes [Zemlińska-Sikora, 2021]. This acceleration led to the immediate initiation of many innovative projects and products, previously awaiting funding, the benefits of which are still being utilized today. The growing prominence of projects in business operations, a phenomenon termed 'projectification' [Juchniewicz, 2018], underscores the increasing importance of IT project management. Consequently, IT project managers (PMs) now play a crucial role in the success of these projects [among others, Spałek, 2004].

IT project management often involves delivering a product that is an intangible computer program. Beyond the critical technical aspects, a project's success often hinges on effective collaboration among team members, facilitated by an assigned project manager (PM). Thus, building a relationship with a team, including gaining trust, seems to be one of the crucial aspects to address at the beginning of the project, [Cripe and Burleigh, 2022]. Several authors perceive PM as a crucial success factor of a project [among others Barth and Koch, 2018]. However, PMs may sometimes lack the necessary skills for successful task execution [Afshari and Kowal, 2018]. The Project Management Institute [2017] defines a PM as "the person assigned by the

* **Urszula Zemlińska-Sikora, M.A.** – AGH University. ORCID: 0000-0002-1488-3225.

performing organization to lead the team that is responsible for achieving project objectives". This definition underscores the various challenges inherent in the PM role. Leading project management organizations acknowledge the complexity of this role and the importance of competencies – defined as 'an important skill that is needed to do a job' [Cambridge, 2022], encompassing abilities, skills, and knowledge [International Project Management Association, 2015].

The profession of project management (PM), designated with the identification code 121904 since 2014 [GOV, 2022], is narrowly defined. Chomicz (2020) also underlines the lack of an unambiguous definition of the PM role. In recent times, many young individuals are shaping their career paths based on their academic learning. Additionally, there is a global shortage in the PM profession, highlighting the need to encourage young talent to pursue this career [Keane, 2022]. Given these considerations, it becomes imperative to precisely define the competencies relevant to the IT PM role. Critical areas such as motivating project team members, facilitating virtual cooperation, and managing changes are of particular importance [Let's Manage IT, 2022]. In this context, a Systematic Literature Review (SLR), as outlined by Czakon [2016], was chosen for its methodological rigor and research credibility. The primary objectives of this work are twofold: firstly, to analyze current literature on the IT PM role, focusing on the competencies required; and secondly, to compile a list of these competencies based on the reviewed papers.

The paper is organized as follows: the next section focuses on the background of PM competencies based on competencies models and project management approaches; the subsequent one presents the SLR approach, including a PRISMA diagram and bibliometric analysis; the fourth section provides an overview of the competencies required by IT PMs; and the final three sections cover proposal for future research, limitations, discussion, and conclusions of the SLR.

1. Universal PM's competencies based on project management approaches and competencies models

It has been previously observed that the PM role is very complex. Existing research recognizes the pivotal role played by the competencies used daily in PM's work as crucial factors leading to the success of a project, as stated before. It's important to note that although the workplace environment has changed over the years, so have the demands placed on PMs. Due to the lack of a defined PM role within agile project teams, the importance of the PM role has been extensively discussed in the literature [SCRUMstudy, 2017]. PMI [Project Management Institute, 2017b] confirmed that many agile frameworks do not address the PM role. This paper concentrates on the PM role, and since this role is not specified in most agile approaches, with AgilePM

being the exception, those other agile approaches will be excluded from this discussion. This section will present universal PMs' competencies based on project management competency models (APM, IPMA) and supplemented by project management approaches (AgilePM, PMBOK, PRINCE2).

The overview of universal PMs' competencies briefly presented in Table 1, is based on the Association for Project Management [2015; 2022] and the Individual Competence Baseline for Project Management [International Project Management Association, 2015]. It is significant to note that some of the competencies, such as "Resource capacity planning" and "Portfolio shaping" typically associated with Program/Portfolio Managers, were not considered in this research.

Table 1. Universal PM competencies

Competency	IPMA, 2015	APM, 2015	APM, 2022
Manage project elements including holistic knowledge of the project	"Power and interest"; "Project design"; "Requirements and objectives"; "Scope"; "Plan and control"	"Requirements management"; "Consolidated planning"; "Reviews"	"Requirements management"; "Integrated planning"; "Reviews"
Tailor tools, techniques, and methods for each project	"Power and interest"	"Solutions development"; "Frameworks and methodologies"	"Solutions development"; "Life cycles"
Focus on business value (benefits) including results orientation	"Power and interest"; "Results orientation"; "Requirements and objectives"; "Scope"	"Business case"; "Benefits management"	"Business case"; "Benefits management"
Schedule management	"Scope"; "Time"	"Schedule management";	"Schedule management"
Cost management	"Finance"	"Budgeting and cost control"; "Financial management"	"Financial management"; "Budgeting and cost control"
Quality management	"Quality"	"Quality management"; "Independent assurance"	"Assurance"; "Quality management"
Resource management	"Resources"	"Resource management"	"Resource management"
Manage risk and issues	"Resourcefulness"; "Risk and opportunity"	"Risk and issue management"	"Risk and issue management"
Analytical skills including reports preparation	"Resourcefulness"	"Reviews"	"Reviews"
Customer management	"Procurement"	"Procurement"; "Contract management"	"Procurement"; "Contract management"
Manage relationships with stakeholders (including negotiation) and expectations	"Power and interest"; "Relationships and engagement"; „Negotiation"; "Requirements and objectives"; "Stakeholders"	"Requirements management"; "Stakeholder and communications management"	"Stakeholder engagement and communication management"; "Requirements management"
Intercultural cooperation	"Culture and values"		

cont. Table 4

Competency	IPMA, 2015	APM, 2015	APM, 2022
Team management including building effective project team	"Relationships and engagement"; "Teamwork"	"Team management"	"Team management"
Leadership	"Leadership"	"Leadership"	"Leadership"
Problem-solving and conflict management including critical thinking	"Conflict and crisis"	"Conflict management"	"Conflict resolution"
(Flexibility) Readiness for change and decision making	"Change and transformation"	"Change control"	"Change control"
Proper communication approach	"Personal communication"	"Stakeholder and communications management"	"Stakeholder engagement and communication management"
Sustainability			"Sustainability"
Diversity and inclusion			"Diversity and inclusion"
Support (post-project) handover		"Transition management"	"Transition management"
Strategic view	"Strategy"; "Requirements and objectives"	"Capability development"	"Capability development";
Ethics	"Personal integrity and reliability"	"Ethics, compliance and professionalism"	"Ethics, compliance and professionalism"
Governance	"Governance, structures and processes"; "Compliance, standards, and regulations"; "Organization and information"	"Governance arrangements"	"Governance arrangements"

Source: own study based on Association for Project Management [2015] APM Competence Framework; Association for Project Management [2022] https://www.apm.org.uk/resources/find-a-resource/competence--framework/overview/ Accessed: 30.12.2022; International Project Management Association [2015] "Individual Competence Baseline Vol.4.0," International Project Management Association, Zurich, Switzerland.

The differences between APM and IPMA approaches are evident in how they present an overview of typical project management aspects such as quality, scope, time, and resources, with a particular emphasis on benefits, results, and a holistic approach to project management [International Project Management Association, 2015]. The Association for Project Management [2015; 2022] also has a standard from 2015, which was updated in 2022 with minor changes to the competencies' presentation, including two new competencies: diversity and inclusion, as well as sustainability. These competencies might be considered emerging directions of project management. A highly significant difference between the organizations is the lack of Transition management (handover to a maintenance team) in the IPMA [International Project Management Association, 2015] standard. What's more, only IPMA [International Project Management Association, 2015] covers intercultural

cooperation as separate competence to be gained by PM. Emotional intelligence and the need for PM certification were also not pointed out in the reviewed materials [Association for Project Management, 2015; Association for Project Management, 2022; International Project Management Association, 2015].

The project management competencies models were presented above. Moving further, project management approaches will be presented briefly: AgilePM, PMBOK, and PRINCE2. It is significant to note that Agile Project Management (AgilePM) is the one agile methodology among the presented three. This implies a distinct understanding of a project's fixed and variable elements. In AgilePM, time, cost, and quality are fixed, while the scope (features) is flexible and delivered based on prioritization. In contrast, traditional approaches like PMBOK and PRINCE2 often view scope and quality as fixed, with time and cost being more variable. These differences can significantly influence the required competencies of project managers.

The AgilePM methodology, as outlined by the Agile Business Consortium [2017], does not provide a clear summary of PM competencies. The role is briefly presented in the handbook which does not address topics previously presented in Table 1. Notably, the handbook lacks a clear statement on ethics and offers a poorly defined perspective on customer management in contract scenarios, which tends to differ in agile approaches compared to more predictable methodologies. Additionally, cost and quality management are not extensively covered, possibly due to their specific treatment in AgilePM. The process of transitioning a project to support is also not addressed in the handbook. Two emerging competencies, sustainability and diversity and inclusion, were also not identified in the AgilePM handbook. However, the handbook does emphasize a facilitative approach to project management over a command-and-control style and highlights the significance of high-level coordination (holistic knowledge of the project). It is also suggested that PM can have either a technical or a business background. Furthermore, it is common for projects to have two different PMs – one representing the customer's side (focusing on business aspects) and another from the supplier's side (specializing in technical aspects).

The British project management methodology [AXELOS, 2018] identifies eight core competencies essential for PM: planning, time management, team management, issues resolution, meticulousness, communication, negotiation, and conflict resolution. PRINCE2, being a traditional methodology, emphasizes a strong formalized position of PM as well as the elements of a project. It requires PMs to possess holistic knowledge and analytical skills, evident in the expectations of preparing various reports. The PM is also seen as a person with significant authority, as they are empowered to make critical decisions during a project. Concerns appear considering poorly presented cost management and support handover in comparison to other project elements. Additionally, the aspect of sustainability was only partially considered, particularly in relation to balancing the PM role and

tailoring it to a specific initiative. Intercultural cooperation as well as diversity and inclusion were not clearly stated in the handbook.

The American standard categorizes competencies into three groups presented in the form of a triangle: technical, strategic, and business management, as well as leadership skills [Project Management Institute, 2017]. Ethics are addressed as a reference to the Code of Ethics and Professional Conduct [Project Management Institute, 2022]. Intercultural cooperation as well as diversity and inclusion are also presented in the book to reduce misunderstanding and help PMs effectively communicate with stakeholders, both within the team and with customers. However, sustainability and transition to support are not identified in the PMBOK. Notably, the latest PMBOK version [Project Management Institute, 2021] includes sustainability as one of the quality dimensions, assessing the deliverables' positive impact on economic, social, and environmental parameters. Despite this, the closing phase remains the final step in the project life cycle, so transition management is not perceived as a project activity. Furthermore, this newest version of PMBOK [Project Management Institute, 2021] presents competencies in performance domains, not as it was before in the form of the PMI talent triangle [Project Management Institute, 2017].

Based on the analysis conducted in this section, it is confirmed that the PM role is indeed complex. Universal competencies have been recognized within the competencies models and project management approaches. Strategic, holistic knowledge of the project including typical project elements such as schedule, scope, resources, risk, issues, cost, and quality, appears to be fundamental. The ability to tailor tools, techniques, and methods to the project is also crucial. Delivering business value and focusing on stakeholders' needs also were consistently mentioned across all standards. Additionally, PMs are expected to possess analytical skills, a problem-solving attitude and an understanding of general ethics as well as governance. Change management, which includes readiness for change, is also addressed as a crucial project management competence. However, differences might be seen between the Association for Project Management [2015; 2022] and others because this competence is specifically addressed in APMs competencies models. Intercultural cooperation, despite its undoubted significance, was not addressed by the Association for Project Management [2015; 2022] and the British methodology [AXELOS, 2018]. What's more, emerging concepts in project management can be noticed. Sustainability is addressed only in the latest version of APM [Association for Project Management, 2022] and PMBOK [Project Management Institute, 2021]. Diversity and inclusion are covered by the American methodology [Project Management Institute, 2017; Project Management Institute, 2021] as well as the APM competencies model [Association for Project Management, 2022].

2. Systematic literature review research methodology

To identify and assess the current knowledge about IT PMs' competencies, as well as build a matrix of the competencies required for the role, a SLR has been conducted. A SLR process was planned based on the procedure proposed by R. Lenart-Gansiniec [2021], which consists of planning, executing, and reporting phases.

In the planning phase, the research purposes were established to conduct a literature review analyzing existing approaches to the IT PMs' competencies and to construct a matrix that presents these competencies. The phase focused on executing the SLR. Four databases were subjectively chosen based on the comparison presented by Lenart-Gansiniec [2021]: Emerald, Science Direct, Web of Science, and Scopus. These databases were searched to find papers about PMs' competencies in the IT industry using the following query: ("project manager" OR "project leader" OR "project leadership") AND ("competences" OR "competencies" OR "skills" OR "roles") AND ("IT" OR "information technology" OR "software development"). The search encompassed all fields in the first two databases and was limited to title, abstract, and keywords in the latter two databases.

Exclusion criteria were applied to streamline the research process. The first criterion was the subject area: the research relates to management as well as the IT industry, so those areas and connected areas (for instance business, and computer science) were included. Secondly, considering the focus on the current state of research, only papers published in the last five years, from 2018 onwards, were considered. The third exclusion criterion combines two aspects: the English language of the publications and content accessibility. It was considered as a single exclusion criterion, because only Emerald, among the chosen databases, allows users to filter out papers that are not accessible. Limiting the search to English-language publications is possible only in Scopus and Web of Science. The results of the searches are presented in Table 2 where a minus sign indicates that the creation was not applicable.
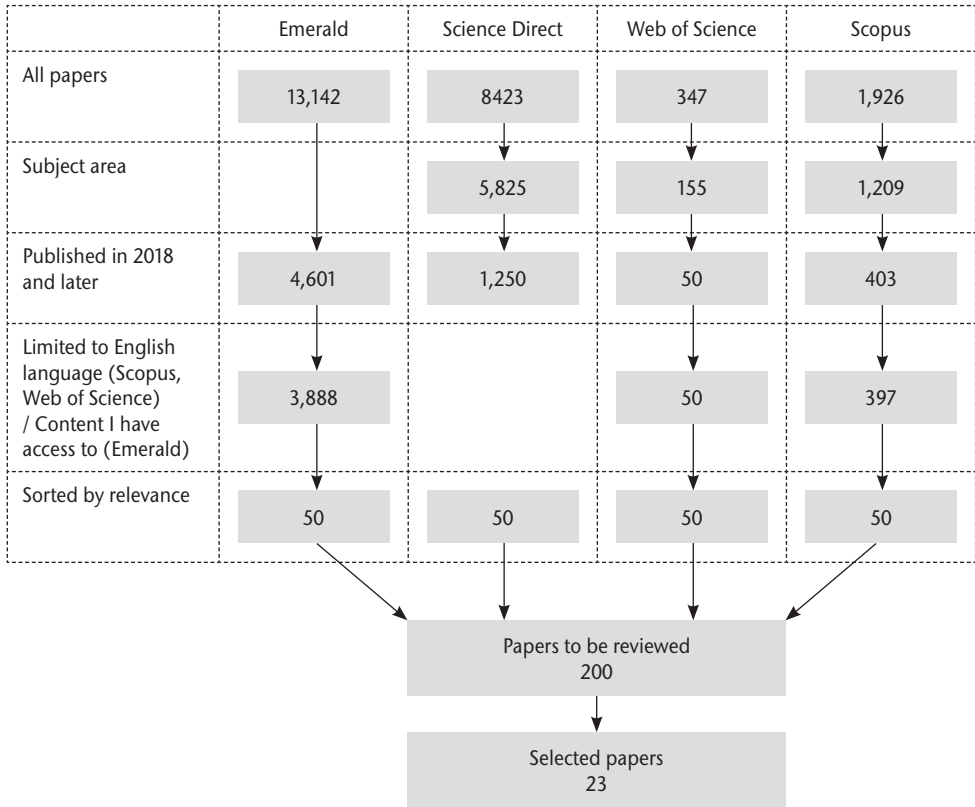
Table 2. Results of the database searches

Database	All papers	Subject area	Published in 2018 and later	Limited to English language (Scopus) / Content I have access to (Emerald)
Emerald	13,142	-	4,601	3,888
Science Direct	8,423	5,825	1,250	-
Web of Science	347	155	50	50
Scopus	1,926	1,209	403	397

Source: own study.

Due to the fact that conducted searches presented over 5,500 records, the author decided to limit the review to only 50 of the most relevant (sorted out by relevance) publications from each database. It resulted in a total of 200 papers, each of which was read and evaluated based on the previously established criteria. The detailed steps of the process are illustrated in Figure 1.

Figure 1. PRISMA diagram

	Emerald	Science Direct	Web of Science	Scopus
All papers	13,142	8423	347	1,926
Subject area		5,825	155	1,209
Published in 2018 and later	4,601	1,250	50	403
Limited to English language (Scopus, Web of Science) / Content I have access to (Emerald)	3,888		50	397
Sorted by relevance	50	50	50	50

Papers to be reviewed
200

Selected papers
23

Source: own study.

Of the publications reviewed, 23 were selected for further analysis. The distribution between journals and books, including book chapters, is depicted in Figure 2. The majority of these works were published in journals – 19 out of the 23 selected publications, which constitutes 83%. Notably, there is no dominant journal or book in this selection; each one is represented by only one paper.

An alternative way to analyze the selected publications is by examining the frequency of publishing. Figure 3 displays the number of articles published per year. The situation, however, is not so clear, and there is no visible trend. In the years 2018, 2019, and 2021, six works published each year. In 2020, the number of publications

reduced to two, which might be attributed to the pandemic, but the similarly low count of three in 2022 might be perceived as decreasing interest in the topic. It is significant to note that this trend can be influenced by the growing prominence of agile approaches, in which the PM role does not exist except in the AgilePM methodology. Nevertheless, this trend does not necessarily pose a threat to PMs in general.

Figure 2. Division of the selected papers between journals and books/chapters
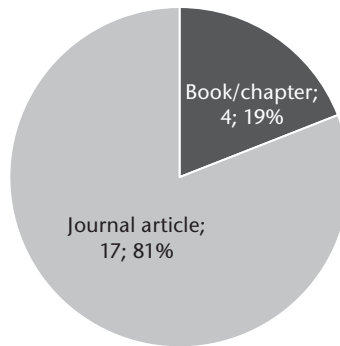
Source: own study.

Figure 3. Frequency of the selected papers presented in the timeline
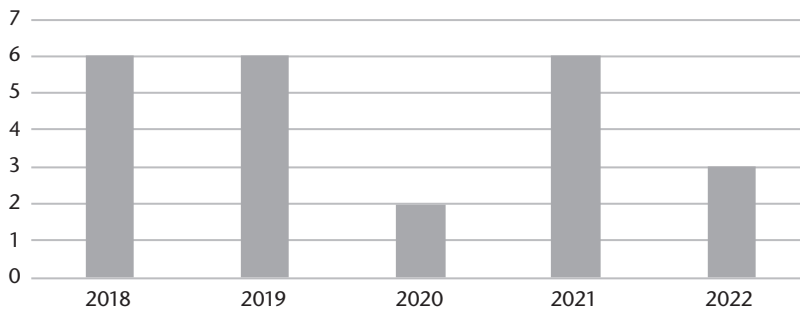
Source: own study.

Regarding the type of research conducted in the analyzed publications, there is no single method that predominates. As presented in Figure 4, eight papers employed quantitative methods, while nine used qualitative methods – including one paper that used both. This distribution indicates that, although the topic is not new, there are still novel elements being explored through qualitative methods. Notably, interviews are the most common qualitative technique (used in six out of nine papers), and questionnaires are the predominant quantitative method (used in seven out of eight papers). Additionally, among the 23 articles, seven were review papers, suggesting that the topic continues to garner significant interest.

Figure 4. Research methods in the selected papers

Source: own study.

3. IT PM's competencies based on SRL

The role of PM appears to be complex across various industries. However, certain aspects are industry-specific for PMs [Afzal, Khan and Mujtaba, 2018; Cripe and Burleigh, 2022; TOGAF, 2018; Sampaio et al., 2021]. Moreover, the PM role itself can be a critical success factor in a project [Barth and Koch, 2018]. In this section, we will examine the competencies of IT PMs based on SLR. Table 3 displays the SLR results, showing the frequency of occurrence as percentage values (right column) and the number of occurrences per year (left column). The table is organized (sorted) as follows: by the total number of occurrences, then by percentage coverage if the numbers are identical, and finally, by alphabetical order in case of a tie.

Table 3. IT PM competencies based on SLR

Competency	2018		2019		2020		2021		2022	
Team management and teamwork	6	100.00%	5	83.33%	2	100.00%	6	100.00%	3	100.00%
Communication	6	100.00%	6	100.00%	1	50.00%	6	100.00%	3	100.00%
Project management	6	100.00%	6	100.00%	1	50.00%	6	100.00%	3	100.00%
Domain knowledge	6	100.00%	5	83.33%	2	100.00%	4	66.67%	3	100.00%
Problem solving (addressing problems) & decision making	4	66.67%	5	83.33%	2	100.00%	6	100.00%	3	100.00%
Leadership	5	83.33%	6	100.00%	1	50.00%	5	83.33%	2	66.67%
Organization	5	83.33%	4	66.67%	2	100.00%	6	100.00%	1	33.33%
Stakeholders management	6	100.00%	6	100.00%	1	50.00%	3	50.00%	2	66.67%
Resources	1	16.67%	6	100.00%	2	100.00%	5	83.33%	3	100.00%
Ability to deal with change	5	83.33%	3	50.00%	1	50.00%	5	83.33%	3	100.00%
Deal with project's complexity	5	83.33%	6	100.00%	1	50.00%	3	50.00%	2	66.67%

Competency	2018		2019		2020		2021		2022	
Trust and relationship building	3	50.00%	4	66.67%	1	50.00%	6	100.00%	2	66.67%
Cost	5	83.33%	2	33.33%	2	100.00%	4	66.67%	2	66.67%
Risk and issue management	4	66.67%	3	50.00%	1	50.00%	4	66.67%	3	100.00%
Strategy	3	50.00%	5	83.33%	1	50.00%	4	66.67%	2	66.67%
Culture awareness	4	66.67%	1	16.67%	1	50.00%	6	100.00%	2	66.67%
Motivation	3	50.00%	2	33.33%	0	0.00%	5	83.33%	2	66.67%
Time	3	50.00%	3	50.00%	1	50.00%	2	33.33%	2	66.67%
Negotiation	2	33.33%	3	50.00%	1	50.00%	5	83.33%	0	0.00%
Creativity	1	16.67%	3	50.00%	0	0.00%	6	100.00%	1	33.33%
Emotional Intelligence	2	33.33%	2	33.33%	1	50.00%	5	83.33%	1	33.33%
Influencing	3	50.00%	3	50.00%	1	50.00%	2	33.33%	1	33.33%
Certification	2	33.33%	2	33.33%	1	50.00%	2	33.33%	1	33.33%
Quality	1	16.67%	2	33.33%	1	50.00%	4	66.67%	0	0.00%
Scope	2	33.33%	2	33.33%	1	50.00%	2	50.00%	1	0.00%
Digital intelligence	1	16.67%	3	50.00%	0	0.00%	3	50.00%	3	33.33%
Schedule	1	16.67%	2	33.33%	2	100.00%	2	33.33%	2	0.00%
Ethics	1	16.67%	1	16.67%	0	0.00%	4	66.67%	4	33.33%
Data analysis (big data)	1	16.67%	0	0.00%	0	0.00%	3	50.00%	3	0.00%
Sustainability	1	16.67%	1	16.67%	0	0.00%	1	16.67%	1	33.33%
Automation	0	0.00%	0	0.00%	0	0.00%	1	16.67%	1	33.33%

Source: own study.

Project management competencies were mentioned in almost all the papers except Wikarek and Sitek [2020]. However, activities such as "setting up a steering committee and defining the budget" or "preparation of the implementation plan" can also be perceived as project management competencies. Interestingly, project management certification is not frequently discussed in the analyzed papers. It can be considered as a higher value of the IT PM itself but also increases the level of trust considering stakeholders [Afshari and Kowal, 2018; S. Duan et al., 2022; F.P. de Silva, 2019; Sołtysik et al., 2020], especially customers. Nonetheless, certifications have a higher value for female IT PMs [Aranyossy, Blaskovics and Horváth, 2018]. Despite their limited mention in the analyzed papers, the number of issued certificates is growing rapidly [Wu, Eom and Song, 2019]. However, certificates should not be considered the sole indicator of project management competency [da Silva, Jerónimo and Vieira, 2019] as practical experience is also crucial [Marnewick and Marnewick, 2021].

Domain-specific technical knowledge, particularly relevant to specific fields within the IT industry, was a prominent topic in most of the reviewed papers (20 out of 23 papers). Regarding 'soft' skills related to the project team, team management and teamwork were emphasized as critical in nearly all the reviewed papers (22 out of 23).

Leadership, trust and relationship building, along with problem-solving and decision-making also featured prominently. However, cultural awareness seems to interconnect with other competencies, particularly in industries [Aranyossy, Blaskovics and Horváth, 2018; Bushuyeva et al., 2018; K. Cripe and Burleigh, 2022; Marnewick and Marnewick, 2019; Marnewick and Marnewick, 2021] where remote work and intercultural cooperation are more frequent. Additionally, the culture of individual team members can significantly impact collaboration aspects, such as communication [Barth and Koch, 2018; Ribeiro, Amaral and Barros, 2021]. Consequently, cultural awareness may be perceived as one of the most crucial competencies [Sołtysik et al., 2020]. Influencing project team members [Cripe and Burleigh, 2022; Murali and Venkatesh, 2019; Sampaio et al., 2021; da Silva, Jerónimo and Vieira, 2019], as well as stakeholders in general [Afshari and Kowal, 2018; Aranyossy, Blaskovics and Horváth, 2018; Gellweiler, 2019 Wu, Eom and Song, 2019], was not frequently mentioned in the analyzed papers, appearing in only 10 out of 23. It is significant to emphasize the PM's competencies in terms of project team management: a proper communication approach that extends beyond the project team, along with the ability to build an effective project team and demonstrate leadership, are key factors for project management success [Ahmed, Philbin and Cheema, 2020; Alvarenga et al., 2019; Ballesteros-Sánchez, Ortiz-Marcos and Rodríguez-Rivero, 2019; Gruden and Stare, 2018]. Moreover, competencies in negotiation, motivation, and creativity cannot be easily interpreted based on the available data, indicating that further research is needed.

Going back to project management competencies, they were analyzed more deeply considering the project constraints: schedule, scope, cost, time, quality, resources, and risks. The first two – schedule and scope – were not frequently highlighted as significant competencies for IT PM. However, competencies related to cost, time, resources, as well as risk and issue management have much higher interest scores. Notably, interest in these constraints has been increasing over time. Interestingly, quality was not as popular a topic in the analyzed publications. This might be due to the technical project team typically being responsible for this aspect. Change and stakeholder management, as well as dealing with the complexity of the projects, still seem to be the actual issues.

Other competencies that warrant consideration are digital and emotional intelligence. While not frequently mentioned in the analyzed papers, their importance is becoming increasingly evident. These competencies are gaining popularity in the field. Digital skills, for instance, enable IT Project Managers (PMs) to enhance team performance [Cripe and Burleigh, 2022; Shet and Pereira, 2021] and it seems to be one of the crucial competencies in the future. Emotional intelligence, on the other hand, supports [Bigbee and Stevenson, 2019; Marnewick and Marnewick, 2021; Patel and Poston, 2021]. IT PM's in fostering open communication approach and plays

a crucial role in the project's success [Afzal, Khan and Mujtaba, 2018; Grander et al., 2022]. Sustainability is a relatively new concept in the field of project management, yet it was mentioned in four out of the 23 papers reviewed. Data analysis (big data) and automation are still not areas of interest considering the IT PM competencies. However, a strategic viewpoint is often highlighted as a key competency, mentioned in over 50% of the papers. Organizational (governance) skills, while frequently noted, appear to be particularly significant in relation to competencies such as team management and influencing. Lastly, ethics was not extensively described in the papers, featuring in only eight out of 23. This might be because standards like PMBOK or PRINCE2 typically address and ensure ethical aspects of project management work.

4. Future works and limitations

The conducted SLR reveals the complexity of the IT PM role, underscoring the need for a combination of social, domain, and project management skills. However, practical experience remains essential. The SLR also indicates that it is challenging to precisely determine the necessary level of each competency for IT PMs. Additionally, competency expectations may vary depending on the IT PM's level of seniority. It is significant to note that the IT industry cooperates with other sectors, such as banking or healthcare, which may introduce unique industry-specific conditions. Conditions might also vary based on gender, project management approach, the IT PM's background, or the customer's country of origin (culture). Based on the conducted SLR, a research gap has been identified, suggesting that further investigation with practitioners may be required to fully understand these nuances.

The conducted research was organized with high discipline; however, it may have some potential limitations that must be acknowledged. First, the research considered four databases with the presented specific combination of search terms. This approach might have overlooked relevant literature due to omitted keywords or phrases. Second, the SLR was limited to English papers, potentially excluding significant publications in other languages that have not been translated into English. Third, the research was conducted by a single individual, which raises the possibility of subjective bias from the researcher. Fourth, the approach involved reviewing only 50 of the most relevant records from each database. While this helped to focus on the most important papers, it may have excluded other relevant workers. Lastly, some of the papers focused on particular IT PMs' competencies, such as leadership [Afzal, Khan and Mujtaba, 2018; Bushuyev et al., 2021; Cripe and Burleigh, 2022; da Silva, Jerónimo and Vieira, 2019], emotional intelligence [Afzal, Khan and Mujtaba, 2018], or digital intelligence [Marnewick and Marnewick, 2021], which could have influenced the overall findings.

5. Discussion

PM competencies are a crucial element influencing project success. However, defining these competencies remains ambiguous, and despite evolving requirements, clear changes are not well articulated. Research conducted within this article focuses on popular competencies models (IPMA, APM), project management methodologies (PMBOK, PRINCE2, AgilePM), and recent IT PM-focused literature, unveiling prevalent expectations and potential development trajectories for IT PMs.

In summarizing the findings from the first part of the analysis, which focused on competency models and project management approaches, several universal PM competencies were identified. Competencies connected with project elements, as well as the ability to have a strategic viewpoint, seem to be crucial. Significant is also to ability to a changing environment, which is additionally underlined through required change management competence. On top of that, PMs are expected to have analytical skills, a problem-solving attitudes, and a general understanding of governance and ethics. The competency models from the Association for Project Management [2015, 2022] and the PRINCE2 framework [AXELOS, 2018] did not emphasize intercultural cooperation. However, emerging concepts such as sustainability and diversity and inclusion are becoming more recognized. Sustainability was acknowledged in the Association for Project Management's 2022 model and the Project Management Institute's 2021 approach, while diversity and inclusion were mentioned in these two sources and PMBOK [2017]. These insights directly contribute to addressing the first objective of this work, shedding light on the crucial competencies as well as emerging ones.

The second phase of the analysis focused on reviewing papers identified in the SLR process. It confirms that PM competencies, tied to specific project elements, are extensively discussed, along with general project management skills. Certifications remain significant, particularly for female PMs, but practical experience is paramount. Domain-specific knowledge is also underscored. Emerging competencies gaining prominence include digital skills, emotional intelligence, sustainability, and competencies in data analysis and automation. Among the reviewed publications, seven were identified as review papers, and three of them employed SLR. Ribeiro, Amaral and Barros [2021] conducted a study focusing on Industry 4.0 PM competencies, contrasting them with a traditional PM competencies. Shet and Pereira [2021] examined managerial competencies within Industry 4.0, identifying 14 distinct competencies. The third SLR paper also cantered on Industry 4.0, specifically examining the competencies necessary for project team members to effectively operate in this rapidly evolving sector. All of the analyzed articles with SLR were

connected to Industry 4.0, which, while not exclusively IT, is strongly connected to it. These insights address the second objective of this paper, highlighting evolving competencies in the field.

Conclusion

Undoubtedly, PM competencies are crucial to achieving success in projects. The conducted research has underscored the importance of competencies, drawing on established competency models and project management methodologies. Based on this, both universal and emerging PM competencies were distinguished. Subsequently, the SLR study on IT PMs' competencies was carried out, utilizing four literature databases. From this SLR, 23 papers were published in 2018 and later were selected for analysis. However, interpreting the trend in publication frequency proved challenging. This could be attributed to the increasing popularity of agile approaches, wherein the traditional role of an IT PM is often absent. Despite that, IT PMs remain essential in practical scenarios. According to the analysis, only scientific papers have been used to identify potential IT PM's competencies; however, additional research with practitioners is required to highlight the most important ones. The SLR study had two primary purposes. Firstly, the SLR provided an understanding of the IT PM role as per the existing literature. Secondly, based on the selected papers IT PM competencies were listed. Nonetheless further research is needed to show core competencies.

IT project management is a dynamic and rapidly evolving field. The COVID-19 pandemic accelerated the changes, particularly those driven by the IT industry. The shift towards remote work and intercultural cooperation are now more apparent, especially in the IT industry. These changes include coordinating across different time zones and collaborating with team members and clients from diverse cultural backgrounds without face-to-face interaction. To cooperate in an intercultural setting and frequently communicate with clients from various industries and nations, the IT PM needs to possess a set of specialized skills. Emotional intelligence, digital intelligence, and sustainability may be emerging competencies for IT PMs.

The research conducted has revealed that IT PM competencies are still a relevant topic today and that new influencing factors have emerged because of the changing environment. This investigation has laid the groundwork for further study, which is essential for acquiring more comprehensive knowledge and a deeper understanding of the subject.

References

[1] Afshari A.R. Kowal J. [2018], *IT project manager selection review*, 2018 IEEE 16th international conference on industrial informatics (INDIN) [Preprint], https://doi.org/10.1109/indin.2018.8472096.

[2] Afzal A., Khan M.M., Mujtaba B.G. [2018], The impact of project managers' competencies, emotional intelligence and transformational leadership on project success in the information technology sector, *Marketing and Management of Innovations*, (2): 142–154, https://doi.org/10.21272/mmi.2018.2-12.

[3] Agile Business Consortium [2017], *AgilePM Handbooks v2*. Agile Business Consortium.

[4] Ahmed R., Philbin S.P., Cheema, F.A. [2020], Systematic literature review of project manager's leadership competencies, *Engineering, Construction and Architectural Management*, 28(1): 1–30, https://doi.org/10.1108/ecam-05-2019-0276.

[5] Alvarenga J.C. *et al.* [2019], The project manager core competencies to project success, *International Journal of Managing Projects in Business*, 13(2): 277–292, https://doi.org/10.1108/ijmpb-12-2018-0274.

[6] Aranyossy M., Blaskovics B., Horváth, Á.A., [2017], How universal are IT project success and failure factors? Evidence from Hungary, *Information Systems Management*, 35(1): 15–28, https://doi.org/10.1080/10580530.2017.1416943.

[7] Association for project management [2015], *APM Competence Framework*

[8] Association for project management [2022], https://www.apm.org.uk/resources/find-a-resource/competence-framework/overview/ (accessed: 30.12.2022).

[9] AXELOS [2018], *PRINCE2 – Skuteczne Zarzadzanie Projektami [Polish Print Version of Managing Successful Projects with PRINCE2]*. Stationery Office.

[10] Ballesteros-Sánchez L., Ortiz-Marcos I., Rodríguez-Rivero R. [2019], The project managers' challenges in a projectification environment, *International Journal of Managing Projects in Business*, 12(3): 522–544, https://doi.org/10.1108/ijmpb-09-2018-0195.

[11] Barth C., Koch, S. [2018], Critical success factors in ERP upgrade projects, *Industrial Management & Amp; Data Systems*, 119(3): 656–675, https://doi.org/ 10.1108/imds-01-2018-0016.

[12] Bigbee J.A.S., Stevenson, D.H. [2019], IT project communication, *International Journal of Information Technology Project Management*, 10(3): 56–72, https://doi.org/10.4018/ijitpm.2019070104.

[13] Bushuyeva N. *et al.* [2018], *IT projects management driving by competence*, 2018 IEEE 13th international scientific and technical conference on computer sciences and information technologies (CSIT) [Preprint], https://doi.org/10.1109/stc-csit.2018.8526680.

[14] Bushuyev S. *et al.* [2021], *Modeling leadership for developing information technologies based on Agile methodology*, 2021 IEEE international conference on Smart Information Systems and Technologies (SIST) [Preprint], https://doi.org/10.1109/sist50301.2021.9465910.

[15] Cambridge [2022], Definition https://dictionary.cambridge.org/dictionary/english/competency (accessed: 20.12.2022).

[16] Chomicz M. [2020], *Znaczenie i rozwój kompetencji polskich kierowników projektów informatycznych*, SGH Publishing House, Warsaw (in Polish).

[17] Cripe K.M., Burleigh C. [2022], Examining leadership skills, behaviors, and effective communication for virtual IT project managers, *Team Performance Management: An International Journal*, 28(3/4): 223–237, https://doi.org/10.1108/tpm-11-2021-0085.

[18] Czakon W. [2016], *Metodyka systematycznego przeglądu literatury,* in: *Podstawy metodologii badan w naukach o zarzadzaniu*. Wydawnictwo Nieoczywiste.

[19] Duan S. *et al.* [2022], *Managerial and professional skills and dispositions from professionals' interviews*, *The 23 rd annual conference on information technology education* [Preprint], https://doi.org/10.1145/3537674.3554751.

[20] Gellweiler C. [2019], Collaboration of solution architects and project managers, *International Journal of Human Capital and Information Technology Professionals*, 10(4): 1–15, https://doi.org/10.4018/ijhcitp.2019100101.

[21] GOV [2022], *Klasyfikacja zawodów i specjalności*, https://psz.praca.gov.pl/rynek-pracy/bazy-danych/klasyfikacja-zawodow-i-specjalnosci/wyszukiwarka-opisow-zawodow//-/klasyfikacja_zawodow/zawod/121904?_jobclassificationportlet_WAR_nnkportlet_backUrl=https%3A%2F%2Fpsz.praca.gov.pl%2Frynek-pracy%2Fbazy-danych%2F-klasyfikacja-zawodow-i-specjalnosci%2Fwyszukiwarka-opisow-zawodow%2F%3Fp_p_id%3Djobclassificationportlet_WAR_nnkportlet%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_count%3D1%26_jobclassificationportlet_WAR_nnkportlet_query%3Dkierownik%2Bprojektu (accessed: 19.12.2022).

[22] Grander G., et al. [2022], Classification of portfolio and project managers: A performance orientation*, The Journal of Modern Project Management*, 9(3): 7–19, https://doi.org/10.19255/JMPM02801

[23] Gruden N., Stare A. [2018], The influence of behavioral competencies on project performance, *Project Management Journal*, 49(3): 98–109, https://doi.org/10.1177/8756972818770841.

[24] International Project Management Association [2015], *Individual Competence Baseline Vol.4.0*, International Project Management Association, Zurich, Switzerland.

[25] Iriarte C., Orè S. B [2018], *Soft skills for IT project success: A systematic literature review*

[26] Juchniewicz M. [2018], Projektyzacja – koncepcja, zakres, konsekwencje, *Studia i Prace. Kolegium Zarządzania i Finansów*, 159: 43–58

[27] Keane S.F. [2022] Becoming a project manager: A social cognitive perspective, *Project Leadership and Society*, 3: 100051, https://doi.org/10.1016/j.plas. 2022.100051.

[28] Lenart-Gansiniec R. [2021], *Systematyczny przegląd literatury w naukach społecznych: Przewodnik dla studentów, doktorantów i nie tylko*, Wydawnictwo Naukowe Scholar, Warsaw.

[29] Let's manage IT [2022], *IT Manager of tomorrow – Report*, https://letsmanageit.pl/hubfs/Raport%20ITMT%202022/Raport%20ITMT%202022–4.pdf?utm_medium=email&_hsmi=213639679&_hsenc=p2ANqtz-_K5mV0RCGbc2P8 rr391SbHn4-vKqdVBtaOT-P6c3vQzjryxR6nddwo_gIgHgoexFDYabWRpzu1pOhe0lHGgDmtFD4p6uA&utm_content=213639679&utm_source=hs_automation, (accessed: 29.12.2022).

[30] Marnewick C., Marnewick A.L. [2019], The demands of industry 4.0 on project teams, *IEEE transactions on engineering management*, 57(3): 1–9, https://doi.org/10.1109/tem.2019.2899350.

[31] Marnewick C., Marnewick A. [2021], *Digital intelligence: A must-have for project managers*, Project Leadership and Society, 2: 100026, https://doi.org/10.1016/j.plas.2021.100026.

[32] Murali B., Venkatesh S. [2019], A research on skills of project managers and success of projects in information technology (IT) companies in Bengaluru city, *International Journal of Engineering and Advanced Technology*, 8(6S): 428–431, https://doi.org/10.35940/ijeat.f1091.0886s19.

[33] Patel J., Poston R. [2021], Using social intelligence to overcome agile adoption challenges, *Journal of Computer Information Systems*, 62(4): 740–751, https://doi.org/10.1080/08874417.2021.1913670.

[34] Project management institute [2017b], *Agile practice guide*. 1st edn. Project management institute.

[35] Project management institute [2017], *A guide to the project management body of knowledge (PMBOK® Guide) – 6th edn.* Project management institute.

[36] Project management institute [2021], *A guide to the project management body of knowledge (PMBOK® Guide) – 7th edn.* and the standard for project management (ENGLISH). 7th edn. Project management institute.

[37] Project management institute [2022], *Code of ethics and professional conduct* https://www.pmi.org/about/ethics/code, (accessed: 30.12.2022).

[38] Ribeiro A., Amaral A., Barros T. [2021], Project manager competencies in the context of the Industry 4.0, *Procedia Computer Science*, 181: 803–810, https://doi.org/10.1016/j.procs.2021.01.233.

[39] Sampaio S. *et al.* [2021], Reach for the sky: Analysis of behavioral competencies linked to project success, *International Journal of Managing Projects in Business*, 15(1): 192–215, https://doi.org/10.1108/ijmpb-09-2020-0276.

[40] SCRUMstudy [2017], *A Guide to the Scrum Body of Knowledge (SBOK Guide).* 2017th edn. VMEdu Inc.

[41] Shet S.V., Pereira V. [2021], Proposed managerial competencies for Industry 4.0 – implications for social sustainability, *Technological Forecasting and Social Change*, 173: 121080, https://doi.org/10.1016/j.techfore.2021.121080.

[42] Spałek S., [2004], *Krytyczne czynniki sukcesu w zarządzaniu projektami*, Wydawnictwo Politechniki Śląskiej, Gliwice.

[43] Sołtysik M. *et al.* [2020], Assessment of project manager's competence in the context of individual competence baseline, *Education Sciences*, 10(5): 146, https://doi.org/10.3390/educsci10050146.

[44] da Silva F.P., Jerónimo H.M., Vieira P.R. [2019], Leadership competencies revisited: A causal configuration analysis of success in the requirements phase of information systems projects, *Journal of Business Research*, 101: 688–696, https://doi.org/10.1016/j.jbusres.2019.01.025.

[45] TOGAF [2018], *The Open Group Standard*, US, pp. 467–471.

[46] Wikarek J., Sitek P. [2020], Configuration of employee competences in IT projects, in: *Intelligent Information and Database Systems*, Springer, Cham: 3–12, https://doi.org/10.1007/978-3-030-42058-1_1.

[47] Wu W.W., Eom M.T., Song J. [2019], Spheres of it project complexity and it project manager archetypes and roles: A case study*, Information Systems Management*, 36(4): 323–335, https://doi.org/10.1080/10580530.2019.1651114.

[48] Zemlińska-Sikora U., [2021], Pozytywna strona ryzyka. Przypadek branży IT w czasie pandemii COVID-19, in: *Wyzwania gospodarcze w czasie pandemii*, Wydawnictwo AGH, Cracow: 121–135.

IT PROJECT MANAGER'S COMPETENCIES – SYSTEMATIC LITERATURE REVIEW

Abstract

In modern organizations, numerous processes have evolved as a result of digital transformation. Today's business operations increasingly incorporate project-based approaches. The COVID-19 pandemic accelerated changes that brought on by the transformation of the IT sector. The field of IT project management is both fascinating and rapidly evolving. Appropriate collaboration between project team members, facilitated by a designated Project Manager (PM), is essential for the IT project's success. However, the specific competencies that an IT PM should possess are not clearly defined. This study aims to present research grounded in competency models and project management methodologies, alongside a systematic

literature review of IT PM competencies. From the conducted work, a list of competencies has been compiled, identifying sustainability, digital intelligence, and emotional intelligence as potential emerging competencies. Additionally, limitations and future research directions have been discussed.

KOMPETENCJE KIEROWNIKÓW PROJEKTÓW IT – SYSTEMATYCZNY PRZEGLĄD LITERATURY

Streszczenie

We współczesnych organizacjach wiele procesów uległo przekształceniom w wyniku transformacji cyfrowej. Dzisiejsze operacje biznesowe coraz częściej wykorzystują podejścia oparte na projektach. Pandemia COVID-19 przyspieszyła zmiany możliwe dzięki transformacjom dostarczanym przez sektor IT. Obszar zarządzania projektami IT jest fascynujący i dynamicznie ewoluujący. Odpowiednia współpraca między członkami zespołu projektowego, wspierana przez przypisanego Kierownika Projektu (KP), jest niezbędna dla powodzenia projektów IT. Kompetencje, jakie powinien posiadać IT KP, nie są jednak szczegółowo określone. Celem tej pracy jest przedstawienie badań opartych na modelach kompetencyjnych i metodykach zarządzania projektami, wraz z systematycznym przeglądem literatury dotyczącym kompetencji IT KP. Na podstawie przeprowadzonych analiz stworzono listę kompetencji, identyfikując zrównoważony rozwój (*sustainability*), inteligencję cyfrową i inteligencję emocjonalną jako potencjalnie wschodzące. Ponadto omówiono ograniczenia i przyszłe kierunki badań.