Critical Factors for a Successful Knowledge Management Implementation: A Systematic Literature Review

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Abstract: Nowadays, knowledge is considered a key resource for organizations, crucial for obtaining long-term sustainable competitive. In line with this principle, many organizations are making efforts toward the implementation of knowledge management (KM) initiatives, recognizing that their competitive foundation lies in the effective way to capture, retain, store and share knowledge. Although companies are increasingly competing based on their ability to effectively manage knowledge, there are still numerous challenges for organizations that intend to implement a KM system. Thus, for a successful implementation of KM in organizations, it is crucial to understand which factors are critical for the effectiveness of KM processes and lead to competitive advantage. Although there are many studies related to critical success factors of KM, few bring together the CSFs in a systematic and extensive manner. This paper aims to have a comprehensive and up-to-date view of the critical factors that lead to the success of KM implementations in organizations. Data was collected from a systematic literature review, using PRISMA flow diagram to summarize it. The critical success factors collected were standardized and categorized into categories and dimensions. In this sense, 25 categories of critical success factors were created and categorized in 4 dimensions: Organization, Technology, Knowledge and KM Capability, and External Influence. The results found suggest that factors related to the organization and people, such as the definition of a clear strategy, the definition of performance measures to evaluate and monitor the strategy, the involvement of top management, or even the organizational culture itself, represent some of the factors that have the most influence on the successful implementation of KM initiatives. With this research, it is expected to contribute from a theoretical perspective to the KM area through the compilation, categorization and classification of a set of critical success factors reported in the literature. From a practical perspective, the results of this study can help any organization, regardless of sector, supporting the preparation and improvement of strategies in this area.

Keywords: Knowledge management, Critical success factors, Systematic literature review, Knowledge management processes

1. Introduction

In recent decades, there has been a growing interest for organizations in knowledge management (KM) as a field of study. Nowadays, knowledge is considered a key resource for organizations, critical for obtaining long-term sustainable competitive advantage (Girard & Girard, 2015; Shivakumar & Pradeepkumar, 2019; Obeso et al., 2020). Many organizations are making efforts toward effective management activities, focusing not only in key processes, but also in knowledge management practices, to improve their efficiency (Bitkowska, 2015). A large part of the existing organizational knowledge is resident only in employees' mind, with a high risk of losing key knowledge with the exit of skilled employees (Slagter, 2007). For this reason, companies seek to convert individual knowledge, the combination of experiences and personal understanding, into organizational knowledge (Obeso *et al.*, 2020). Therefore, it is crucial for organizations to have mechanisms to ensure the utilization of useful knowledge. According to Paliszkiewicz (2011), to obtain a competitive advantage, a company must create and acquire new knowledge, transfer it to the right parts of the organization, interpret and integrate it with the existing one, to finally be used and achieve better performance.

The development of KM initiatives is supported by several tools and techniques for better managing knowledge processes, such as Communities of Practices, Knowledge Bases (e.g. Wiki) and Lessons Learned (Young, 2010). Although companies are increasingly competing based on their ability to effectively manage knowledge, there are still numerous challenges for organizations that intend to implement a KM system. Some of the most significant challenges facing organizations adopting knowledge management initiatives are related to people and culture; the lack of a "sharing" culture and understanding of KM benefits are great examples of obstacles to implementation (Yang, Yeh & Lee, 2010). Thus, for a successful implementation of knowledge management, it

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is crucial to understand which factors are critical for the effectiveness of knowledge management processes and lead to competitive advantage – the critical success factors (CSFs) of KM.

In the literature, many studies highlight the critical factors of KM implementation in organizations. For instance, Moffett, McAdam & Parkinson (2002) describe the development of a conceptual model for KM implementation, identifying a set of critical success factors. The number of studies related to Knowledge Management CSFs has been increasing over time due to the continual development in this field. However, these studies are very dispersed and few bring together the CSFs in a systematic and extensive manner, with no sector restrictions (Yang, Yeh & Lee, 2010; Sensuse et al., 2018). The literature lacks an up-to-date study with a holistic and comprehensive view of the CSFs of KM implementation. Therefore, it becomes extremely important to compile these success factors, since the way organizations live is also changing over time.

Yang, Yeh & Lee (2010) conducted a systematic literature review on the CSFs for the adoption of KM. Nevertheless, that research was undertaken in 2010 and may be outdated. Since KM is a dynamic and increasingly sought-after field, CSFs need continuous attention to ensure their sustainability. More recently, Sensuse *et al.* (2018) also conducted a systematic literature review on the same topic. However, it is a conference article with some restrictions, basing the research on 15 papers.

For the above reasons, the main motivation of this study is to have a comprehensive and up-to-date view of the critical factors that lead to the success of KM implementations in organizations. Today, organizations are increasingly dynamic and what works for one may not work for others. Consequently, a comprehensive and detailed study identifying KM factors common to a large number of organizations, with no sector or size restrictions, might be helpful for organizations. Naturally, there is always a need for adaptation according to each organization's reality. This research includes a systematic literature review with papers between 2000 and 2021.

On the other hand, since KM is considered by many authors as a process involving several activities (e.g. knowledge creation, capture, sharing and application) (Alavi & Leidner, 2001), it would also be interesting to study which KM processes are most important for organizations implementing KM, relating them to CSFs, if possible. Therefore, this research is directed towards these processes, with the additional objective of understanding which are the most outstanding processes in the literature. This review can be used to identify possible gaps in the literature and also to help organizations to understand how they can enhance the success of KM implementations.

2. Literature Review

Knowledge is a crucial resource for companies, playing a key role in organizational effectiveness. To improve organizational effectiveness it is important not only a constant focus on improving key processes but also an effective knowledge management during the process activities (Bitkowska, 2015).

In literature, several authors consider knowledge management as a process involving various activities (Alavi & Leidner, 2001). Although there is a wide range of terms to describe KM activities or processes, it is possible to find a consensus regarding their basic categories and concepts (Alavi & Leidner, 2001; Chedid, 2020). For this, some studies adopted four KM processes commonly used in literature and defined in the *'European guide for good practice in knowledge management'*, also considered by Chedid (2020):

1. Knowledge Creation: continuous process related to the acquisition of new contexts, new views and new knowledge, through the interactions amongst individuals or between individuals and their environment (Nonaka, Toyama & Konno, 2000);
2. Knowledge Capture: the inclusion of the knowledge into the existing knowledge base of an organization (Nielsen, 2006);
3. Knowledge Sharing: process of applying the created knowledge and sharing it from individual to individual or groups (Sun, 2010);
4. Knowledge Application: process of using effectively knowledge to fill a gap or need (Paliszkiewicz, 2011).

The interest in organizational knowledge has led to the implementation of KM in many organizations (Alavi & Leidner, 2001). To achieve a successful outcome, any KM practice must be based on three fundamental interdependent elements: people, processes and systems (technology) (Igbinovia & Ikenwe, 2018). KM involves

people, the main conveyor of knowledge, and the way they interact and share knowledge (Awad & Ghaziri, 2004; Igbinovia & Ikenwe, 2018). Processes are another important component, corresponding to the methods by which KM initiatives are achieved. Igbinovia & Ikenwe (2018) state that people firstly design and then operate processes, while processes define the roles and knowledge needed by people. Lastly, systems or technologies are devices that support the implementation of KM, in particular the people and processes involved (Igbinovia & Ikenwe, 2018).

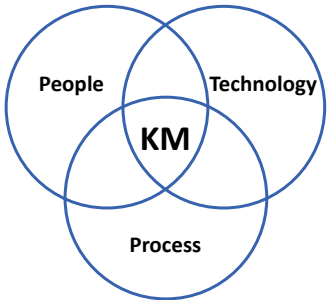

Figure 1: Core Elements of Knowledge Management

The decision of implementing knowledge management must be well considered, since it requires a major shift in organizational culture and a commitment at all levels of an organization to be successful (Gupta, Iyer & Aronson, 2000). Indeed, according to Awad & Ghaziri (2004), the biggest challenge in KM is explaining what it is and how it can benefit a corporate environment. If the culture does not encourage cooperation and trust, employees will not cooperate (Awad & Ghaziri, 2004).

In this sense, understanding the critical success factors (CSFs) of KM implementation might be a huge advantage for organizations, reducing the risk of failure (Othman et al., 2018). According to Othman *et al.* (2018), many researchers defined the critical success factors (CSFs) as "the keys in which acceptable outcomes would result in accomplished competitive performance". In this area, the CSFs are activities and actions needed to implement KM successfully (Ghomi & Barzinpour, 2018). The identification of these factors will support organizations to better evaluate the status of KM implementation and identify improvements (Theriou, Maditinos & Theriou, 2011).

According to Othman et al. (2018), several researchers indicate leadership, resources, information technology (IT) and culture as vital factors for a successful KM implementation. In the study of Ghomi & Barzinpour (2018), which was taken in a university, the authors found the following critical success factors of using KM tools: (i) human-motivational factors (motivation, resources, human resource management); (ii) information technology; (iii) education; (iv) leadership and management support; (v) processes and activities; (vi) structure; (vii) culture; (viii) measurement; (ix) organizational infrastructure; strategy and goal; and (x) communication.

3. Material and Methods

The methodology used for this research is a systematic literature review (SLR). Denyer & Tranfield (2009) defined a SLR as "a specific methodology that locates existing studies, selects and evaluated contributions, analysis and synthesizes data, and reports the evidence in such a way that allows reasonably clear conclusions to be reached about what is and is not known". This study follows the five established steps presented by Denyer & Tranfield (2009), illustrated in figure 2 and described below.

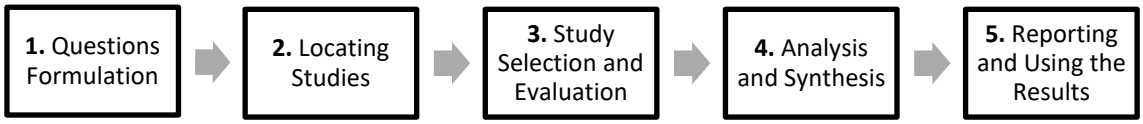

Figure 2: Five SLR steps

3.1 Step 1: Questions Formulation

This step aims to establish the focus and purpose of the research, asking framed questions. The purpose of this research is to analyse the state of knowledge that exists in the literature related to the CSFs of KM practices. Since the KM field is very oriented to KM processes, this research is directed towards there processes, with the

additional objective of understanding which are the most outstanding processes in the literature, formulating the following questions:

- What are the main CSFs for implementing knowledge management strategies in organizations?
- At the level of the CSFs identified, what are the most relevant KM processes for companies implementing KM initiatives?

It should be noted that this study focuses on four KM processes: Knowledge creation, Knowledge sharing, Knowledge capture and Knowledge application.

3.2 Step 2: Locating Studies

This step involves the identification of relevant studies, including search terms, based on key-words and concepts directly related to the research questions, in proper databases (Snyder, 2019).

The authors made several attempts before establishing the final search string. To avoid losing important results, besides the KM processes identified previously, the authors also considered in the keywords other processes also widely cited in the literature that could be related to the previous ones: knowledge transfer, knowledge storage and acquisition, as well as KM processes in general.

With the final search string (Figure 3), the author performed a search on March 06, 2022, in Scopus database, since it is multidisciplinary and offers the widest coverage of papers throughout the available databases (Mongeon & Paul-Hus, 2016). Initially, a total of 239 hits were found.

3.3 Step 3: Study Selection and Evaluation

The purpose of this phase is to use a set of selection criteria to assess the relevance of each research for answering the review questions and discard those that do not meet the criteria (Denyer & Tranfield, 2009).

In this research, the search was limited to articles published in English and Portuguese, which are the languages that the authors understand. All the articles with no author identification were also excluded. With the application of these criteria, a total of 223 publications were selected out of the 239 initially identified. Afterward, the authors examined the title, abstract and keywords, which made it possible to determine the articles that were clearly related, or not, to the research question. In this process, the authors found many articles related to knowledge management, however, without reference to critical success factors, therefore they were excluded. On the other hand, articles mentioning CSFs but not related to KM initiatives were also excluded. Additionally, in some articles, the authors could not conclude by reading only the title and abstract, so these were not excluded and moved to the next phase. A total of 89 publications were selected for further analysis.

3.4 Step 4: Analysis and Synthesis

This step aims to review and analyse each of the selected articles, reading them in their entirety. Thus, it is possible to break down individual studies into different topics and describe how each relates to the other, allowing to reformulate the information and develop knowledge that is not apparent from the isolated reading of studies (Denyer & Tranfield, 2009).

Of the 89 articles selected previously, there were 17 studies that the authors could not obtain in full text. After reading the remaining 72 articles, 21 papers with no relevant content were also excluded, since they did not meet the selection criteria, with a final total of 51 articles obtained and included in this research.

During this synthesis process, a database was created in a spreadsheet containing, among other data collected, the main contributions of each paper, the CSFs mentioned and KM processes that address. Other complementary information was also identified, such as the author, title, year of publication, journal and methodology followed in each study.

3.5 Step 5: Reporting and Using the Results

This step aims at reporting the main results of the analysis and synthesis of the selected papers (Denyer & Tranfield, 2009). The information extracted from the studies has been combined and categorized; in this way, the results can be discussed and any research gaps and future research can also be identified.

In order to summarize the SLR followed in this study, the authors used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) flow diagram, shown in figure 3, since it is widely accepted for both meta-analysis and systematic reviews (Liberati *et al.*, 2009).

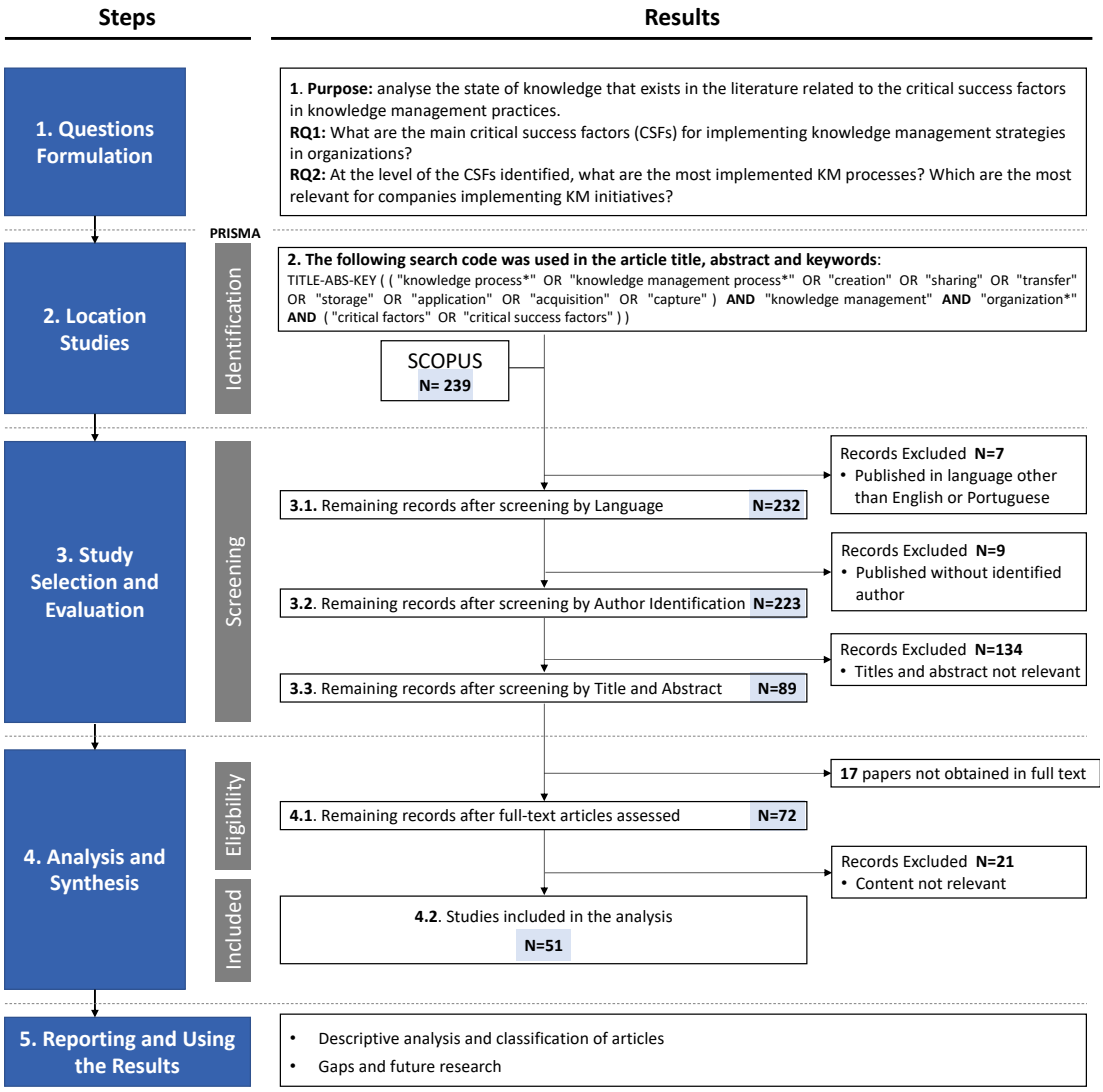

Figure 3: Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology

4. Results

4.1 Overview of the included articles

Figure 4 shows that the papers obtained were published between 2000 and 2021 and the preferred way to publish research is via journals. Most of the articles are published between 2006 and 2010. In 2018 and 2020, the number of publications increased considerably again. Most of the journals and conference papers have only one article published. However, it is important to highlight the "Journal of Knowledge Management", the journal with more published articles (five).

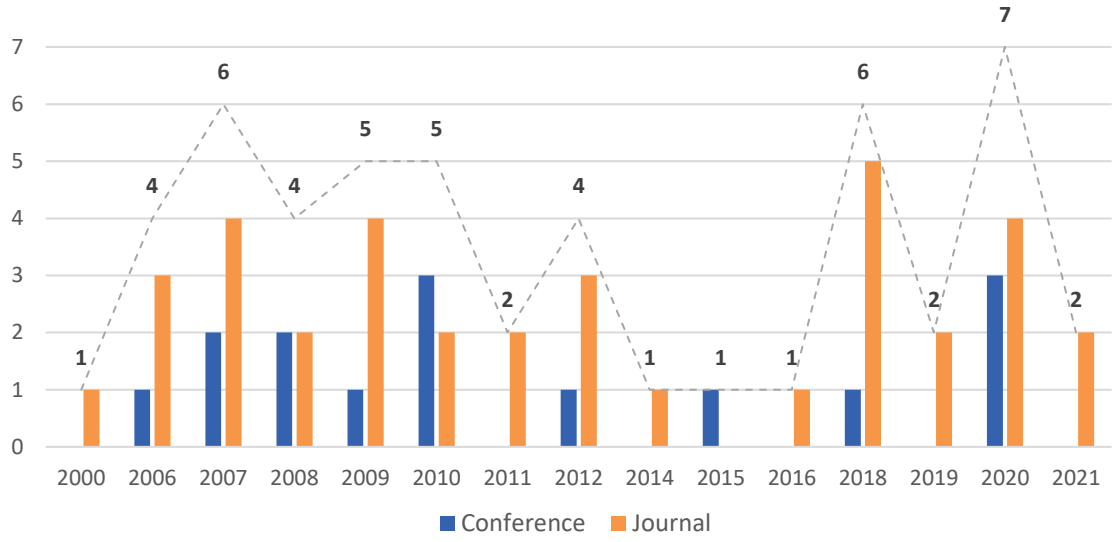

Figure 4: Papers Distribution Over Time

Regarding the methodology used (Figure 5), quantitative studies are most common, followed by qualitative studies. Generally, the studies applying quantitative methodology use questionnaires to collect data, processing it with statistical techniques such as descriptive analysis, factor analysis, multiple regressions, among others. In terms of qualitative methodology, the most used techniques are interviews with experts and case studies. Additionally, conceptual studies focus on the development of conceptual frameworks and have no empirical content.

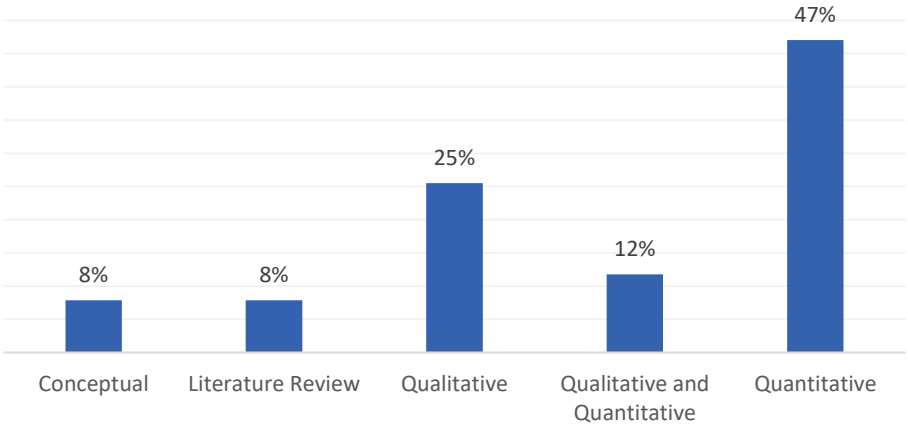

Figure 5: Papers Distribution by Methodology used

4.2 Main CSFs Identified

Through the analysis of the 51 articles, it was possible to extract 524 critical factors. To facilitate the analysis of these factors, 4 iteration stages were performed (figure 6).

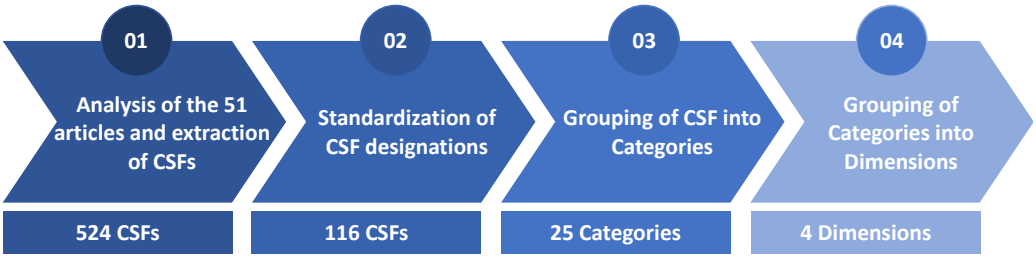

Figure 6: Steps for CSF Compilation

After the extraction of 524 CSFs, the authors removed duplicated factors and standardized the designations, using generic terms that represent synonyms. Some factors are present in several articles, with the same meaning but using different terms. For example, to refer the "alignment between KM strategy and business needs" factor, Mathew & Rodrigues (2019) presented "KM strategy aligned with organizational strategy" and du Plessis (2007) referred as "linking KM strategy to the business strategy". In addition, some authors presented the factors in more detail than others - for example, Ghomi & Barzinpour (2018) presented "Culture" as a CSF in a general way, unlike Alsadhan, Zairi, & Keoy (2008) which referred "Trust", "Openness", "Collaboration" and "Acceptance of Knowledge Sharing & Reuse" as CSF related to Culture. Other authors presented 2 factors in only 1 item – for example, Damodaran & Olphert (2000) presented "appropriate communication, training and support" as a unique factor, but for Xiong & Deng (2008), "effective communication" and "training" are two separate factors. With this first iteration, it was possible to standardize the 524 CSFs in 116 different factors.

The next step was to group similar factors into categories. In providing names for each category, the authors took care to ensure that these names were representative of the factors in question as much as possible. A total of 25 categories were obtained. Some factors did not have any similar factors and therefore some categories refer to only one factor (e.g. Benchmarking).

Finally, due to the high number of categories, the 25 categories were grouped into 4 dimensions. Figure 7 shows the dimensions and respective categories created, as well as the number of papers that cited each category, which provides valuable information about the popularity of these factors. There are more important factors than others, or at least, cited more frequently in the literature. Indeed, factors related to the organization are the most relevant, especially the organizational culture, which is the most cited category. Categories such as KM Strategy, Top Management Support and Leadership and Training should also be highlighted. In addition, regarding the technology dimension, IT Application was also one of the most cited categories in the literature.

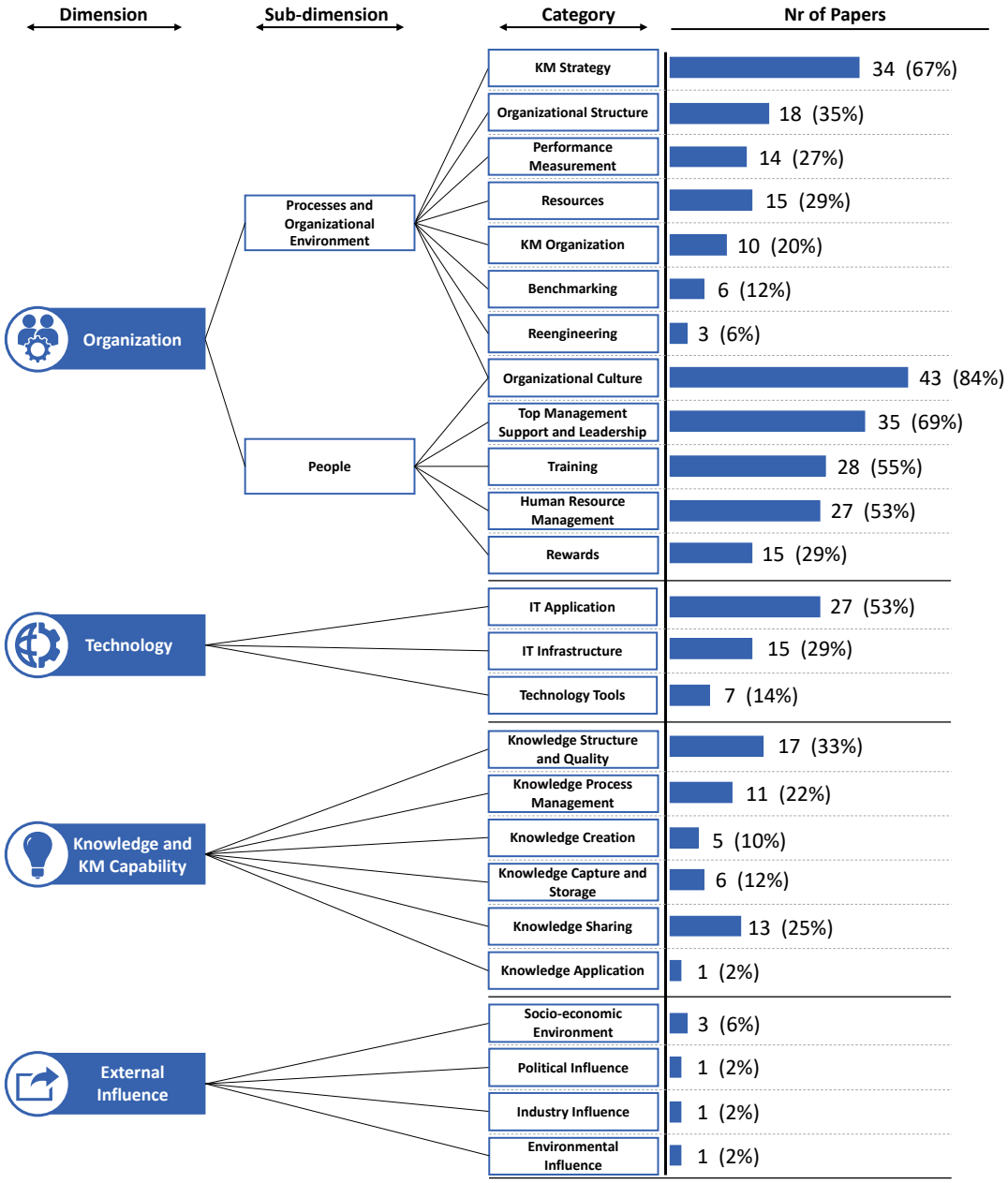

Figure 7: CSFs of KM: Dimensions and Categories

An overview of each CSF category is provided below.

4.2.1 CSFs: Organization Dimension

This dimension presents all categories directly related to the organization and is divided into two sub-dimensions: i) processes and organizational environment and ii) people.

Processes and organizational environment contain factors related to the structure of the organization, which must be flat and flexible, KM strategy, resources and processes carried out in the implementation of the KM program. People sub-dimension includes people-related factors, such as motivational or personal development factors, essential for the development of KM initiatives. The organizational culture category, despite being related to the organization, may belong to both sub-dimensions. Culture is related to people, as they think and act, but also belongs to the environment of the organization as a whole.

Table I presents all the critical success factors identified in the literature for each category belonging to the Organization dimension.

Table I: Critical Success Factors of KM: Organization Dimension

Category	Critical Success Factors	Citations
KM Strategy	**1.** Alignment between KM strategy and business needs; **2.** Clearly articulated KM Strategy; **3.** Communication and Marketing; **4.** Holistic approach; **5.** KM Strategy; **6.** KM Value Proposition; **7.** Integration with other initiatives and work practices; **8.** Strategic Planning; **9.** Pilot; **10.** User Orientation; **11.** Enterprise-wide and business unit specific needs	(Damodaran & Olphert, 2000; Ahmed & Hegazy, 2006; Artail, 2006; Akhavan, Jafari, & Fathian, 2006; Butler & Murphy, 2007; R. S. Chen & Hsiang, 2007; Jafari et al., 2007; du Plessis, 2007; Peszynski, Cooper & Molla, 2008; Xiong & Deng, 2008; Alsadhan, Zairi & Keoy, 2008; Bishop et al., 2008; Chang et al., 2009; Lo & Chin, 2009; Mohammadi, Khanlari & Sohrabi, 2009; Aggestam & Persson, 2010; Kant & Singh, 2010; Yang, Yeh & Lee, 2010; Altaher, 2010; Theriou, Maditinos & Theriou, 2011; Arif & Shalhoub, 2014; Tessier & Dalkir, 2016; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Koloniari, Vraimaki & Fassoulis, 2018; Mathew & Rodrigues, 2019; Heryanto, Aulawi & Munthe, 2020; Yap & Toh, 2020; Zain & Latief, 2020; Romero-Hidalgo et al., 2021)
Organizational Structure	**12.** Organizational structure; **13.** Flat structure; **14.** Flexible structure; **15.** Formalization; **16.** Centralization; **17.** Decentralization	(Akhavan, Jafari, & Fathian, 2006; Jafari et al., 2007; Alsadhan, Zairi & Keoy, 2008; Mohammadi, Khanlari & Sohrabi, 2009; Xu, Zhao & Wang, 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Yang, Yeh & Lee, 2010; Sadovykh & Sundaram, 2015; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Koloniari, Vraimaki & Fassoulis, 2018; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Artini, Wati & Afrizal, 2020; Yap & Toh, 2020; Aldehayyat, Almohtasb & Alsoboa, 2021)
Performance Measurement	**18.** Performance Measurement; **19.** Financial performance; **20.** Non-financial performance; **21.** KM progress tracking and measurement; **22.** Business performance	(Ahmed & Hegazy, 2006; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Xu, Zhao & Wang, 2009; Chang et al., 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Yang, Yeh & Lee, 2010; Kant & Singh, 2010; Arif & Shalhoub, 2014; Nazarizade & Azizi, 2018; Othman et al., 2018; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Mathew & Rodrigues, 2019)
Resources	**23.** Availability of resources; **24.** Financial resources; **25.** Free time and space; **26.** Use of consultants; **27.** Customer and knowledge supplier relationships	(Artail, 2006; Chen & Hsiang, 2007; Jafari et al., 2007; Alsadhan, Zairi & Keoy, 2008; Lo & Chin, 2009; Chang et al., 2009; Kant & Singh, 2010; Nazarizade & Azizi, 2018; Othman et al., 2018; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Mathew & Rodrigues, 2019; Artini, Wati & Afrizal, 2020; Heryanto, Aulawi & Munthe, 2020; Barua, 2021)
KM Organization	**28.** Chief Knowledge Officer; **29.** KM Champions and Leaders; **30.** KM Department; **31.** Specialized KM team; **32.** KM roles and responsibilities; **33.** Clearly defined knowledge ownership; **34.** Knowledge communities; **35.** Network of experts	(Butler & Murphy, 2007; Slagter, 2007; Jafari et al., 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Bishop et al., 2008; Xu, Zhao & Wang, 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Ghomi & Barzinpour, 2018; Mathew & Rodrigues, 2019)
Benchmarking	**36.** Benchmarking	(Alsadhan, Zairi, & Keoy, 2008; Akhavan, Hosnavi & Sanjaghi, 2009; Kant & Singh, 2010; Gunasekera & Chong, 2018; Othman et al., 2018; Barua, 2021)
Reengineering	**37.** Reengineering	(Akhavan, Jafari & Fathian, 2006; Butler & Murphy, 2007; Jafari et al., 2007)

Category	Critical Success Factors	Citations
Organizational Culture	**38.** Organizational Culture; **39.** Collaboration; **40.** Trust; **41.** Common vision and goals; **42.** Knowledge creating and sharing culture; **43.** Knowledge-centered culture; **44.** Learning culture; **45.** Learning from failure; **46.** Teamwork; **47.** Transparency; **48.** Openness; **49.** Readiness to accept the new system; **50.** Risk-taking climate	(Damodaran & Olphert, 2000; Ahmed & Hegazy, 2006; Artail, 2006; Lin & Lin, 2006; Akhavan, Jafari, & Fathian, 2006; Butler & Murphy, 2007; R. S. Chen & Hsiang, 2007; Slagter, 2007; Jafari et al., 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Peszynski, Cooper & Molla, 2008; Xiong & Deng, 2008; Chang et al., 2009; Lo & Chin, 2009; Mohammadi, Khanlari & Sohrabi, 2009; Xu, Zhao & Wang, 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Aggestam & Persson, 2010; Altaher, 2010; Kant & Singh, 2010; Yang, Yeh & Lee, 2010; Theriou, Maditinos & Theriou, 2011; Atanda, Dominic & Mahmood, 2012; Cardoso, Meireles & Peralta, 2012; Lee, Gon Kim & Kim, 2012; Arif & Shalhoub, 2014; Sadovykh & Sundaram, 2015; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Koloniari, Vraimaki & Fassoulis, 2018; Ganapathy, Mansor & Ahmad, 2019; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Artini, Wati & Afrizal, 2020; Heryanto, Aulawi & Munthe, 2020; Nyame & Qin, 2020; Vyas, Bhalla & Najneen, 2020; Yap & Toh, 2020; Zain & Latief, 2020; Romero-Hidalgo et al., 2021)
Top Management Support and Leadership	**51.** Top management support; **52.** Leadership	(Damodaran & Olphert, 2000; Ahmed & Hegazy, 2006; Artail, 2006; Lin & Lin, 2006; Akhavan, Jafari, & Fathian, 2006; Butler & Murphy, 2007; Chen & Hsiang, 2007; Slagter, 2007; Jafari et al., 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Peszynski, Cooper & Molla, 2008; Xiong & Deng, 2008; Bishop et al., 2008; Lo & Chin, 2009; Mohammadi, Khanlari & Sohrabi, 2009; Altaher, 2010; Kant & Singh, 2010; Yang, Yeh & Lee, 2010; Theriou, Maditinos & Theriou, 2011; Lee, Gon Kim & Kim, 2012; Arif & Shalhoub, 2014; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Koloniari, Vraimaki & Fassoulis, 2018; Ganapathy, Mansor & Ahmad, 2019; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Artini, Wati & Afrizal, 2020; Heryanto, Aulawi & Munthe, 2020; Nyame & Qin, 2020; Yap & Toh, 2020; Zain & Latief, 2020; Aldehayyat, Almohtasb & Alsoboa, 2021; Barua, 2021)
Training	**53.** Training	(Damodaran & Olphert, 2000; Ahmed & Hegazy, 2006; Artail, 2006; Akhavan, Jafari, & Fathian, 2006; Butler & Murphy, 2007; Slagter, 2007; Jafari et al., 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Xiong & Deng, 2008; Chang et al., 2009; Lo & Chin, 2009; Mohammadi, Khanlari & Sohrabi, 2009; Jafari et al., 2010; Kant & Singh, 2010; Yang, Yeh & Lee, 2010; Cardoso, Meireles & Peralta, 2012; Arif & Shalhoub, 2014; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Koloniari, Vraimaki & Fassoulis, 2018; Mathew & Rodrigues, 2019; Heryanto, Aulawi & Munthe, 2020; Yap & Toh, 2020; Zain & Latief, 2020; Romero-Hidalgo et al., 2021)

Category	Critical Success Factors	Citations
Human Resource Management	**54.** Human Resource Management; **55.** Human Resources; **56.** Employee commitment; **57.** Employee empowerment; **58.** Employee involvement; **59.** Employee motivation; **60.** Employee retention; **61.** Human capital; **62.** Job security	(Ahmed & Hegazy, 2006; Butler & Murphy, 2007; R. S. Chen & Hsiang, 2007; Hsu et al., 2007; Alsadhan, Zairi & Keoy, 2008; Mohammadi, Khanlari & Sohrabi, 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Jafari et al., 2010; Kant & Singh, 2010; Chen et al., 2011; Theriou, Maditinos & Theriou, 2011; Atanda, Dominic & Mahmood, 2012; Cardoso, Meireles & Peralta, 2012; Arif & Shalhoub, 2014; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Ganapathy, Mansor & Ahmad, 2019; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Artini, Wati & Afrizal, 2020; Yap & Toh, 2020; Zain & Latief, 2020; Aldehayyat, Almohtasb & Alsoboa, 2021; Barua, 2021)
Rewards	**63.** Incentives and rewards	(Ahmed & Hegazy, 2006; Lin & Lin, 2006; Butler & Murphy, 2007; Chen & Hsiang, 2007; Slagter, 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Bishop et al., 2008; Mohammadi, Khanlari & Sohrabi, 2009; Xu, Zhao & Wang, 2009; Yang, Yeh & Lee, 2010; Ganapathy, Mansor & Ahmad, 2019; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Yap & Toh, 2020)

4.2.2 CSFs: Technology Dimension

Technology is considered one of the critical enablers of KM (Theriou, Maditinos & Theriou, 2011; Mathew & Rodrigues, 2019). This dimension includes the application of information technology in general, technology tools to be used in the KM system, as well as some important factors related to the effectiveness and security of the system infrastructure.

Table II presents the critical success factors identified for each category of the Technology dimension.

Table II: Critical Success Factors of KM: Technology Dimension

Category	Critical Success Factors	Citations
IT Application	**64.** IT Application; **65.** Balance between people and IT; **66.** Technology; **67.** Learner-focused technology; **68.** Alignment between business and technology; **69.** Friendly and easy to use KM system; **70.** KM system design	(Damodaran & Olphert, 2000; Artail, 2006; Lin & Lin, 2006; Butler & Murphy, 2007; R. S. Chen & Hsiang, 2007; Jafari et al., 2007; du Plessis, 2007; Bishop et al., 2008; Chang et al., 2009; Xu, Zhao & Wang, 2009; Altaher, 2010; Yang, Yeh & Lee, 2010; Theriou, Maditinos & Theriou, 2011; Atanda, Dominic & Mahmood, 2012; Lee, Gon Kim & Kim, 2012; Sadovykh & Sundaram, 2015; Al-Hakim & Hassan, 2016; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Koloniari, Vraimaki & Fassoulis, 2018; Mathew & Rodrigues, 2019; Biloslavo, Kljajić-Dervić & Dervić, 2019; Heryanto, Aulawi & Munthe, 2020; Zain & Latief, 2020; Barua, 2021)
IT Infrastructure	**71.** Effective IT infrastructure; **72;** Access to network infrastructure and hardware; **73.** Security	(Ahmed & Hegazy, 2006; Artail, 2006; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Lo & Chin, 2009; Mohammadi, Khanlari & Sohrabi, 2009; Aggestam & Persson, 2010; Arif & Shalhoub, 2014; Othman et al., 2018; Artini, Wati & Afrizal, 2020; Heryanto, Aulawi & Munthe, 2020; Nyame & Qin, 2020; Yap & Toh, 2020; Aldehayyat, Almohtasb & Alsoboa, 2021; Romero-Hidalgo et al., 2021)
Technology tools	**74.** Collaborative tools; **75.** Effective KM tools; **76.** Functions of KMS; **77.** Knowledge repository	(Damodaran & Olphert, 2000; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Jafari et al., 2010; Mathew & Rodrigues, 2019; Heryanto, Aulawi & Munthe, 2020; Romero-Hidalgo et al., 2021)

4.2.3 CSFs: Knowledge and KM Capability Dimension

This dimension includes factors related to the structure and quality of knowledge to be used, the knowledge processes management in general and also the KM processes capability, which in turn is related to the efficiency of each KM process in the organization.

The critical success factors of this dimension are summarized in table III.

Table III: Critical Success Factors of KM: Knowledge and KM Capability Dimension

Category	Critical Success Factors	Citations
Knowledge Structure and Quality	**78.** Flexible knowledge structure; **79.** Knowledge structure and map; **80.** Knowledge architecture; **81.** Nature of knowledge; **82.** Quality of information; **83.** Variety of knowledge sources	(Akhavan, Jafari, & Fathian, 2006; Jafari et al., 2007; du Plessis, 2007; Alsadhan, Zairi & Keoy, 2008; Chang et al., 2009; Mohammadi, Khanlari & Sohrabi, 2009; Xu, Zhao & Wang, 2009; Akhavan, Hosnavi & Sanjaghi, 2009; Aggestam & Persson, 2010; Yang, Yeh & Lee, 2010; Atanda, Dominic & Mahmood, 2012; Arif & Shalhoub, 2014; Gunasekera & Chong, 2018; Othman et al., 2018; Mathew & Rodrigues, 2019; Artini, Wati & Afrizal, 2020; Nyame & Qin, 2020)
Knowledge Process Management	**84.** KM processes and procedures; **85.** KM processes easy to follow; **86.** Knowledge process management; **87.** Managing explicit and tacit knowledge; **88.** Managing knowledge throughout its lifecycle; **89.** Mechanism to approve activities; **90.** Precise KM processes	(Lin & Lin, 2006; du Plessis, 2007; Chang et al., 2009; Lo & Chin, 2009; Jafari et al., 2010; Ghomi & Barzinpour, 2018; Gunasekera & Chong, 2018; Nazarizade & Azizi, 2018; Othman et al., 2018; Zain & Latief, 2020; Romero-Hidalgo et al., 2021)
Knowledge Creation	**91.** Knowledge Creation; **92.** Innovation	(Ahmed & Hegazy, 2006; Kant & Singh, 2010; Yang, Yeh & Lee, 2010; Nyame & Qin, 2020; Romero-Hidalgo et al., 2021)
Knowledge Capture and Storage	**93.** Knowledge capture; **94.** Knowledge storage; **95.** Knowledge identification	(Ahmed & Hegazy, 2006; Akhavan, Jafari, & Fathian, 2006; Akhavan, Hosnavi & Sanjaghi, 2009; Chang et al., 2009; Zain & Latief, 2020; Romero-Hidalgo et al., 2021)
Knowledge Sharing	**96.** Knowledge Sharing; **97.** Multiple channels for knowledge sharing; **98.** Specialized meetings, conferences and seminars; **99.** Procedural design needs to help to establish a loop of knowledge-sharing	(Ahmed & Hegazy, 2006; Artail, 2006; Akhavan, Jafari, & Fathian, 2006; R. S. Chen & Hsiang, 2007; Jafari et al., 2007, 2010; du Plessis, 2007; Chang et al., 2009; Yang, Yeh & Lee, 2010; Kant & Singh, 2010; Atanda, Dominic & Mahmood, 2012; Gunasekera & Chong, 2018; Yap & Toh, 2020)
Knowledge Application	**100.** Knowledge Application	(Yang, Yeh, & Lee, 2010)

4.2.4 CSF: External Influence Dimension

This dimension focuses on factors that are beyond the organization's control, allowing organizations to identify threats and opportunities and map them to their strengths and weaknesses in projects execution (Gunasekera & Chong, 2018). It includes socio-economic, political, industry and environmental influence factors.

Table IV presents the critical success factors of external influence.

Table IV: Critical Success Factors of KM: External Influence Dimension

Category	Critical Success Factors	Citations
Socio-economic Environment	**101.** Socio-economic environment; **102.** Economic climates; **103.** Economic stability; **104.** People affected because of the project activities; **105.** People benefiting from the project; **106.** Sound economic policy; **107.** Surrounding neighbours affected because of the project activities	(Sadovykh & Sundaram, 2015; Gunasekera & Chong, 2018; Othman et al., 2018)
Political Influence	**108.** Sources of finance; **109.** Confidence of politicians; **110.** Regulations; **111.** Adaptability to amendment of project plans	(Gunasekera & Chong, 2018)
Industry Influence	**112.** Availability of external resources; **113.** Subcontractors and suppliers; **114.** Market prices of materials and labour	(Gunasekera & Chong, 2018)
Environmental Influence	**115.** Ground conditions of projects; **116.** Weather conditions	(Gunasekera & Chong, 2018)

4.3 KM Processes

The authors also identified which KM processes were used and/or highlighted throughout the articles under study. As previously mentioned, this research focuses on four main KM processes. It should be noted that some authors identified other very similar processes that fit into the four initial processes (e.g. knowledge transfer was considered as knowledge sharing, due to the similarities of these processes in the literature). Additionally, knowledge storage was also widely cited and, for this reason, was grouped into "Knowledge Capture and Storage", since the capture process can be defined as the inclusion of knowledge into the existing knowledge base of an organization (Nielsen, 2006). Figure 8 summarizes the frequency of citations of the KM processes identified.

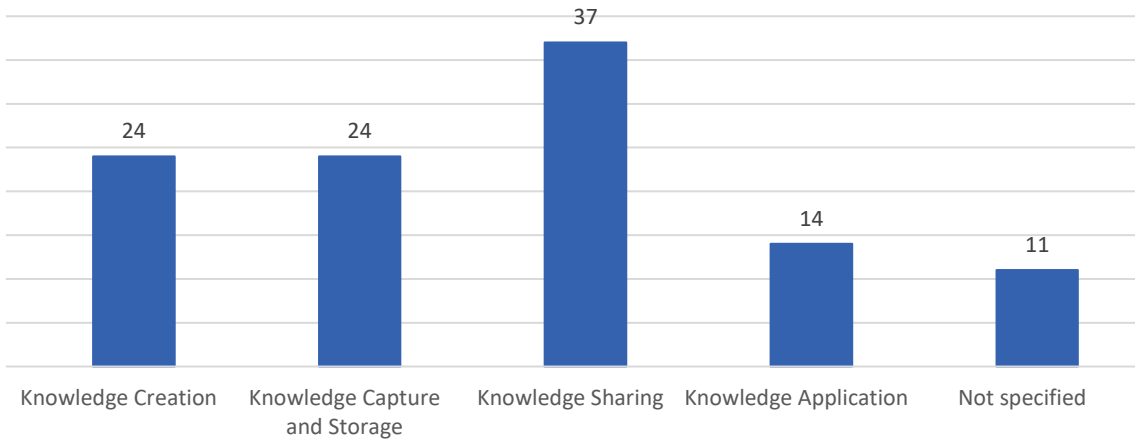

Figure 8: KM Processes Citations

Figure 8 shows that Knowledge Sharing is the most cited process, where there is more focus when implementing KM practices, followed by Knowledge Capture and Storage and Knowledge Creation. In fact, organizations also look for methods and techniques for knowledge creation and capture, with the subsequent objective of being shared among the organization.

Knowledge Application was explicitly mentioned only 14 times, but it does not mean that this process is less relevant. Although KM processes are almost always mentioned in the literature review section of the articles, not all papers focus on the processes most used in the KM strategies - 12 articles did not highlight any specific KM process.

It should be noted that, in general, when presenting the CSFs, the authors of the articles did not relate them to just one particular KM process, but to the KM initiative or strategy as a whole.

5. Discussion and Conclusions

As has been mentioned previously, knowledge management is a complex field, increasingly sought by organizations that want to improve processes and ensure the use of useful knowledge to gain long-term competitive advantage. Although there are several methodologies, there is no single comprehensive or integrated approach to implement KM projects, therefore it is crucial to look at what other organizations have done, their main results and lessons learned.

This research proposes a comprehensive investigation of the CSFs of KM implementations in organizations. Through the synthesis of 51 articles, 25 CSFs categories were extracted, forming a support base for organizations that are implementing KM initiatives.

The results show that factors related to the organization are the most important for KM. Firstly, because this is the dimension with the largest number of CSF categories identified, and secondly, because these categories are the most cited in the literature. In particular, organizational culture is the most important factor for the success of KM, as also concluded by other authors (Mathew & Rodrigues, 2019; Theriou, Maditinos & Theriou, 2011).

Promoting a culture of sharing and creating knowledge, trust, respect and collaboration is crucial and a prerequisite for KM - if people are not motivated and willing to share knowledge, the initiative will fail.

In addition, the implementation of KM in an organization is not an easy process, so it is fundamental to have a well-defined and concise strategy, with concrete goals to achieve success. This strategy must be aligned with the organizational strategy and be communicated to the organization, with a vision that inspires others to participate in KM initiatives.

In general, the results suggest that people-related factors have the greatest impact in KM adoption. Besides organizational culture, mentioned above, factors such as top management support and leadership, training, HRM and rewards have been frequently mentioned in the literature. Since most of the organizational knowledge resides in people and they are the main conveyor of knowledge (Igbinovia & Ikenwe, 2018), the significance of these factors becomes evident. It is crucial to adopt mechanisms and procedures that support and motivate people to participate in KM initiatives.

On the other hand, any KM practice should also be based on Technology and Processes (Igbinovia & Ikenwe, 2018). There is no doubt that IT facilitates KM, which can also be observed through the results of this study - 27 papers presented factors related to the IT application as critical to the success of KM. However, technology cannot be seen as a single facilitator to KM, as it will never work by itself. Therefore, it serves as support to people and processes involved, as perceived by Igbinovia & Ikenwe (2018).

In terms of knowledge processes, some authors identified the capability of these processes as CSFs to KM implementation, however, this aspect is not consensual. Most researchers identify CSFs to KM implementation indirectly contemplating KM processes in general, and not the processes in particular. Nevertheless, 11 papers identified knowledge process management as a CSF.

In any case, within the CSFs, the ability to share knowledge stands out from other processes, which is supported by the second part of the results. Most companies begin to implement KM practices with the main objective of knowledge sharing within the organization, since one of the main problems is knowledge residing only in the mind of employees. However, almost no author has related CSFs to a particular KM process, but to the KM initiative in general. It was not possible to relate CSF to specific KM processes. This leads to the conclusion that for KM initiatives to be successful, it is important to integrate all processes, not just share knowledge, for example.

Finally, it should be noted that only 3 articles mentioned external influence factors (Sadovykh & Sundaram, 2015; Gunasekera & Chong, 2018; Othman et al., 2018). The unpopularity of these topics can be explained by the concept of context which, although it has been increasing weight in the literature, there are still many authors who consider the role of context irrelevant for organizations seeking to promote KM practices (Sadovykh & Sundaram, 2015). Besides, the results show that external influence factors are related to the sector of the organization, such as the construction sector demonstrated by Gunasekera & Chong (2018). Thus, the authors conclude that external factors are less referred to in the literature since KM depends a lot on factors inherent to the organization, such as people, processes and technology. Except for certain situations, factors that are outside the control of organizations are not critical to the success of KM implementations, however, they should not be totally ruled out.

In summary, this study is comprehensive enough and its findings are relevant for all organizations intending to implement KM initiatives, regardless of size and sector. It is expected from a theoretical perspective to contribute to the area of KM through the compilation, categorization and classification of a set of critical success factors reported in the literature. From a practical perspective, these results can contribute as a consultative tool to support the preparation of strategies in this area by organizations wishing to implement KM initiatives. The identification of these CSFs facilitates organizations to understand which areas should be improved and what are the main measures to take in order to succeed in the KM implementation, creating an important decision instrument for organizations. However, it should be noted that each organization is different and therefore its current state of KM implementation should be well reflected, as well as which success factors will best fit its context.

This research also has limitations. The present study focuses on specific KM processes, and since there is still a lot of divergence in the literature regarding the main processes (or concepts), it may not have covered all KM processes and critical success factors. Future research may focus on identifying CSFs covering all KM processes, or none at all, since KM implementation includes the entire cycle of KM.

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