

HARD SKILLS REQUIRED FOR PROJECT MANAGEMENT IN THE POST-PANDEMIC ERA: COVID-19 CONTRIBUTIONS IN CHANGING PROFESSIONAL PROFILE

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ABSTRACT

The COVID-19 Pandemic has brought unthinkable changes in the most diverse work environments. In the project management field, this premise is not different. This new way to work required new soft and hard competencies to allow the continuity of the projects. The methodological aspects of this research comprised a Systematic Literature Review to raise new competencies required for project managers in the pandemic and post-pandemic era. As a result, 25 hard competencies were identified and a framework with temporal evolution of these competencies was proposed. The discussion inferred the main ways the COVID-19 pandemic contributes to changing the professional profile of project managers, requiring new hard skills. In conclusion, this work presents a theoretical framework that may help managers and academics by providing a deep understanding of the temporal evolution of the hard competencies required for project managers in pandemic and post-pandemic periods. Regarding practical impacts, this study provides insights that may help organisations strengthen their project manager's capacity during future crises and unforeseen significant changes.

Keywords: Project Management, Hard Competencies, COVID-19

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COMPETENCIAS TÉCNICAS REQUERIDAS PARA LA GESTIÓN DE PROYECTOS EN LA ERA POST-PANDÉMICA: CONTRIBUCIONES DE COVID-19 EN EL CAMBIO DEL PERFIL PROFESIONAL

RESUMEN

La pandemia de COVID-19 ha traído cambios impensables en los entornos laborales más diversos. En el campo de la gestión de proyectos, esta premisa no es diferente. Esta nueva forma de trabajar requirió nuevas competencias técnicas y blandas para permitir la continuidad de los proyectos. Los aspectos metodológicos de esta investigación comprendieron una Revisión Sistemática de la Literatura para identificar las nuevas competencias necesarias para los gerentes de proyectos en la era de la pandemia y post-pandemia. Como resultado, se identificaron 25 competencias técnicas y se propuso un marco con la evolución temporal de estas competencias. La discusión dedujo las principales formas en que la pandemia de COVID-19 contribuye a cambiar el perfil profesional de los gerentes de proyectos, exigiendo nuevas habilidades técnicas. En conclusión, este trabajo presenta un marco teórico que puede ayudar a los gerentes y académicos al proporcionar una comprensión profunda de la evolución temporal de las competencias técnicas necesarias para los gerentes de proyectos en períodos de pandemia y post-pandemia. En cuanto a los impactos prácticos, este estudio proporciona ideas que pueden ayudar a las organizaciones a fortalecer la capacidad de sus gerentes de proyectos durante futuras crisis y cambios significativos imprevistos.

Palabras clave: Gestión de Proyectos, Competencias Técnicas, COVID-19

1 INTRODUCTION

The COVID-19 Pandemic has brought unthinkable changes in the most diverse work environments. In the project management field, this premise is not different. The lockdown period, imposed on governments brought together the necessity to work remotely. This new way to work required new soft and hard competencies to allow the continuity of the projects being performed.

Moreover, with the advent of the COVID-19 crisis remote work has increased significantly during the last 2 years Gupta (2023), and the project management discipline is not left out of this radical change (MARHAOUI, 2023). According to Marhraoui (2023), although classical soft skills such as social and interpersonal relations, namely openness to change, critical thinking, creativity, leadership and emotional intelligence are yet required to successfully manage a project, these classical skills are not sufficient anymore to deal with project management in a “new normal” scenario. The same is true for the case of hard competencies.

The above facts reinforce the necessity for new hard competencies developed in the pandemic era, mainly during the lockdown period. These competencies certainly will impact the future of project management in the post-pandemic era (new normal). This way, identifying these new required competencies may provide a path with a temporal evolution of the hard competencies during the pandemic period. The identification of the new required competencies can give managers in practice some insights about how new unseen events may impact/require other new hard skills in this field of study. To fulfil this gap is just the objective of this research. So, this work raises and critically analyses the new hard competencies of project managers required by the lockdown imposed by the governments as a premise to minimize the contamination risks of COVID-19, proposing a theoretical conceptual model that presents the

temporal evolution of hard skills in the project management field.

Thus, the remainder of this paper is organised as described: Section 2 presents a brief theoretical background about the main terms that compose this research, featuring, for example, soft and hard competencies for project management and COVID-19. Section 3 presents the methodological steps followed to raise the competencies. Section 4 presents the research's results with the new key hard competencies for project management. Section 5 discusses the results, offering the theoretical conceptual model with the new key competencies required by the market for managers to remotely work in project management, inferring the practical and theoretical impacts of the proposed framework in the field of project management. Section 6 concludes the research by proposing future studies that may reinforce the findings of this work.

2 THEORETICAL BACKGROUND

This section conceptualises the main constructs used in this research. Section 2.1 defines Project managers' competencies and section 2.2 presents a brief overview of the COVID-19 pandemic.

2.1. Project management key competencies

Managing projects in stable scenarios is already a very hard task. Doing it in times of pandemic and unstable scenarios is yet more difficult and requires a myriad of soft and hard competencies. Inside this context, according to the PMI (2017), key competencies in project management are essential skills and knowledge for project management to lead a project efficiently and effectively. The key competencies, according to the referred guide are, for example, leadership, scope, time, cost and quality management, human resource and communication management, risk and procurement management and ethics and professional responsibility.

These key competencies are comprehensive and cover many different areas of project management. Chell; Athayde (2011) present a soft and hard competencies definition adopted in this work to raise the new hard competencies required for project managers in the pandemic and the post-pandemic era. For these authors, soft skills are the ones that may be acquired through practice and are composed of behaviours. Soon, the hard competencies, according to the authors, are acquired as knowledge and are essential for project managers to meet a high level of competencies inside this group (hard competencies). Likewise, having a good command of these skills can help a project manager succeed in delivering the project within the established timeframe, budget and quality standards.

2.2. COVID-19

Towards the end of 2019, a new disease with signs and symptoms, similar to those of atypical pneumonia, occurred in Wuhan, China, linked to a seafood market, where infected patients commonly consumed food. It's supposed that contamination mechanisms were passed from animals to humans (Xavier et al., 2020). According to Monteiro et al. (2020) in January 2020 the virus rapidly spread throughout the world, becoming a global threat, due to its high transmissibility, affecting not only health but the global economy as well. Lacerda et al. (2020) state that only in March 2020 COVID-19 was characterized as a global pandemic.

Among the main symptoms of mild cases of the disease are fever, tiredness, and dry cough. Some patients may also experience pain, nasal congestion, rash, loss of taste or smell, diarrhoea, sore throat, and conjunctivitis (PAHO, 2020). In more severe cases, the patient may develop pneumonia, requiring hospitalization and advanced life support (Monteiro et al., 2020). The exponential increase in the disease's contamination rate brought with it a scientific race to

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seek an understanding of the various factors associated with increasing the disease's mortality rate.

Among the studies on risk factors, according to Rod; Oviedo-Trespacios; Cortez-Ramirez (2020), age and diabetes were the most associated with the number of deaths from the disease. Other studies have also pointed out COVID-19 as a potential exacerbator of diseases such as heart disease, hypertension, chronic respiratory diseases, and neoplasms (Lana et al., 2020). Thus, the combination of these comorbidities, associated with age and COVID-19 contamination, is closely associated with the need for advanced life support, as pointed out by Monteiro et al. (2020), generating an overload on the health system with the consequent collapse of the system, as well as an increase in mortality associated with contamination. Notwithstanding these problems, there is a need to reconfigure behaviours, prioritizing constant hygiene actions such as hand washing, use of hand sanitiser, social distancing, mask-wearing, and environmental and emotional care (HAMMERSCHMIDT, K.; SANTANA, 2020).

3 RESEARCH'S METHODOLOGICAL SEQUENCE

This theoretical-conceptual study presents a literature review seeking to raise the new key competencies required for project managers in the pandemic era, presenting a theoretical conceptual model that presents the new required competencies for project managers with the advent of the COVID-19 pandemic. To the better of our knowledge, this study is the first to systematically raise, show and explain how the COVID-19 pandemic supported the emergence of new key competencies of project managers in terms of hard skills.

According to (Denyer; Tranfield (2009) Systematic Literature Review (SLR) is an essential endeavour by itself and not merely a review of the previous writing. Having guide questions as a study guide, Tranfield; Denyer; Smart (2003) point out that SLR is a “methodology that locates existing studies, selects and evaluates contributions, analyses and synthesises data, reporting evidences to allow reasonable, clear conclusions about what is and is not known”.

In the sequence, we follow the three steps proposed by Christou et al. (2022). These steps are, in this sequence, planning, conduction and dissemination. The following section summarises the planning stage, presenting the research protocol (Table 01). This research protocol contains the objective and subject inclusion and exclusion criteria. The objective selection criteria include the database chosen, the type of papers, the analysis period, and the studies' field.

3.1. Planning

This section presents the main aspects of this research. Table 1 contains the objective and subjective parameters of the study.

Table 1 - Research Protocol

Research Protocol	
Objective	To identify the temporal evolution of new hard skills of project managers, developed due to the lockdown period imposed by the COVID-19 Pandemic;
Guiding Questions	<i>1 – Which new hard competencies are necessary for project managers in the post-pandemic era?</i> <i>2 – Which areas are impacted by these competencies?</i>

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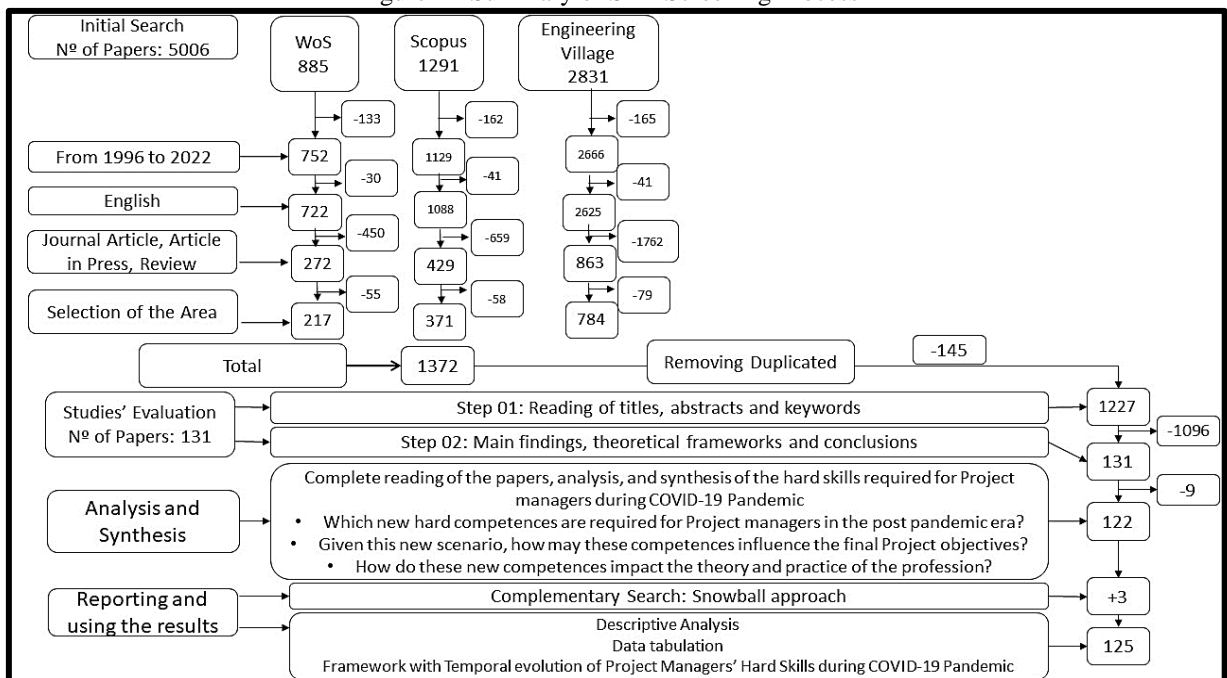
	<i>3 – How do these new competencies impact the theory and practice of the profession?</i>
Database	<i>Engineering Village, Scopus, Web of Science</i>
Period	<i>From 1996 to 2022</i>
Document Type	<i>Journal Articles, Articles In Press, Conference Papers, Review</i>
Language	<i>English</i>
	((("team leader" OR "team leaders" OR "project manager" OR "project managers" OR "project management")) AND ((“competenc*”) OR (“soft*”) OR (“hard*”) OR (“skill*”)))
Criteria	Criteria Explanation
Exclusion (NR)	NR-1: Articles considering manager’s competencies in other areas; NR-2: The definition of “competence” is not related to the Project Management Field;
(LR)	LR: Papers that cite competencies but do not express discussion about how these hard competencies positively impact a project
Inclusion (PR)	PR: Articles that focus on one or a few hard competencies of project managers in the post-pandemic era
(CR)	CR: Articles featuring project managers’ hard competencies, pointing out competencies and their relationship with the project’s final objective;

Source: The authors

3.2. Conduction

This section presents the conduction phase of the research. To perform this phase, we use the help of StArt Software. This software helps us to perform the first part of the subjective filter, where we read the title and abstract. Figure 1 shows a summary of the screening process for the papers.

Figure 1 - Summary of SLR Screening Process



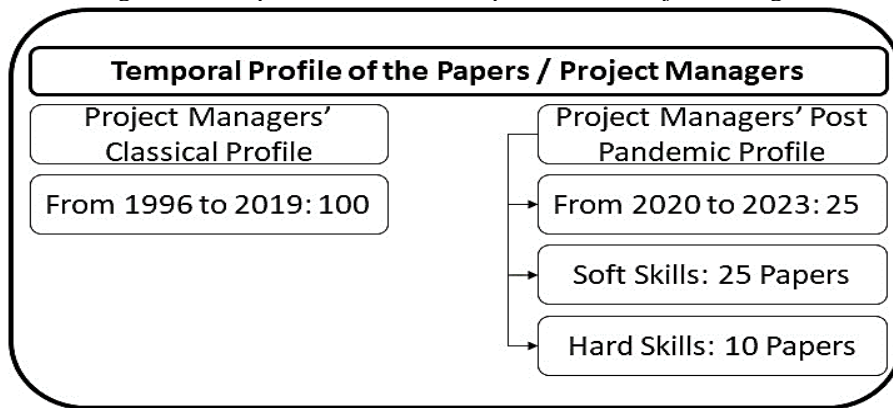
Source: The authors

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During the screening phase, 125 papers were selected to compose the final sample analysed. Of these papers, 100 were published before the pandemic and 25 during or after this period. Figure 2 summarises the temporal papers/project managers’ profile. Although we identified the new hard competencies required by project managers in the post-pandemic era, all the competencies were tabulated to allow the comparison between the conventional and the post-pandemic profile of project managers in terms of hard skills.

In sequence, we classify the hard competencies into four groups: Technical Skills and Specific Knowledge, Strategic and Decision-Making Skills, Management and Leadership Skills, and Business Context Related Skills.

Figure 2 - Temporal Profile of the Papers and the Project Managers



Source: The authors

4 RESULTS’ ANALYSIS

This section presents the results of this research, presenting the competencies and new competencies required for project managers remotely managing projects.

4.1. New hard competencies for project managers

After performing the planning and conducting phase, the hard competencies required for project managers in the post-pandemic era were identified. These competencies are summarised in Table 2.

Table 2 - Hard Competences required by project managers in the post-pandemic era

Competence	Code	Description	Authors	Year
Technical competence	CHS1	The knowledge, skills, and behaviours related to specific domains of the project. The technical aspects of performing one’s role	1	2020
Information technology skills	CHS2	Having information technology skills	1	2020
Strategic Direction	CHS3	The knowledge of and expertise in the industry and organisation that enhanced performance and better delivers business outcomes	1	2020

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Knowledge of using tools and techniques	CHS4	Special knowledge in the use of tools and techniques	1	2020
Tendering	CHS5	The ability to handle the process of inviting bids for a project and selecting a contractor for carrying out the project	1	2020
Judgment	CHS6	The ability to make considered decisions or come to sensible conclusions	1	2020
Project implementation and monitoring	CHS7	Implementing the project plan and ensuring that project progress complies with original or revised goals	2	2020
Recruitment of team members	CHS8	Selecting the team members with the right skills for the job	2	2020
Education	CHS9	Having the appropriate education, both in project management and also in the technical area of the project (ex: construction or IT)	2,9	2020
Procurement and partnerships	CHS10	The process of buying or obtaining goods and/or services from external parties. Developing partnerships for obtaining resources from external parties	2	2020
Estimating	CHS11	Making estimates such as how much time something is going to take and how much it is going to cost	3	2020
Computer use	CHS12	Knowing how to use a computer	3	2020
Lead meetings	CHS13	Leading meetings	3	2020
Logic reasoning	CHS14	A mental activity that aims to conclude rigorously. It happens in the form of inferences or arguments by starting from a set of premises and reasoning to a conclusion supported by these premises	3	2020
Metric management	CHS15	The managing of functions through the use of metrics and in particular identifying areas needing improvement and methodologies for tracking resource costs and usage	4	2020
Business skills	CHS16	keenness and quickness in understanding and dealing with a business situation in a manner that is likely to lead to a good outcome	5,8	2020
Financial skills	CHS17	Reporting financial systems, project finance arrangement, cash flow and budget;	5	2020
Data analysis and interpretation	CHS18	Analysing and interpreting data;	6	2021
The utilisation of information systems	CHS19	Using information systems;	7	2021

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Project Feasibility	CHS20	Determining how possible to implement the project plan is;	8	2021
Contract administration	CHS21	Understanding contractual clauses, opening and closing contracts	8	2021
Supervision	CHS22	Paying attention to what people are doing and being able to manage people to keep them on task	8	2021
Business and corporate management	CHS23	The knowledge and skills related to managing a business. Understanding the business/corporate world	8	2021
Strategic decision-making	CHS24	The process of comprehending the interaction of decisions and their impact on an organisation to gain an advantage. Making the most advantageous decisions	9	2022
Digital skills	CHS25	The ability to find, evaluate, use, share, and create content using digital devices	10	2022

Source: The authors

Notes: 1 - Moradi; Kähkönen; Aaltonen (2020); 2 - Sołtysik et al. (2020); 3 - Moura; Carneiro; Oliveira (2020); 4 - Rahul S Mor*, Priyanshu P. Srivastava, Richika, Sanskar Varshney (2020); 5 - Ijaola; Omolayo; Zakariyyh, (2020); 6 - Amoah; Marimon (2021); 7 - Sarpin et al. (2021); 8 - Vaz-Serra; Mitchelltree (2021); 9 - Ozorhon; Akgemik; Caglayan (2022); 10 - Zheng; Qiang (2022).

4.2. Temporal evolution of project managers' hard competencies: COVID-19 contributions

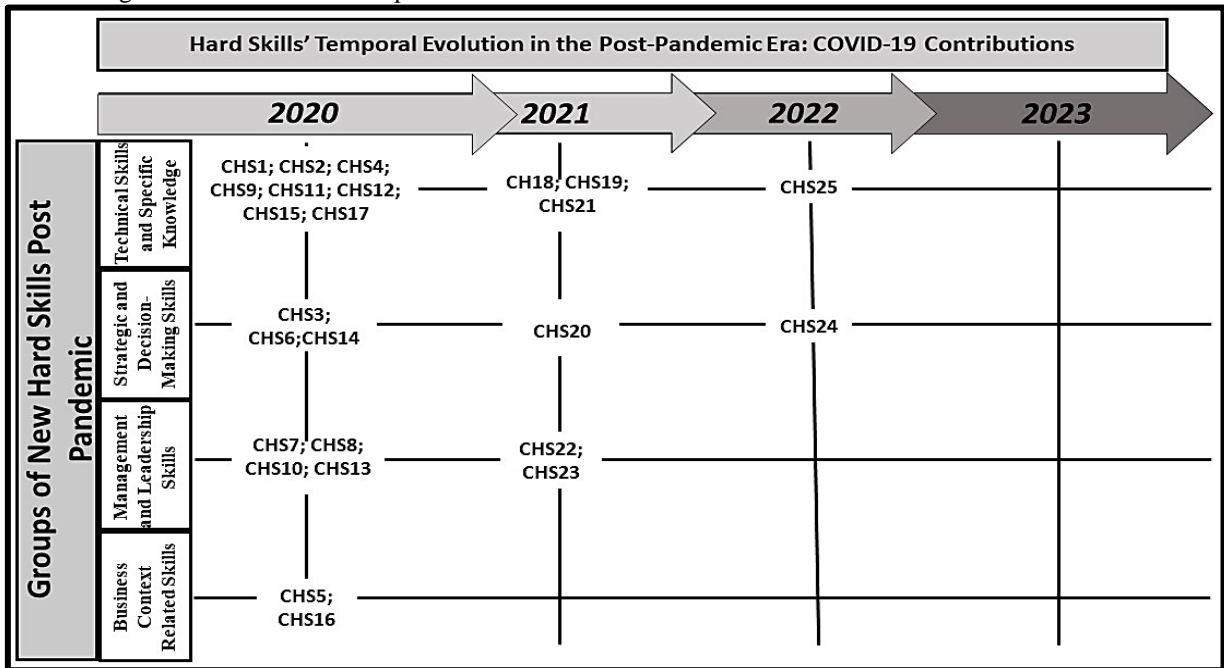
Figure 3 presents the final framework containing the hard skills' temporal evolution during and post-pandemic era. In the framework, 25 competencies were identified. These competencies were grouped into 4 categories according to the characteristics of each one.

Group 1 contains competencies related to technical skills and specific knowledge. Group 2 comprises competencies related to Strategic and decision-making skills. Group 3 is featured with competencies related to management and leadership skills and finally, group 4 comprises competencies related to business context.

The classification of the competencies was performed with the support of the NVivo software. The content analysis was performed crossing the words contained in the definition of each competence with each category to verify the fit between them. In sequence, the definition and discussion of each level are performed in the next section.

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Figure 3 - Hard Skills' Temporal Evolution in the Post-Pandemic Era: COVID-19 Contributions



Source: The authors

5 RESULTS' DISCUSSION

Through an extensive Systematic Literature Review, following the steps proposed by Tranfield; Denyer; Smart (2003), it was possible to identify 25 competencies brought by the COVID-19 pandemic in the project management area, culminating in a theoretical framework that presents temporally the evolution of these competences according to four pre-defined categories. From the proposed framework, it was possible to give for theoretical and managers in practice a deep understanding of the new hard skills required in the new normal, inside the project management field of knowledge. Consequently, our framework may be used as a base for managers to deal with future disruptions that may, unforeseen, affect future projects.

From the proposed framework (figure 3) is it possible to perceive that, from the 25 competencies, 12 competencies (48%) are linked with the first group (technical skills and specific knowledge). This phenomenon may be explained by the fact that the lockdown, imposed by governments to diminish COVID-19 proliferation, served as the fuse for the development of many tools that allowed project managers to remotely deal with the daily tasks related to the current projects. Yet, as a consequence of the first developments in this category, three competencies emerged in the next year, such as data analysis and Interpretation (CHS18). Besides, inside this first group, our finding is reinforced by Marhraoui (2023), v the capacity to analyse data and manage information as one of the most important hard skills required in the post-pandemic era.

Regarding group 2 (Strategic and decision-making skills), 5 competencies (20%) were found inside this thematic. The competencies identified are related to the managers' capacity to strategically take decisions. Besides, in the face of the COVID-19 pandemic, the exigence of fast decisions in uncertain scenarios or even in the face of unforeseen changes in the simplest planned activities such as loss of human resources that work at the operational level and other unforeseen phenomena brought by the new normal may be considered a fuse for the emergence of competencies inside this category.

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Concerning group 3 (Management and leadership skills), 6 competencies (24%) were classified inside this category. Analysing this category, the advent of lockdown and the increase in remote working brought the necessity for managers to take collaborative decisions on distance to improve team engagement. In addition, the teams needed to be self-organised with this new scenario, which contribute to the requirement of the new competencies that compose this third category for example, CHS 8 (Project competence and monitoring) and CHS 13 (Lead meetings). So, once project managers are performing these activities, the team needs to continue working and advancing the project targets.

Finally, group 4 (Business context-related skills) is composed of 2 competencies (8%), required in the first year of the COVID-19 pandemic. Considering the competencies in this group, CHS 16 (Business Skills) was strongly required and was also fundamental to facing marketing challenges that came with the COVID-19 pandemic. Complementing this competence, CHS 5 (Tendering) was required to prepare competitive proposals, fulfilling legal and technical requisites and ensure reliable suppliers and provide necessary products and services.

6 CONCLUSIONS AND FINAL REMARKS

To close this work, this section presents the theoretical and practical implications of this research, presenting the limitations and future research directions that may fulfil the gap between theory and practice in the project management field of study.

6.1. Theoretical implications of this research

Project Management as a field of knowledge is a broadly studied thematic as we can see in the initial sample raised in the conducting phase. As in practically all professions, the project management area was strongly impacted by the COVID-19 pandemic and, inside this context, new competencies were required to fit the new normal.

Thus, this work raises and presents a theoretical framework with the temporal evolution of the hard competencies in the pandemic and post-pandemic era. The proposed framework may provide insights for theoretical and managers in practice about the behavioural profile evolution of hard competencies in a disruption context. This may help academics to improve project management courses fitting the new normal requirements.

6.2. Practical implications of this research

Through the proposed framework, it was possible to perceive that in the age of 2020, some new competencies emerged, compared to the next years. These new competencies were required to align the project management profile with the new normal. This fact suggests that COVID-19 had a meaningful impact on the project management profile's changing.

These new competencies still emerged as a result of the most diverse challenges and single demand imposed by the COVID-19 pandemic as the necessity of fast adaptation, implementation of security measures, disruptions in the supply chain and changes in customer demand.

These findings have important practical implications for organisations seeking to strengthen their project managers' capacity during crises and unforeseen significant changes. They should be mindful of the emerging competencies identified in this study and strive to develop and enhance them. However, it is important to note that the practical implications of this study are based on evidence collected up to this point and may evolve as new information and contexts emerge.

6.3. Limitations and future research directions

The present study employed a SLR to identify new hard competencies required in the project management's profile as a result of the COVID-19 pandemic. Like any other research, this study has its limitations and weakness, many of which are inherent to the methodology used. Among the weaknesses, one may point out the selection of the databases used to gather the papers, the period and type of material selected, as well as the subjectivity inherent in the interpretation of the works that composed the final sample of this research, which may have led to the exclusion of articles that may have pointed out competencies not identified in this study. To minimise these weaknesses, we adopt a double-blind review process, with two independent researchers evaluating the competencies presented in the selected papers.

In conclusion, future studies may strengthen the results of this research through empirical studies that can validate or refute the proposed competencies, including adding new ones not identified in theory. Studies that identify theoretically and empirically new soft skills added to the profile of project managers during, and post-pandemic era may complement the findings of this study.

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