This is an Accepted Manuscript of an article published by Taylor & Francis in CYBERNETICS AND SYSTEMS on 13.01.2021, available online: https://www.tandfonline.com/doi/full/10.1080/01969722.2020.1871223

Postprint of: de Castro R., Sanin C., Szczerbicki E., Levula A., Where Did Knowledge Management Go?: A Comprehensive Survey, CYBERNETICS AND SYSTEMS (2021), pp.1-20, DOI: 10.1080/01969722.2020.1871223

Where did Knowledge Management Go?: A Comprehensive Survey

Rodrigo Oliveira de Castro[a]*,Cesar Sanin [a], Edward Szczerbicki[b], Andrew Levula[c]

[a]*Business Information Systems, Australian Institute of Higher Education, Sydney, Australia;*

[b]*Faculty of Management and Economics, Gdansk University of Technology, Gdansk, Poland;*

[c] *Business Information Systems, Sydney International School of Technology and Commerce, NSW, Australia*

* r.castro@aih.nsw.edu.au

Where did Knowledge Management Go?: A comprehensive survey

Knowledge Management (KM) research outputs have been expanding exponentially in the past years, generating diversified topics, which lack integration and classification. It has been challenging for experts to classify KM because of its versatile open fields, and in our view, it contributes to the technocratic approach remaining behind the organizational approach. This paper highlights a way to classify KM publications through a pattern that will support technocratic developments representing knowledge in a more explicit form. This study uses a classification method thatuses a template in a taxonomy shape, executing some procedures and allowingan accurate identification and organizationof KM research outputs. The proposed taxonomy method is proven on a set of 150 different KM publications from the last 15 years. This scheme is grouped into two main categories: Conceptual and Empirical which could enable academics and practitionersalike to better understand the current gaps that are prevalent in KM.

Keywords: Content analysis, Taxonomy development, Classification scheme, KM frameworks, Knowledge management.

1. Introduction

The amount of knowledge management (KM) research papers published over the past fifteen years have increased significantly(Gaviria-Marin, Merigó et al. 2019; Martins, Rampasso et al. 2019). A query executed usingMicrosoft Academic research tool showed that over fifty thousand search results were achieved by the term "knowledge management". The identical query if applied today in GoogleScholar would result in more than 1.5 million papers [1]. In addition, Ragab andArisha (2013) highlight this pattern and predict that the number of publications would grow significantly. This increased number can be explained by the higher interest for academics and professionals in the KM discipline (Qiu and Lv 2014).

Even though there has been an increased number of publications,there is still a lot of confusion on knowledge terminology and their correct usage which tends to be synonymous

[1]Query executed on Google.com: “knowledge management”, 23rdof November 2020.

with knowledge activity and knowledge process(Wong and Aspinwall 2004). These termsare used mutually to describe the same KM concept, but they are often misinterpreted and conflict with each other (Nie et al. 2009; Handzic 2003). Furthermore, some researchers or professionals may consider KM differently(Herong, Pengcheng et al. 2008; Liew 2013; Bashir and Farooq 2019). For example, the KM description itself may be limited or extended to include additional structures, such as policy, people, and processes. Different views can lead to communication confusions if not prior agreed. Although, a wide range of frameworks, models and school of thoughtrelated to KM have emerged, the lack of consistence and theoretical underpinning to guide implementation of KM still remain(Hussinki, Kianto et al. 2017; Bashir and Farooq 2019). In short, there have been no agreements on the main topics that build up the KM identity (Vorakulpipat and Rezgui 2008; Peachey and Hall 2005), resulting in an extensive and diverse discussions about KM's identity.

In order to address this heterogeneous approach, classification and consolidation of published papers are required. Both Serenko (2013) and Bedford (2015) stressed the need to establish a standard KM classification based on keyword lists referring to KM topics such as tools. Studies have attempted several different approaches to classify KM literature in general (Nie et al. 2007; Jafari et al. 2009), or by proposing models and frameworks for concrete KM-related topics such as KM systems (Xu et al.2011), alternativelyby performing citation analysis (Serenko 2013). Although, these attempts are not widely accepted classification methodologies, they integrate known results and provides aninformative summary of KM without discrimination to any particular perspective (Serenko 2013; Guo and Sheffield 2008).

The purpose of this paper is to address thisgap in the literature by implementing a classification scheme which is going to organize, classify, and consolidate KM through a literature analysis.A total of 150 conference and journal papers were analyzed, and they have been categorizedas Conceptual and Empirical. This produced a two-dimensional detailed structure. The Conceptual approach is appropriate when it is related to some abstract idea(s) or

theory. In contrast,the Empirical approach is “gained by producing practical elements”, particularly by outputs such as technology applied or documentation of patterns and behavior through experimentation. This method has proven to be more flexible and allows the possibility to manage categories that were wrongly assigned.

The rest of this paper is organizedin the following manner: the next section defines the background used in this paper. Subsequently, the methodology adopted in developing the scheme, and the summary of survey, followed by the findings and conclusion.

2. Data, Information, and Knowledge

Knowledge can be described as being a justified belief which increases the capacity of an individual to act effectively and is something that humans have always tried to acquire(Tang, Mu et al. 2010; Dabić, Vlačić et al. 2019). However, before we discuss knowledge further, we must first define the concepts of data and information. Whereas data are unorganizedand unprocessed representations of facts about the world expressed in terms of numbers, characters and/or other elements, information emerges as a consequence of treating, processing, manipulating and organizing data in such a manner that it becomes meaningful to the recipient (Davis 1974).

It should be noted that the rapid progress made in the area of ICT has enabled large volume of data tobe created. This data needs to be processed in a certain manner so that it can be converted into information which can then be combined with experience, context, interpretation and reflection to become ‘knowledge’(Liew 2013). Thus, knowledge is information that has been evaluated and organizedin such a way that it can be used to make a difference in an enterprise, perhaps through the teaching of a lesson or the solving of a problem. Knowledge is more subjective and intangible than data and information, and unlike data and information, it is not easy to store, describe, or manipulate (Ameri and Dutta 2005).

Two categories of knowledge are described in the literature: formal or explicit knowledge, and informal or tacit knowledge(Herong, Pengcheng et al. 2008). Tacit knowledge is individual, subjective, context-specific experience-based intuition, and is difficult to formalize and communicate (Alavi and Leidner 2001;Hisyam Selamat and Choudrie 2004). Despite these challenges, tacit knowledge is valuable and likely to lead to breakthroughs in organizations(Wellman 2011). A lack of focus on tacit knowledge directly reduces an organization'scapacity for innovation and sustained competitiveness (Miguelanez et al. 2010). Explicit knowledge, on the other hand, is knowledge that is social, objective and formalized, and can be transmitted easily (Nonaka and Takeuchi 2007; Wellman 2011). It is commonly used in organizationsto ensure that people have access to what they need in order to perform the tasks required of them. Unfortunately, 95percent of knowledge held by organizationsis retained as tacit knowledge and is therefore difficult to manage (Ghaziri and Awad 2005).

2.1. Experience

Experience can be defined as being knowledge or a skill that is acquired in daily life with the passage of time (Sun and Finnie 2003). It is usually understood to be knowledge that is gained through practice rather than from theory (Sharma, Singh and Goyal 2012). Experience or experiential knowledge can thus be regarded as a specializedform of knowledge that includes information and strategies that have been acquired through the prior performance of tasks. Both knowledge and experience are important attributes for any knowledge worker who is attempting to resolve real-world problems in organizations.

In today's dynamic business environment, appropriate KMand experience management (EM) are essential in ensuring that enterprises can both survive and maintain a competitive advantage. In this regard, while individual decision makers can base future decisions on lessons learned from similar situations that they have encountered previously (Sanin and Szczerbicki 2005), organizationsare often unable to capitalizeon much of their experience due to inadequate

knowledge administration. This leads to the reprocessing of decisions and lengthy response times, and is generally associated with a lack of flexibility to adapt in dynamic environments(Szczerbicki and Sanin 2020).

2.2. Knowledge Management and Knowledge Representation

KM is based on the theory that organizationsshould function in a knowledge-based or knowledge-centric way (Nonaka and Takeuchi 1995; Kogut and Zander 1992;Grant 1996; Lee 1993). It is a discipline that integrates multiple approaches to the identification, capture, evaluation, development, sharing and use of knowledge as a valuable asset that can achieve organizationalobjectives (Nonaka and Takeuchi 2007). The discipline of KM involves the establishment and administration of processes that can deliver useful information, and can help people to act on and share this information so as to improve the performance of organizations(O'Dell and Hubert 2011). Moreover, KM technologies, applications, and theories can give enterprises a different perspective on knowledge management (Matayong and Mahmood 2012).

In practice, KM can be difficult. Lack of a standardizedimplementation method, multiplicities of approaches to KM across different areas, and a general lack of agreement with regard to how knowledge should be managed,all of these presenting barriers to the success of KM in enterprises. However, these challenges can be overcame by appropriate and proper knowledge representation (KR) such as the ones that allow the acquisition of tacit knowledge and its subsequent transformation into explicit knowledge. Explicit knowledge and its representationare fundamentally a surrogate, a substitute for the thing itself, which is used to enable an entity to determine consequences by thinking rather than acting, that is, by reasoning about the world rather than taking action in it (Szczerbicki and Sanin2020).

It is necessary, therefore, for knowledge to be acquired and represented in a form that is understandable to and shareable by the agents that seek to use it, and this leads to the question of

how knowledge should be most appropriately represented (Li, Xie and Xu 2011). Whereas inappropriate KR leads to the creation of a version of explicit knowledge that is fragile and unstable; appropriate KR allows the creation of stable and reliable explicit knowledge, where stability and reliability are crucial attributes of any knowledge that is to be used in artificial intelligence (AI). Such knowledge is formalizedknowledge, and allows the acquisition of information and contexts in an artificial system (Negnevitsky 2005). This general view, which was developed in the field of AI, is closely related to the initial idea of KM, in terms of knowledge regarded as an artificial resource. Hence, the view that any approach to KM should be purely mechanistic, and as such it has seen the creation of numerous techniques and tools that support KM and decision-making processes. Efforts in this regard have come mainly from the fields of information technology (IT), AI, Knowledge Management Systems (KMS), Simulation, Expert Systems (ES), Decision Support Systems (DSS), and Data Mining (DM), among others (Liao 2003).

2.3. Classification Scheme and Taxonomy

Classification scheme is a term used to describe a process of categorizingan object through content analysis and grouped them by similarity (Fteimi and Lehner 2018). It is a method that utilizesynonyms such as framework, taxonomy, or typology(Nickersonet al. 2013; Gregor 2006; Bailey 1994) andit refers to the outcome of a classification approach for multiple entities. The categorizationprocess describes the function of structuring different things into (n) categories or groups, which can be sub-categorized(Bailey 1994). A classification scheme, helps to clarify and evaluate the complexity of a research domain, simplifies and crates of a common vocabulary and improves the efficiency of database searches through a unique terminology (Barki et al. 1988).

A taxonomy definition was limited to classify living beings, but then the term was applied to a larger context, and it is now applied to more general concepts. Nearly everything

can be categorizedusing a taxonomy scheme. Taxonomy can also be defined as a simple organizationof objects into sortable list or groups. In a mathematical approach, it is described as hierarchical tree structure that contains certain groups of objects, with a single root at the top that classifies all objects (Rahnamafard, S.M. and ShariatPanahi, H.F. 2006).

Nickerson et al. (2013) presented the basis for a classification scheme (Figure 1) to establish if research outcomes moved from Empirical-to-conceptual schemes or vice versa. Such research provides interesting results and a taxonomy for analysis of research process and outputs.

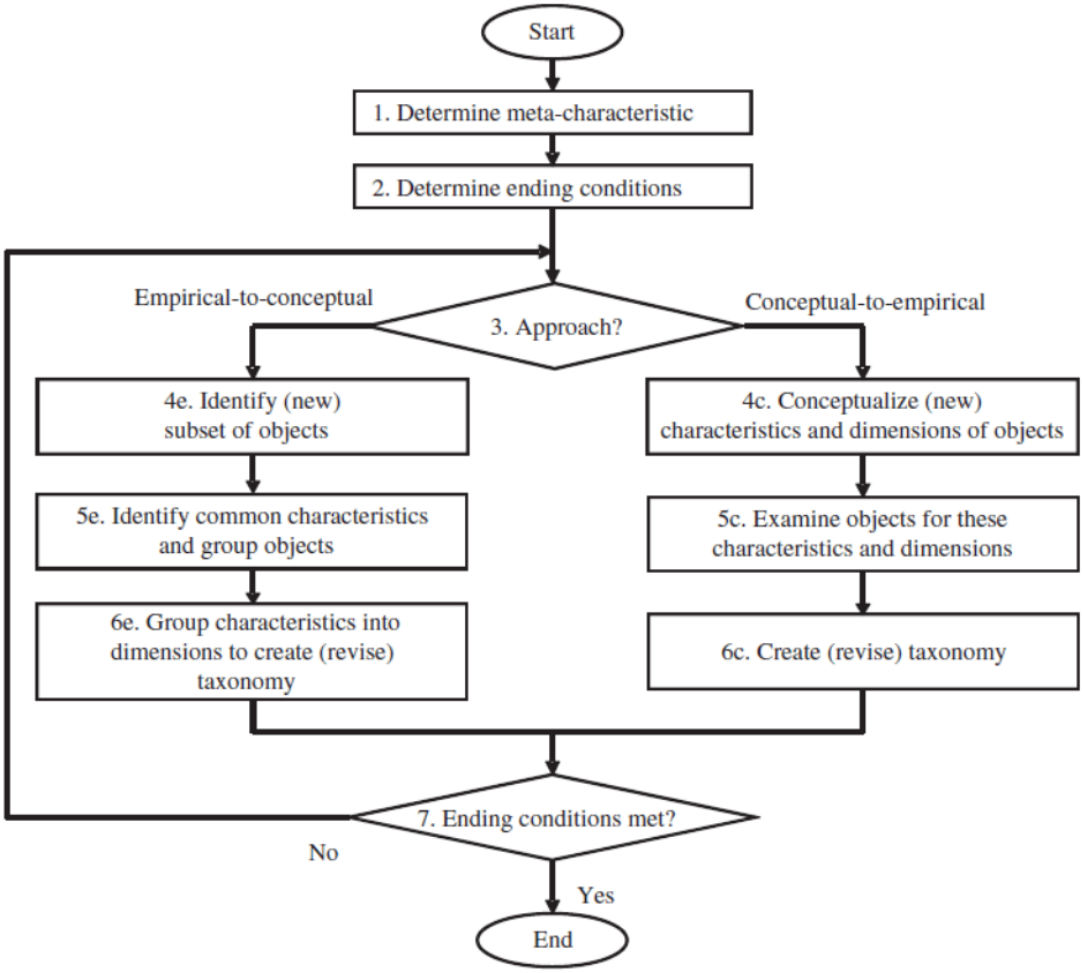

Figure 1: Nickerson et al.2013 classification and taxonomy method.

2.4. Empirical and ConceptualResearch Outputs

Conceptual research outputs are connected to an abstract or theoretical idea(s). Intellectuals and philosophers usually use it to create new frameworks or reinterpret existing ones. Empirical

outputs, on the other hand, relies on technology, applications or documentation of patterns and behavior through experimentation.It couldbe a data-based analysis or evaluating findings that can be confirmed by producing practical elements or experimentation. In this type of research, it is important to find out facts first in order to actively produce the necessary information or application(Reseapro Scientific Services (P) Limited2012).

2.5. Content Analysis

Content analysis is a method to evaluate the existence of certain words, themes, or concepts. It is used by researchers to measure and interpret some qualitative data. Once applied, researchers can, for example, evaluate and analyzethe vocabulary used in a news article to find outif there are any bias(Berelson 1952). "Researchers can then interfere in the messages within the texts, the writer(s), the audience, and even the culture and time" to search for bias or partiality. (Public Health Columbia 2020). Furthermore, literature describes content analysis as a "research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use'' (Krippendorf 2013, p. 24).

3. Methodology

Based on Nickerson et al. (2013), a four steps approach was created to establish our proposed classification scheme and assessment of research outputs (Figure 2). Step 1consistsof downloading papers and doing a structured publication review (Webster and Watson 2002), in order to identify and compare existing classification approaches(Fteimi and Lehner 2018). In Step 2, we performed a content analysis, which comprises a qualitative and quantitative analysis of each paper. Then, on Step 3, the basis for a classification scheme is created (Figure3)by adjustingNickerson et al. (2013) method. As a result, on Step 4, we can apply such classification of papers and their outcomes, and therefore,understanding where KM movement has gonesince our proposed method of classification uses KM categories in just two distinctive ways:

Conceptual and Empirical; in which we simplify and adapt Nickerson et al. (2013) method as follows in Figure 3.

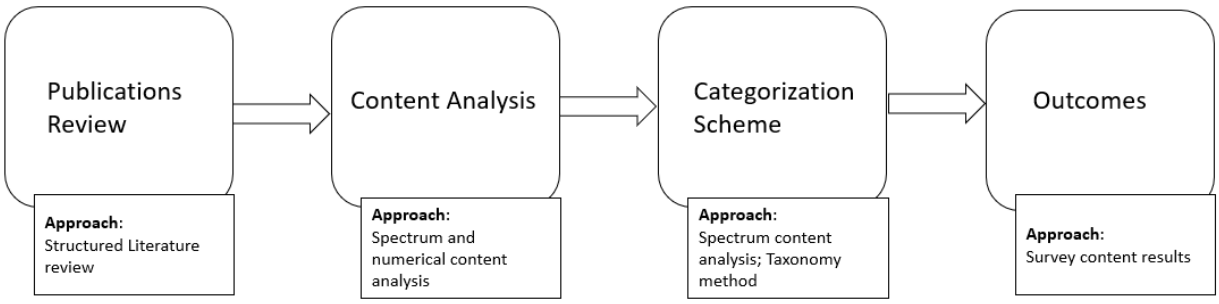

Figure 2: Four steps approach research method.

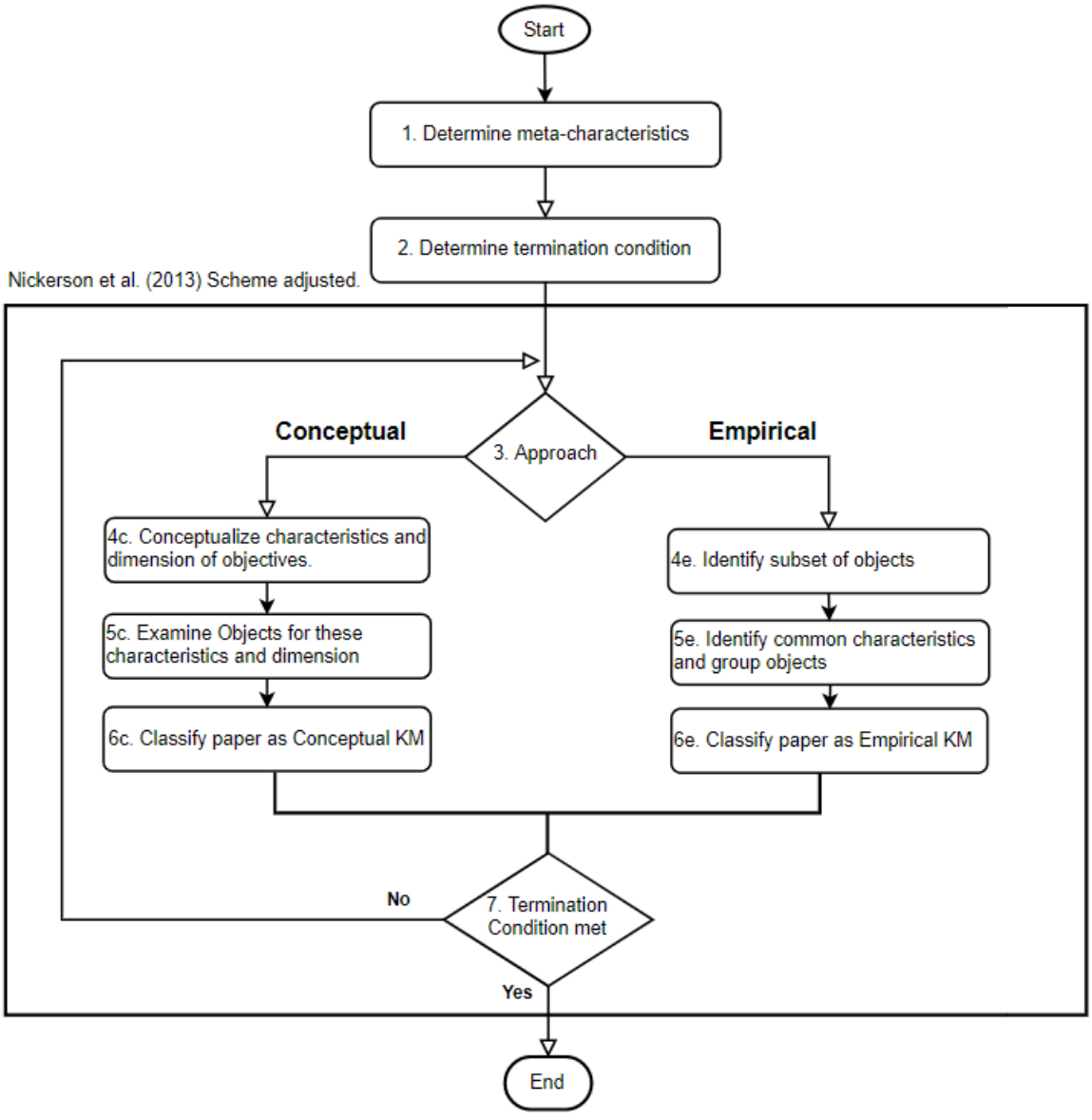

Figure 3: Proposed KM research outcomes classification scheme.

In order to have an efficient KM analysis, we focused on KM collected papers and their outcomes in a range of years from 2005 to 2020 to be classified. We decided to work with 150 distinct KM papers, in combination of conference and journal papers. Initially collecting papers records comprising title, abstract and author-provided keywords, as similarly done by Fteimi and Lehner (2018). Then, we initiated an analysis by applying quantitative content analysis gathering similar papers and comparing them among themselves. The literature describes content analysis as a “research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use’’ (Krippendorf 2013, p. 24). Content analysis, as an analytical method of study, gives us new perspectives that suit well for the analysis of large quantities of data and or documents(Fteimi and Lehner 2018).

Initially, the findings were evaluated by concentrating and investigating on the 'knowledge management' keyword. The results were refined, and the quantitative content analysis accomplished. A two-stages strategy is involved in the content analysis: while the search engine was able to identify single and compound 'knowledge management' terms from web-based publications, a manual qualitative analysis was done to analyzethe paper content. In a recent study, Fteimi and Basten (2015) published a similar approach that involves a dictionary creation, which support a starting point for their strategy. Their final survey version containeda manual content analysis for quantitative and qualitative publications and applied to 150 selected publications.

The existence of different terms used synonymously in the literature to describe the classification or categorizationprocess were not only noted by Bailey (1994), but also by Nickerson et.al (2013), which based on his observation, presented a taxonomy development method, which is applicable to both empirical and conceptual outcomes. The method of Nickerson et al. (2013) was adopted to provides insights of a classification process to consolidate the simultaneous usage of the KM terms. However, an adaptation of Nickerson et al. (2013) method was necessary to complete this study. As illustrated at Figure 2, to define the

classification of the paper, seven steps were applied. Step 1,determine meta-characteristics, observed paper properties and frequently occurrence of similarity among KM publications.Step 2,determine termination condition, applied when a paper does not fit into the KM field and fixed any search engine error in applying the query correctly. Regarding Step 2, Nickerson et al. (2013) suggest the following conditions, the first three being objective, in contrast to the last four that are subjective and prone to varying interpretations (Nickerson et al. 2013; Howard and Longstaff 1998; Amoroso1994;Fteimi and Lehner 2018).

Step 3 approach presented a decisionbased on two approaches whereby the researcher must use an iterative process to choose between the approaches: **Empirical** or **Conceptual**. The choices are determined according to the researcher's understanding of the subject domain and data availability. The conceptual approach is initially usedwhen the paper is connected to an abstract or theoretical idea(s), or little is known about the subject domain, and little data are available. The present study's objective modifies and adjust the KM classification scheme based on a prior content analysis from the Step 3. In this scenario, new data needs to be identified, conceptualizedand dimensioned in Step 4c. Afterwards, objects are grouped by dimension in Step 5c. And finally, the objects are classified as Conceptual in Step 6c.In contrast, the empirical approach is appropriate when the paper provides a sufficient data-based analysis, findings, and/or outcomes that can be confirmed by observation, experimentation, implementation or even a computer application. The approach begins with the identification of object characteristics in Step 4e. Subsequently, their common characteristics need to be determined in Step 5e, then the paper is classified as Empirical in Step 6e. The method ceases when all termination conditions have been met in Step 7. There are 6 termination conditions that should be met:

1- After the final iteration, all objects (papers) have been categorized in Conceptual or Empirical outputs.
2- Assessment of any given paper to multiple categories should be avoided.

3- Grouping papers according to categories should produce similar results when repeating the categorization by different coders.
4- It should be easy to add a new paper to an existing classification in its further revisions.
5- Categories should be comprehensive and acceptable.
6- The results should provide useful insights to the community.

In summary, eleven iterations were necessary to develop the proposed classification scheme.

4. Findings

The experimentation model presented in this paper, began with a web-based search, followed by the manual content analysis as per our applied research method presented in Figure 2. Then, we applied the modified Nickerson et al. (2013) classification method as in Figure 3. As a result, we had each paper classified in one of the two approaches: Conceptual or Empirical, in order to find out where KM research outcomeshave gone to.

Our main hypothesis is that most of the KM research outputs has been concentrated into conceptualizationof knowledge and its branches; therefore, little has gone into practical (empirical) elements of it, with not many automatic or semiautomatic KM implementations. This has resulted in a reduction of the KM movement in the last couple of years, and consequently a greater development of artificial intelligence and machine learning techniques without the support of KM frameworks, including knowledge representation of the order of general domain.

Effectively, one of the main aspects that were observed during this study isthe confirmation of the hypothesis since most of the KMoutcomes in published papers refer to KM as abstract or theoretical idea(s) with a **62.67%,** while a minor part focus on empirical KM with a **30.00%**. The termination element corresponds to research outcomes published that were not classified as part of the KM in the Step 2 in our classification scheme with a **7.33%** (some

papers were even considered terminated as they broke a copyright law and the publisher considered to ban them. The classification results presented in Figure 4, shows that even in different types of publications (i.e., journal and conference papers) the KM conceptual idea is more popular among researchers in the fifteen years.

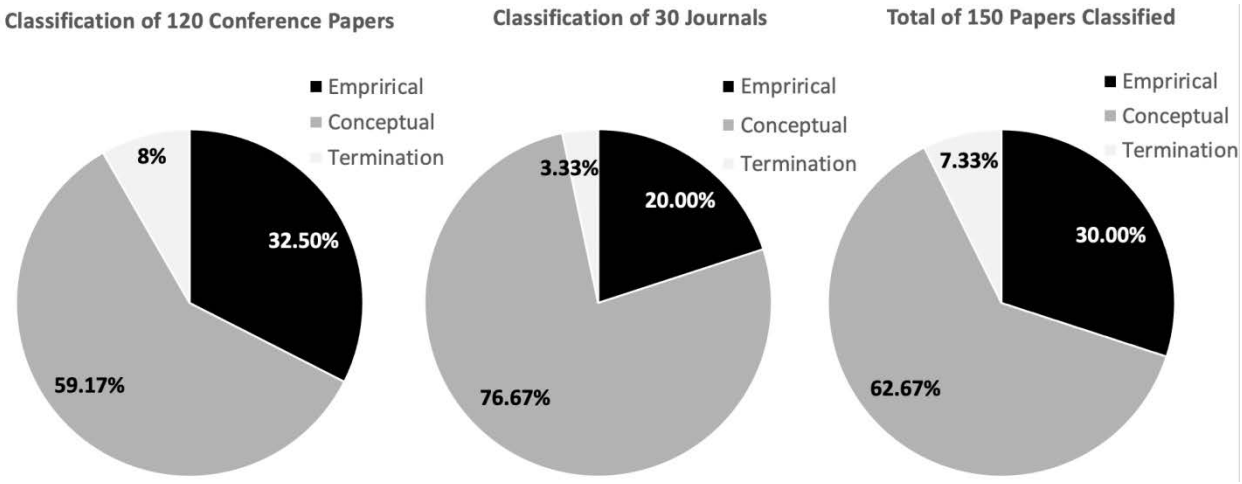

Figure 4:KM Research Outcomes Classification Results.

The results present the majority of papers as conceptual category. However, few of those conceptual papers are not KM specific, few of them describes organizational structure or educational programs using concepts that should be considered when organizations implement KM to achieve organizational goals and improve effectiveness. This observation reveals the interdisciplinary nature of KM and its strong connection to other research disciplines such as healthcare and political science that may influence KM or attract the attention of KM researchers.

One further conclusion concerns the challenge posed by ambiguous terms. Content analysis and the subsequent classification process allowed confirming the diversity of terms used in KM publications. Almost every KM paper contains interchangeable synonyms, varying spellings and abbreviations. Furthermore, there are papers that were assigned to the respective category due to being related to its theme. For instance, five synonyms of the keyword KM were identified during the analysis: Knowledge Process, Knowledge Collaborative Behavior,

Knowledge Exchange, Knowledge Reuse, Knowledge Structure. This ambiguity illustrates the existence of confusing terminology used by the KM community and poses a challenge by hindering communication processes in general and complicating the execution of search queries in databases which, in turn, fail to produce appropriate or desired search results.

In general, our proposed scheme provides a detailed overview of KM publications and their focus area. As the development of the common ground in the KM field remains a challenge, the findings of this study help reach a common understanding and foster a focused discussion among researchers and practitioners. Furthermore, the present study delivers a valuable instrument for identifying gaps in KM that need to be addressed in the future. For example, the classification scheme can guide the authors' search for future research ideas by focusing on underrepresented categories(Hussinki, Kianto et al. 2017). Editors of conference proceedings and journals can benefit from the study results when describing the call for papers by focusing on topics derived from the scheme's categories. Authors of future KM publications can classify their research results according to the scheme's categories. This helps communicate clearly the publication topic and relevant keywords. Furthermore, describing publications correctly can augment the accuracy of search query results. The categorizationprocess involved merging synonyms and different keyword spellings. This process reduced the diversity of keywords and improved the accuracy of database search results. Researchers and practitioners can use the resulting classification scheme as a benchmark to create the common terminology and avoid introducing redundant or ambiguous concepts. Finally and most importantly, the study results contribute to establish clarity towards what efforts the KM community should make if seeking a new relaunch of the field with more practical elements.

5. Conclusions

This study presented the development process of a classification scheme for KM publications based on the taxonomy method described by Nickerson et al. (2013) and Fteimi and Lehner

(2018). The scheme was developed, relying on manually content analysis of 150 KM-related publications. The categorizationdata resulted in a higher portion of conceptual outputs (62.67%) against empirical publications outputs (30%) in the range of fifteen years.

Some challenges were faced during the write-up of this paper. First, the scheme presented was developed conceptually. Although empirical data in the form of count lists of KM publications were used as an input to the categorizationprocedure, all categories were derived subjectively based on authors' perceptions. As a consequence, the publications that often present content similarities were automatically assigned to the same category. This approach helps determine the possible categories clusters. Future research can build on the results of this study by developing a KM ontology and a more specific categorization within each class. Another challenge is that the focus of this publication was limited to the range of 150 academic articles, and even though the quantities fulfill statistical numbers, a bigger number will provide a better understanding of the KM field. This paper address only the adjusted version of the scheme and the evaluation of the overall method remains to be improved, and supplemented in the course of future research, this scheme represents the first step towards classifying the KM field in more effective ways. Finally, a further limitation concerns the publication language as just publication written in English were selected; publications written in other languages, such as Portuguese or Spanish, were neglected. Future research can also expand the scheme and its categories by adding analysis of non-English texts.

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