

# REVIEW AND ANALYSIS OF PROJECT MANAGEMENT KNOWLEDGE AREAS IN THE CONTEMPORARY LITERATURE

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## ABSTRACT

*The purpose of this paper is to analyze 10 key knowledge areas of project management. The objective is to identify the most frequently mentioned Project Management Knowledge Areas (PMKAs) in relevant project management journals and to analyze their interrelationships. To this end, we searched for articles published in 10 project management journals indexed in the Web of Science Core Collection database (WoSCC) from 2007 to 2019. A total of 1,329 articles relating to some of the PMKAs were found. Project Time/Schedule Management, Project Stakeholder Management, Project Resource Management, and Project Communication Management are the most represented and most related PMKAs, while Project Scope Management, Project Procurement Management, Project Quality Management is surprisingly underrepresented and hardly related to other PMKAs. The study's limitation refers to the limited number of journals searched for in the WoSCC database and singled out using the keyword "project". There are certainly other journals that publish articles on project management, and the inclusion of more journals in the analysis could potentially deepen the interpretation of the results. The value of the study lies in deepening the knowledge of project management in general and the representation of some PMKAs in the academic literature in particular, and in highlighting those PMKAs that need more attention in the future.*

**Keywords:** Project Management, Project Management Knowledge Areas, Iron Triangle.

## INTRODUCTION

Project management is a constantly developing area within organizational theory and practice. After the Second World War, theory, practice, and the scientific and professional literature in the field of project management saw rapid development as a result of the race between the U.S.A. and the then U.S.S.R. to develop military and space technology (Cleland & Ireland, 2007; Picciotto, 2020). The most straightforward definition describes project management as the application of knowledge, skills, tools, and techniques to carry out diverse activities, the purpose of which is to meet the project requirements (Project Management Institute, 2017; Wysocki, 2019). Project management involves planning, organizing, monitoring, and controlling all aspects of a project, and the motivation of all involved to achieve the project's objectives safely and in accordance with the agreed time, cost and performance criteria (ICB-

IPMA, 2006). Project management also refers to the ability to lead, allocate, and control all project resources throughout a project's lifecycle, using modern management techniques to accomplish pre-defined objectives and satisfy all project participants in a specified time (Gido & Clements, 2009; Perić, 2009).

According to the American standard, the key Project Management Knowledge Areas (PMKAs) needed to fully understand project management processes are Project Integration Management, Project Scope Management, Project Schedule Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, and Project Stakeholder Management (Project Management Institute, 2017). Every PMKA contains specific processes, practices, input, output, tools, and techniques, and together they complement each other to meet the project's overall requirements and demands. The synergistic effect of these PMKAs is well known in project practice and science, despite some PMKAs often being singled out as "*more important*" than others. For example, it is often said that project management focuses on delivering a product according to defined scope, time, cost, and quality (Project Management Institute, 2017; Wysocki, 2019; Zidane & Olsson, 2017). Furthermore, a term frequently mentioned in the project management literature is the Iron Triangle, which refers to the three major elements of or constraints to project management – time/schedule, cost, and quality (Duggal, 2011; Pollack et al., 2018; Shenhar & Dvir, 2007). The Iron Triangle was originally conceived as a framework to enable project leaders to evaluate and balance the competing demands of cost, time, and quality within their projects (Atkinson, 1999). Over time, it became the favoured method for defining and measuring project performance, with the general perception of project leaders being that only those three criteria are needed for a project to be successful (Pinto, 2010). The Iron Triangle concept refers to the interdependence of three constraints: increasing quality may require an increase in time, which could lead to an increase in cost, while a fixed time schedule might result in a drop in quality and a subsequent increase in cost (Morris & Sember, 2008). Although the strength of the Iron Triangle has often been examined with regard to other knowledge areas such as Scope or Performance (Badewi, 2016; Pinto, 2010; Pollack et al., 2018), it remains the dominant concept in project management.

The purpose and aim of this paper are to investigate and analyze whether some PMKAs are in fact more important than others. In other words, are Time, Cost and Quality truly the predominant PMKAs mentioned in the relevant literature in the context of successful project management, or can other PMKAs of equal or even greater importance be found in the available literature? The next section provides a brief review of the ten basic PMKAs according to the Project Management Institute (2017). The third section explains the methodology of research, and the fourth, presents and interprets/discusses the obtained results. The last section closes with concluding thoughts, the paper's limitations, and recommendations for further research.

## LITERATURE REVIEW

### Project Integration Management

Project Integration Management is a specific PMKA, directly under the control of the project manager and, as a rule, is not delegated to other project members (Project Management

Institute, 2017). It is a kind of integration engineering, which is a part of systems engineering (Eisner et al., 1993) that creates a governance structure that makes the management of key stakeholders' requirements more systematic (Asif et al., 2010). Kim (2006) explores the link between supply chain integration and a company's performance, while Berteaux & Javernick-Will (2015) highlight the organizational integration of knowledge, process, and strategy, indicating that organizational integration helps to improve project performance through capabilities developed in previous projects and innovations throughout the organization, all of which contribute to keeping the organization competitive. Integration management has a significant impact on the performance of project processes. There is a strong relationship between these two concepts (Demirkesen & Ozorhon, 2017), which defines resource allocation, balancing (competing) projects requirements and demands, analyzing alternative options, adjusting project processes to meet objectives, and managing the interdependence among PMKAs (Project Management Institute, 2017).

### **Project Scope Management**

Project Scope Management is about defining and carrying out all processes that ensure the project involves all activities needed for its successful execution (Project Management Institute, 2017). This means that not a single activity needed to deliver a project can be omitted but also that activities that are unessential should not be included in the project. As every project has deliverables (for example, a product or service), scope is typically defined at the level of the requirements of individual deliverables/products but also at the level of overall project requirements. Both in theory and in practice, some elements linked to defining work schedules, work duration, resource needs, and work costs are often included in project scope (Mazur et al., 2009; Moroz & Nemchenko, 2017; Pollack et al., 2018). As there are a special PMKAs for those elements, project scope should be viewed exclusively as defining and controlling activities that lead to accomplishing project objectives (Bingham & Gibson, 2017). The purpose of defining project scope is to identify project objectives, output, requirements, and constraints by analyzing the project's final state, with overall work on the project divided into smaller, more manageable, group activities or so-called work packages.

### **Project Schedule Management**

The time needed to deliver individual project activities and/or the entire project is one of the fundamental characteristics of any project, and an element of the so-called Iron Triangle (Baloyi & Bekker, 2011; Duggal, 2011; Pollack et al., 2018). As the Project Management Institute (2017) pointed out, it is not time that is managed but rather the schedule of project activities that is defined and managed. Accordingly, the name of this knowledge area was changed from Time Management to Schedule Management. A project schedule is an element of project management which analyses and develops a specific timeline, providing a detailed plan of activities, delivery, and milestones within a project, and it serves as a communication tool in communicating with other project stakeholders. Once the activities needed for deliverables are specified, the interrelationship of activities is determined and the time required to perform each activity is estimated. All this is brought together and documented in the schedule management plan. The schedule usually includes the planned start and finish dates, the duration of activities,

and the resources allocated to each activity. Although the critical path defines the priority activities that must be completed exactly within the given time in order for the project not to be delayed (Liu & Hu, 2021), a certain amount of flexibility is needed in other activities to ensure the project manager can successfully deliver the project (Zidane & Olsson, 2017).

### **Project Cost Management**

Cost is yet another part of the so-called Iron Triangle. Cost usually refers to direct costs (for example, the cost of labor and materials) that are directly linked to project delivery, and to indirect costs that include general and administrative costs. In any project, cost management is an exceptionally important element of project management, and it reflects directly on a company's strategic objectives, business plans, and mission (Pinto, 2010). Ultimately, good cost management will help to maximize a company's profit. Hence, such a system should have the support of upper-level management but should also seek to involve employees across all company positions (Huang & Zhang, 2013). A manager's aim is to express all costs in financial terms. Accordingly, Project Cost Management refers to planning, estimating the financial resources needed to deliver a project, aggregating individual costs into a budget, and controlling planned and realized costs (Project Management Institute, 2017).

### **Project Quality Management**

Quality is the last piece of the Iron Triangle (Pollack et al., 2018). In a project setting, quality refers to both meeting a project's technical specifications and to meeting the needs and expectations of customers. Quality also refers to the quality of project deliverables and to the quality of project management. Quality management includes knowledge and processes needed to ensure the highest quality of products and services resulting from the project process. To achieve (and maintain) the desired level of excellence, it is necessary to plan for quality in a project (establish quality standards), ensure that quality policies have been adequately implemented in the project (so-called quality assurance) and, finally, monitor and assess the performance of specific project deliverables and management processes (Lu et al., 2019; Ab Malik et al., 2019; Nastase, 2013; Project Management Institute, 2017).

### **Project Resource Management**

Project Resource Management in the project process is a vital element that can cause a project to either fail or succeed. Human resources (knowledge, skills, and competencies) are often highlighted as the most important resources and determinants of project success or failure (Denicol et al., 2020; Do Vale et al., 2018). This is linked to leadership and coaching, by which a project manager with developed leadership and coaching skills guides participants in the project process to a successful ending, by motivating them and providing them with the knowledge and skills needed, while shaping future project managers through continuous learning (Woods & Abdon, 2011; Shokory & Surady, 2018; Spence et al., 2019). The Project Management Institute (2017) points out that resource management refer to other types of resources as well. The main processes in resource management are resource estimation, acquisition of required resources,

team and team competencies building, team management, and resource control, to ensure that all required material resources will be allocated and used according to plan.

### **Project Communication Management**

Communication is an essential precondition to work on a project. Project Communication Management involves planning communications, managing communications, and monitoring communications (Project Management Institute, 2017). This is not simply a process of information exchange, but rather a knowledge area that also encompasses processes needed to ensure the timely and proper planning of, search for, collection, creation, storage, management, control, monitoring and, ultimately, use of project information. Effective communication can help to achieve considerable cost savings and reduce project duration (Yap & Skitmore, 2020).

### **Project Risk Management**

Every project has certain risks (Denicol et al., 2020; Rehman et al., 2020). A risk is an uncertain event or condition that, if it occurs, can have a positive or negative effect on project objectives. Hence, risk management is a component of project management. According to the Project Management Institute (2017), risk management consists of the following steps: risk management planning, risk identification, qualitative and quantitative risk analysis, risk response planning, response implementation, and process monitoring and control. Although every risk has a certain probability of occurring and can have a certain impact on a project, high probability risks and high impact risks need to be especially monitored (Darwish & Zubari, 2020). As it is impossible to prevent some risks from happening, it is the task of project management to keep risk at a level that is acceptable to the project and its stakeholders.

### **Project Procurement Management**

Project Procurement Management refers to the processes needed for procuring products, services, or deliveries from stakeholders outside the project team (Project Management Institute, 2017). By carefully preparing and planning procurement, conducting procurement, and controlling procurement the most favourable supplier is selected (whose price does not necessarily have to be the lowest) (Lent, 2013; Owusu et al., 2020; Rane et al., 2019). This phase of project management should ensure that the project is managed in an efficient, sustainable and legally compliant manner.

### **Project Stakeholder Management**

Project Stakeholder Management is the most recent PMKA (Project Management Institute, 2017). A project does not exist for itself but for specific stakeholders, such as a sponsor or owner who wishes to gain personal benefit from the project (profit, for example) or a customer who will consume (and pay for) project deliverables (Derakhshan et al., 2019). Often a project must meet certain legal regulations or gain public support. Hence, identifying key stakeholders and gaining their support is crucial to any project. To successfully deliver a project, managers need more than just technical knowledge; they need to be able to identify stakeholders

and build and maintain a positive relationship with them. Various strategies can be used to engage stakeholders in a project. Stakeholders can be involved in developing the project charter and project scope statement, creating the project management plan, approving changes to the project and participating in the supervisory board for change, and establishing boundaries (Jayasuriya et al., 2020; Project Management Institute, 2017).

## METHODOLOGY

A database search was conducted of the Web of Science Core Collection (WoSCC) in August and September 2020 to identify the PMKAs most frequently mentioned in the relevant literature on project management and to analyze their interrelationship. In the first stage, to reduce the number of sources, publications in the fields of Business, Business & Economics, Economics, Economics & Business, Management, and Management & Organization were searched using the keyword “*project*”. The search resulted in a total of ten journals (Table 1).

In the second stage, the search focused on finding how many times the key PMKAs are mentioned in these ten journals and in which context (to which other PMKAs is a specific PMKA linked). A search for article titles and abstracts was conducted for all ten PMKAs (according to Project Management Institute, 2017), and additionally for the terms Time Management and Human Resource Management that were once separate PMKAs but were merged with Project Schedule Management and Project Resource Management, respectively, in the 2017 standard. The search encompassed the period from 2008 to 2019, that is, from the moment a journal was entered into the WoSCC database to December 2019 inclusive.

	Name of journal	Observed period	Number of articles	
			Total number published	Articles mentioning PMKAs
1.	Acta Structilia	2007-2019	129	57
2.	IJISPM-International Journal of Information Systems and Project Management	2013-2019	97	41
3.	International Journal of Information Technology Project Management	2010-2019	193	115
4.	International Journal of Managing Projects in Business	2008-2019	492	295
5.	International Journal of Project Management	2009-2019	1,074	533
6.	Organisational Project Management*	2014-2015	9	6
7.	Organization Technology and Management in Construction	2016-2019	52	24
8.	Project Management Journal	2008-2019	475	206
9.	Revista de Gestao e Projetos	2010-2019	242	41
10.	Revista de Gestao e Secretariado-Gesec	2010-2019	232	11
	Total		2,995	1,329

Note: \*No longer active

Out of 2,995 articles, 1,329 (44.37%) were directly related to at least one of the mentioned PMKAs. The journal International Journal of Project Management accounted for the

largest number of articles found (533), followed by the International Journal of Managing Projects in Business (295) and the Project Management Journal (206) (Table 1).

In the last stage, the contents of the selected articles, that is, their titles, keywords, and abstracts, were analyzed. Analysis focused on counting the frequency with which the individual PMKAs appear in the titles and abstracts of the articles. Any of the PMKAs needed to be mentioned at least once in an article in order to be counted, and PMKAs that were mentioned the most times were treated as the primary knowledge area of that article. Furthermore, every article was searched to see whether it (inter) relates the identified primary PMKA to any other (secondary) PMKAs. To reduce the chance of error, two of the authors independently carried out the analysis and once completed, all the authors discussed the results together. Any dilemmas were resolved by consensus, to jointly reach the final version.

## RESULTS ANALYSIS AND DISCUSSION

Of all PMKAs, Project Time Management was the PMKA most often mentioned in the analysed articles – a total of 429 times, of which 304 times as the primary area and 125 times as the secondary area. The importance of the time dimension for project management was further confirmed by the fact that Project Time Management was mentioned as many as 140 times (of which 113 times as a primary area), despite this PMKA being introduced as an official knowledge area not before 2017 (Project Management Institute, 2017). An analysis of related knowledge areas indicates that this PMKA, which is viewed jointly (Time and Schedule) and is a part of the Iron Triangle, thus crucial to a project (Jacobsson et al., 2015), was mentioned the most in relation to Stakeholder Management (157 times) and Resource Management (146 times) (Table 2).

The results of this research also point to the large number of mentions of Project Stakeholder Management, which was mentioned as a primary area as many as 306 times in the listed journals. Although being a knowledge area only since 2017, Project Stakeholder Management is truly a vital segment of project management, because a project can be seen as a temporary organization of stakeholders, jointly creating (Andersen, 2005) and continuously developing their mutual relationships (McElroy & Mills, 2003). Project Stakeholder Management was mostly associated with Project Resource Management (188 times), while the need for communication among stakeholders was mentioned 40 times. The stakeholder perspective is important because stakeholders can have a strong influence on projects, in particular with regard to infrastructure deliverables that involve both public and private actors (Vuorinen & Martinsuo, 2019). The role of stakeholders was also recognized as a potential source of project risk (41 times)

Both the above areas – Project Time/Schedule Management and Project Stakeholder Management – are often linked to resources. The great importance of efficiently and effectively managing project resources is evident from the results that show that Project Resource Management is mentioned 175 times as a primary area. Project Resource Management, one of the most demanding aspects of management, involves planning, distributing, balancing, and coordinating resources. The resource management of a given project assumes that the project's resource requirements have been fully met (Li & Tang, 2010). Within the context of Project Resource Management, the area of Human Resource Management, in particular, is frequently

highlighted and is mentioned a total of 83 times in the listed journals in the period 2007-2019 but only ten times as a primary PMKA.

The literature on human resource management focuses on the members of work teams (Campion et al., 1993; Yang, Huang, & Wu, 2011). Recent studies show that the success or failure of a group often depends on the group's team skills and teamwork, integration, mutual trust, and the skills of each individual member (Baiden & Price, 2011; Chansler et al., 2003; Do Vale et al., 2018; Floris & Cuganesan, 2019; Maurer, 2010). Recently, frequent mention has also been made of project learning as a function of the internal cognitive processes of individuals, the interpretation and integration of learning at the team and project level, and the ability of organizations to institutionalize learning into practices (Wiewiora et al., 2020). A certain level of cohesion is also essential for a team to stay together, cooperate, and create a basis for high-quality teamwork (Hoegl & Gemuenden, 2001). The project manager is the person who manages the available human resources to accomplish an organisation's objectives (Asquin et al., 2009; Chiocchio et al., 2010; Ferrin et al., 2007; Zwikael & Unger-Aviram, 2010). Human capital is a key component of any organisation, and greatly varying results will be achieved depending on a combination of diverse employees, task allocation, trust, and motivation (Maurer, 2010). The project manager's relationship with the project team plays an important role in the success of a project (Geoghegan & Dulewicz, 2008; Malach-Pines et al., 2009; Müller & Turner, 2010; Shokory & Surady, 2018; Yang et al., 2011) and includes communicating with team members.

A widely prevailing basic assumption is that successful teamwork depends not only on the amount and accuracy of work tasks, but also on how well team members collaborate or communicate (Hoegl & Gemuenden, 2001). The results of this study indicate the importance of Project Communication Management, which was mentioned 260 times in the listed journals in the period 2007-2019, of which 163 times as a primary PMKA. This PMKA is most often connected to Project Resource Management (75 times) and Project Stakeholder Management (80 times), confirming the importance of communication not only within a project but outside of the project as well. Effective communication with stakeholders suggests their participation in change management processes through teamwork and empowerment, while a lack of communication leads to a rational project culture that prioritises effectiveness and efficiency over stakeholder involvement (Butt et al., 2016; Collyer, 2016). This makes the connection between Project Communication Management and Project Stakeholder Management highly preferable, as suggested also by the results of this study.

A surprising finding is the relatively rare mention of the other parts of the Iron Triangle – cost and quality. Project Cost Management is mentioned as a primary PMKA in 46 articles. Cost management in the project process is a common source of difficulties (Allahaim & Liu, 2012; Memon, 2013; Flyvbjerg et al., 2004); requiring constant control to prevent increases in the costs planned in the project's budget, which is, ultimately, a risk for any project. According to some authors, the three major reasons for a project going over budget are fluctuating prices of materials and labour, construction delays, and inadequate project planning (Dlakwa & Culpin, 1990; Kaming et al., 1997; Love et al., 2011). The findings of most scientific papers on the topic of managing project costs highlight the fluctuation of material prices and the inadequacy of planning, together with slow decision making (non-decision making) that slow up processes (Baloy & Bekker, 2011). According to Ahabab et al. (2019), project cost and time control is very important for the implementation and effectiveness of project management. Slow decision-



making causes processes to stall while the cost of delaying grows by the day, increasing the risk of failure. Not surprisingly therefore, Project Cost Management is most often connected with knowledge areas that focus on risk (12 times) and project time and schedule (nine and six time, respectively). On the other hand, Project Quality Management as a primary PMKA is mentioned in 29 articles, and is most often connected with other areas of the Iron Triangle (seven times each, with time and cost). Project Quality Management includes essential processes to ensure a project meets the demands for which it was undertaken, and it also involves the overall management function that determines a project's quality policy, objectives, and responsibilities (Nastase, 2013; Lu et al., 2019). Although quality management is important in every phase of a project's lifecycle, some differences may exist depending on the industry in which the project is undertaken (Memon et al., 2011)

Project Scope Management, occasionally a contender for a place on the Iron Triangle (Pollack et al., 2018; Wysocki, 2019), is mentioned 24 times as a primary PMKA and is most often connected with areas of the Iron Triangle (cost, time, and quality). This makes sense because to effectively manage a project, the scope of work must be determined and this involves establishing certain initial information, such as how work should be carried out, the sequences and duration of work, resource requirements, and cost of labor (Mazur et al., 2009; Moroz & Nemchenko, 2017).

PRIMARY AREA	SECONDARY AREA											
	Int	Scop	Sch	Tim	Cost	Qual	Res	HRM	Com	Risk	Proc	Stak
P.Int.M	<b>78</b>	5	0	8	4	9	0	1	5	14	5	0
P.Scop.M	2	<b>24</b>	0	5	3	4	0	0	3	1	1	2
P.Sch.M	0	0	<b>113</b>	28	20	6	45	4	4	24	0	12
P.Tim.M	0	0	8	<b>304</b>	28	13	101	11	29	48	0	145
P.CostM	1	4	6	9	<b>46</b>	7	0	0	2	12	3	2
P.Qual.M	0	3	1	7	7	<b>29</b>	0	2	2	7	0	0
P.Res.M	0	0	1	11	4	3	<b>175</b>	38	8	16	0	47
P.HRM	0	0	0	0	0	0	3	<b>9</b>	0	0	0	9
P.Comm.M	1	0	3	11	4	7	75	11	<b>163</b>	23	0	80
P.RiskM	2	6	1	5	6	7	0	1	3	<b>54</b>	4	0
P.Proc.M	1	2	2	5	3	3	0	1	1	6	<b>28</b>	0
P.Stak.M	1	0	5	36	12	11	118	5	40	41	0	<b>306</b>

Note: Table 2 should be read horizontally, by row. The numbers in bold (along the diagonal) represent the number of times a specific PMKA was mentioned as being a primary PMKA. The other numbers in each row show the number of times a primary PMKA (from the first column) was related to another knowledge area.

Of the other PMKAs, Project Risk Management is the primary interest of 54 articles in the sample. Risk assessment is part of the decision-making process in all project phases (Meier, P. 2012). It is a skill that can be scientifically based as well and its aim is to protect the interests of all project stakeholders, from contractors to users (Darwish & Zubari, 2021; Schwalbe, 2014). Risk and uncertainty in projects can cause over-budgeting and delays in schedule (Wang & Chou, 2003; Wysocki, 2019; Aibinu & Odenyinka, 2006; Aramvareekul & Seider, 2006; Baloi & Price, 2001; Nasir et al., 2003; Banaitis & Banaitiene, 2012). It comes as no surprise then that

Project Risk Management is connected with those PMKAs that make up the foundation of a project – cost, time, and quality (the Iron Triangle areas). This finding is consistent with previous studies that have identified poor Project Risk Management as the most common cause of project problems and project failure (Baccarini et al., 2004; Alhawari et al., 2012).

Project Integration Management is referred to 78 times as a primary PMKA. This relatively high number points to the importance of integration for project success. Namely, every project in construction begins with the integration of all project processes and all stakeholders (Demirkesen & Ozorhon, 2017), regardless of which sector or activity is involved. A crucial part of integration is defining requirements in technical terms and identifying the people who will be responsible for specific processes from the project's very beginning (Kamara, 2012), and this implies diverse strategies used in the project's tasks (Waheed et al., 2019). The integration of all stakeholders and resources in a project process with pre-defined project execution cycles can ensure the transparency, fluidity, and unimpeded flow of the project process, within pre-defined deadlines, to the satisfaction of all parties involved, while trying to keep all potential risks at a minimum. The results of this study partly confirm this, given that Project Integration Management is most often linked to managing risk (14 times), quality (nine times), and time (eight times), and then to communication, procurement, scope, and human resources.

Finally, Project Procurement Management is mentioned as a primary PMKA in 28 articles published in the listed journals in the period 2007-2019. The procurement phase of the project process is a complex job, requiring that clear and fair criteria are established in the project planning phase for the selection of goods and service suppliers essential to the project process (Owusu et al., 2020; Pesamaa et al., 2009). Poor procurement is a key project risk (Denicol et al., 2020) and can have a negative impact on a project's performance with regard to cost, time, and quality objectives. This is especially the case in large-scale projects (in the construction industry, for example) that require the coordination of numerous tasks and individuals, are fraught with complexity and uncertainty and, consequently, have a greater need for more efficient cooperation. This study also confirms the connection of procurement with the Iron Triangle elements (time, quality, and cost) and risk.

## CONCLUSION

By reviewing the relevant scientific journals in the field of project management, this paper sought to determine whether some PMKAs are more important than others. At the level of all ten analyzed journals, Project Time/Schedule Management and Project Stakeholder Management are the most often mentioned knowledge areas, followed by Project Resource Management. Based on the primary assumption that successful teamwork depends on how well team members collaborate or communicate, Project Communication Management is also of exceptional importance. That of these four PMKAs, only Time belongs to the Iron Triangle, comes somewhat as a surprise. It is also surprising that the PMKAs Project Cost Management and Project Quality Management, also part of the Iron Triangle, lag behind the third point of the triangle (Time/Schedule). The results lead to the conclusion that in recent times project management researchers have a different understanding and assessment of the importance of time (and schedule) management and of project stakeholder management within the Iron Triangle. Similarly, Project Scope Management, often connected with the knowledge areas of the

Iron Triangle (cost, quality, and time) is not a subject of greater interest for researchers. This could be explained by the fact that scope, that is the activities carried out, often belongs to the technical and operational aspects of a project and depends significantly on the nature of the project itself. In other words, because of its specific features, project scope is difficult to generalize and analyze in research papers.

With regard to the interrelationship of the individual PMKAs, Project Time Management is most often linked to Project Stakeholder Management and Project Resource Management. There is also a stronger connection between Project Stakeholder Management and Project Resource Management. This suggests that project stakeholders have a significant impact on time management and that they consider efficient and effective resource management, on which they also have a significant effect, as being of the utmost importance for the success of a project.

By studying the representation of key PMKAs in papers published in the selected journals and the interrelationships of individual knowledge areas, the authors sought to deepen the theoretical knowledge on project management. The study points to a lacking number of papers covering certain specific PMKAs (Procurement, Risk) while establishing which PMKAs are most often mentioned and studied together (Time/Schedule, Stakeholders, Communication, Resources). The PMKAs most often mentioned and interrelated are certain to continue to be research subjects in the future; however, researchers should take care not to neglect other, less mentioned and less interconnected PMKAs, as the success of a project can be ensured only through a comprehensive approach to all PMKAs.

Despite the efforts made by the authors, this paper has some limitations, regarding the limited number of journals searched for in the WoSCC database and singled out using the keyword “*project*”. Clearly there are other journals that also publish articles concerning project management, and the inclusion of more journals in the search could help to deepen the interpretation of results. The search should also be expanded to include other databases. The use of software to process textual data could also be helpful in future analyses, even though software has certain limitations in analysis as it often cannot get to the core of what researchers are actually trying to say. It will also be necessary to keep abreast of the further development of standards linked to PMKAs, and it is especially recommended to focus greater attention in future research on the field of human resource management, with emphasis on people, and their soft skills in particular, as a key success factor.

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