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A comprehensive investigation for knowledge management publications.

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Abstract: In recent years, research outputs in knowledge management (KM) have increased dramatically with a lack of agreement, integration and classification between different KM domains. As such, experts are inadequately equipped when attempting to classify KM into their specific areas, which in our view contributes to the technocratic approach remaining behind the organizational approach. This paper illustrates a method of classifying KM publications by a scheme that assists technocratic developments and express knowledge in a more explicit form. The study uses a classification method that applies a taxonomical template, perform procedures, and as a result brings a correct classification and organization of the KM published papers. A series of 180 different KM publications from the last 15 years using a proposed taxonomy framework has highlights that there are two key categories: Conceptual and Empirical, that would help explain the existing discrepancies found in KM for academics and practitioners.

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

1. Introduction

The number of research papers published in the last 15 years regarding knowledge management (KM) has considerably increased [12, 20]. The search results obtained after using the word “knowledge management” in the Microsoft Academic research tool were over fifty thousand, against more than 1.5 million articles if the same query is executed today in the Google Scholar tool[1]. Ragab and Arisha [27] also emphasised this trend and they highlighted there would be a massive increase in the number of publications, which is justified through the higher interest in KM subject by academics and professionals [26].

Despite the fact that more papers are being published, there is still substantial uncertainty about the Knowledge Management term and its proper use that appears to be associated with knowledge activity and knowledge process [40]. These concepts are used mutually to explain the same KM meaning but are sometimes confused and inconsistent [21, 14] . In addition, some researchers or specialists may ponder KM differently [15, 19, 4]. The definition of KM, for instance, can be limited or extended to include additional arrangements such as regulations, people, and processes [19, 9]. Unless previously acknowledged, differences of KM opinion can contribute to misunderstandings. While the variety of KM-related frameworks, models, and schools of thinking has become popular, the lack of continuity and theoretical support for guiding KM implementation remains [17, 4]. Briefly, no consensus was reached on the main topics of KM [37, 25], which culminated in a wide variety of debates about KM's identity.

Classification and consolidation of published papers are needed to solve this heterogeneous approach. The need to create a standard KM classification based on keyword as a tool, was illustrated by Serenko [32] and Bedford [5]. Studies have evaluated many methods to classify KM literature in general [22, 18], or by offering models and frameworks for compact KM-related topics such as KM systems [41], alternatively by conducting

[1]Query executed on Google.com: “knowledge management”, 03rd of December 2020.

reference analysis [32]. These attempts are not commonly recognised classification methodologies, but they provide established findings which includes an informative description of KM without discrimination to any distinct perspective [32, 13].

This document seeks to resolve this lacuna in the literature by applying a classification scheme that can arrange, classify, and consolidate KM through a literature review. A total of 180 articles were reviewed, analyzed, and categorised as Conceptual or Empirical, which provided a complex structure in two dimensions. When it refers to an abstract thought or theory, the conceptual approach is acceptable. In contrast, the Empirical approach is achieved by the development of functional elements, data outputs, and especially by the use of technologies in both cases; by observing patterns and behaviour. This approach has been found to be more versatile to handle mistakenly allocated categories. The rest of this paper is structured in the following way: the subsequent part describes the background applied in this paper. Afterward, the methodology adopted in developing the scheme, and the summary of the survey, followed by the findings and conclusion.

2. Data, Information, and Knowledge

Data concepts are defined by unorganized and unprocessed representations of facts about the world expressed in terms of numbers, characters, and/or other elements. While Information emerges as a consequence of treating, processing, manipulating, and organizing data in such a manner that it becomes meaningful to the recipient [8].

Knowledge can be defined as a justifiable conviction that enhances an individual's capacity to behave efficiently, which is something people often wanted to obtain [36, 7]. In the literature, there are two types of knowledge: formal or explicit, informal or tacit [15]. Tacit knowledge is personal, subjective, and based on intuition, which is difficult to formalize and convey [1, 16]. Explicit knowledge, however, is social, objective can be readily conveyed and formalized [24, 38].

2.1. Experience

Experience can be described as an ability to learn every day over time during a lifetime [34], which is generally seen as the information learned by experience rather than by theory [33]. Experience or experiential knowledge may also be viewed as a specific type of knowledge that involves information and techniques learned in previous tasks. Both knowledge and experience are important attributes for any knowledge worker who tries to solve corporate real-world problems.

In the competitive business world, appropriate KM, and experience management (EM) are important to ensure that businesses can succeed and rely on a competitive edge. For this reason, while prospective choices can be taken by human decision-makers based on the experiences gained from similar circumstances faced before [30], organizations are frequently unable to rely on any of their expertise from insufficient knowledge administration. This drives to the reprocessing of decisions and lengthy response times and is regularly linked with a lack of compliance to adapt in dynamic situations [35, 31].

2.2. Classification Scheme and Taxonomy

Classification scheme is a terminology used to define a method for classifying an entity through content analysis and grouping it by similarity [11]. It is a method which uses synonyms such as framework, taxonomy, or typology [23, 12, 2] and it refers to the output of a multi-entity classification approach. A classification scheme helps to explain, clarify, simplifies, and create a standard vocabulary, that enhances the quality and terminology of database searches [3].

A definition of taxonomy was restricted to classifying living organisms, but the term has been used in a wider sense. Taxonomy may also be characterized as a basic organization in sortable classes or a list of objects. It is defined as a hierarchical tree structure containing specific object classes, with a single root on top classifying all objects in a mathematical approach [28].

Nickerson et al. [23] provided the basis for a classification method (Figure 1), to determine whether paper results had been moved from empirical-to-conceptual schemes or vice versa. Such analysis provides interesting taxonomy results for evaluating research papers and outputs.

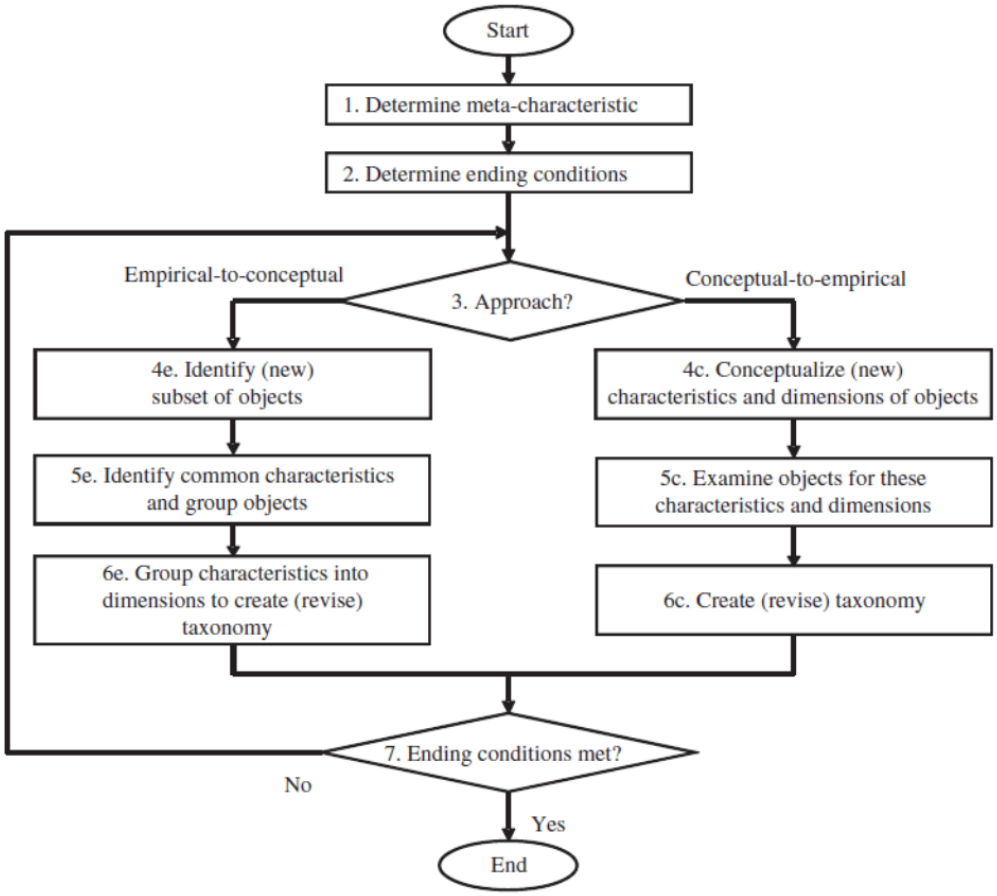

Figure 1: Classification and taxonomy method. (Source: Nickerson [23], pp. 336-359)

2.3. Empirical and Conceptual Research Outputs

Conceptual research outputs are related to an abstract or theoretical theory(s). It is typically used by thinkers and theorists to construct new methods or to re-interpret current ones. On the other hand, the Empirical outputs depend, by testing, on technologies, software, or documentation of patterns. It can be a data-based analysis, which may be verified by functional elements or tests. In such studies, the evidence must first be identified in order to produce the necessary information or application [29].

2.4. 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. For example, once implemented, researchers will assess

and evaluate the vocabulary used in the new paper for locating any bias [6]. 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). Content analysis, as an analytical method of study, gives a new perspective that is suitable for the analysis of large quantities of data and or documents [11].

3. Methodology

Based on the actions taken by Nickerson [23], we developed the a three steps scheme to evaluate the findings of our studies (Figure 2). In Step 1, we downloaded papers and a systematic analysis review of the publications [39] to identify and compare current classification approaches[11]. In Step 2, we performed a content analysis for each paper, where qualitative and quantitative analysis is applied, which denotes the basis for our simplified and adapted Nickerson [23] method. (figure 3). As a result, in Step 3, we can apply such classification of papers and their outcomes will help us to understand the KM movement between two distinctive groups: Conceptual or Empirical in Figure 3.

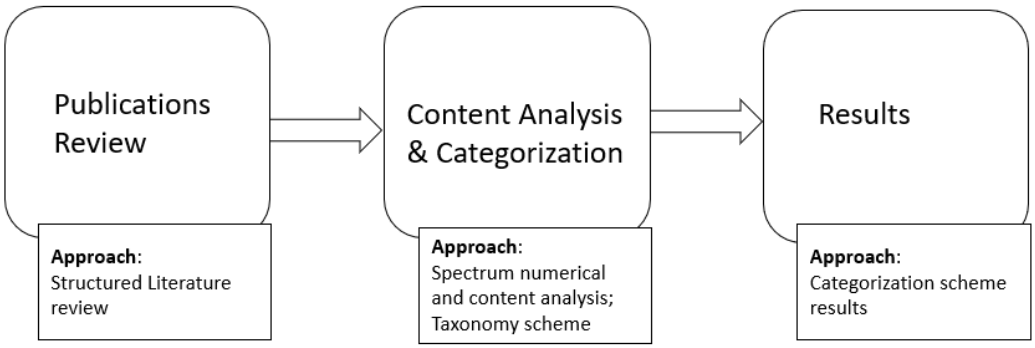

Figure 2: Three steps approach research method.

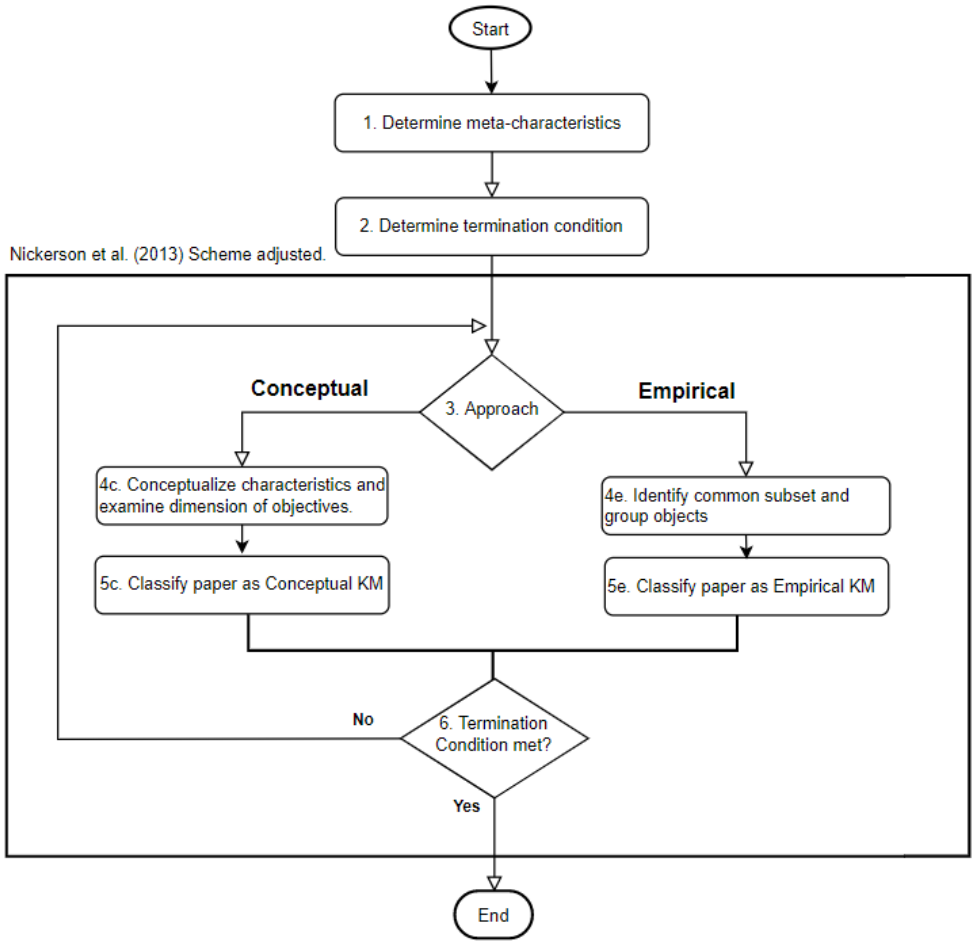

Figure 3: Proposed KM research outcomes classification scheme.

In order to have an efficient KM analysis, we focused on collating KM articlesin a range of years from 2005 to 2020 to be classified. The work utilises 180 distinct KM papers, in combination of conference and journal papers. Then, we initiated an analysis by applying quantitative content analysis gathering similar papers and comparing them among themselves.

A two-stages strategy was 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 content analysis was applied to 180 selected publications. In a recent study, Fteimi and Basten [10] published a similar approach that involves a dictionary creation, which support a starting point for this strategy.

Nickerson [23] and Bailey [4] noted the existence of different terms used synonymously in the literature to describe the classification or categorization process, which ended in the creation of a taxonomy method by Nickerson [23], applicable to both empirical and conceptual outcomes. However, an adaptation of Nickerson [23] method was necessary to complete this study. As seen in Figure 3, six steps have been taken to establish the paper's classification. Step 1, evaluate the meta-characteristics, the paper properties observed, and correlations between KM publications. Step 2, define the termination state, where a paper does not match in the KM area or any mistake in the search engine tool is discovered. In Step 3, the decision is determined according to the researcher's understanding of the subject domain and data availability, then one of the paths: **Empirical** or **Conceptual** are selected for continuing the process execution. The conceptual approach is first used where the paper is related to an abstract or theoretical idea(s), the subject area is little understood, and/or there are little details. In contrast, when a paper produces a sufficient data-based analysis, finding, and/or results that can be verified by evaluation, tests, or even by a computer program, the empirical approach is adequate. The objective of this present study is to modify and adjust the KM classification scheme based on a previous content analysis from phase 3.

Considering the researcher decided the Conceptual approach, in this scenario, new data needs to be identified, conceptualized, and dimensioned, then the objects are grouped by dimension in Step 4c. After that, the

objects are classified as Conceptual in Step 5c. Otherwise, if the researcher decides the Empirical approach, then the approach begins with the identification of common characteristics of object in Step 4e, and then the paper is classified as Empirical in Step 5e. The method ceases when all termination conditions have been met in Step 6. In summary, ten iterations were necessary to develop the proposed classification scheme. However, if the paper met the 6 termination conditions below, it must be removed from the process:

1- All objects (papers) were categorized in Conceptual or Empirical outputs after the final iteration.
2- Avoid classifying any of the given papers to multiple categories.
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 revised.
5- Categories should be comprehensive and acceptable.
6- The results should provide useful insights to the community.

4. Findings

The test model presented in this paper started with a web-based search, followed by manual content analysis, as defined in Figure 2. We then implemented the updated classification system of Nickerson et al. [23] in Figure 3. As a result, we have grouped each paper into one of two approaches: Conceptual or Empirical, to conduct a comprehensive Taxonomy of knowledge management publications.

We primarily assume that most of KM research findings have been based on the conceptualization of information and its branches [44], and therefore little has been assigned to practical (empirical) elements with few automatically or semi-automatically KM implementations. This resulted in reduced advancement in the last years and subsequently, greater development of artificial intelligence and machine learning techniques without the assistance of KM systems, including knowledge representation of the order of a particular or a general domain.

Initially, we provide a summary of the publications by group (journal or conference paper) and by year (2005 to 2020). The following histograms in Figure 4 present a distribution of conference papers with the following highligts: highest number of publication was recorded in 2009 with a count of 21. This was followed by 2010 and 2013 with 13 conference papers each, followed by 2008 with 10 publications, then 2014 and 2015 with 9 publications.

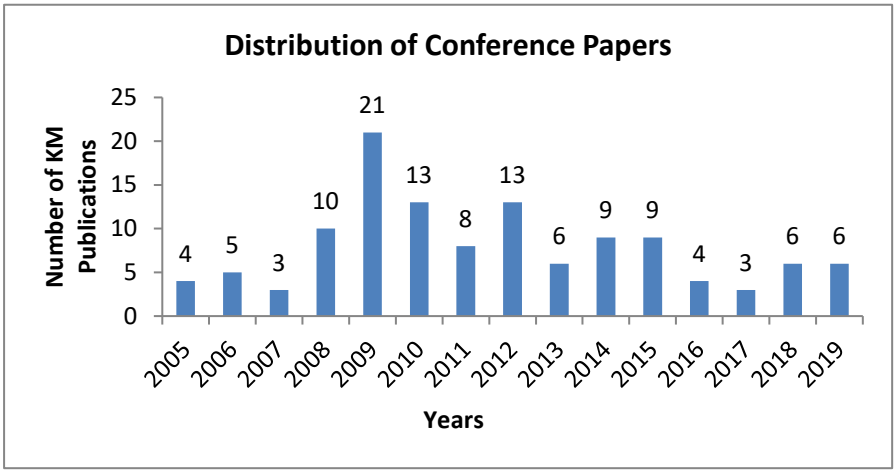

Figure 4: Distribution of the reviewed conference papers per year across the period of the study.

Figure 5 presents the histogram of the distribution of journal papers with the following highligts: highest numer is in the year 2020 with 45 journal papers, most probably affected by the way the databases present the most recent publications despite the option 'most relevant' was chosen; then, it is followed by 10 journal papers in 2019.

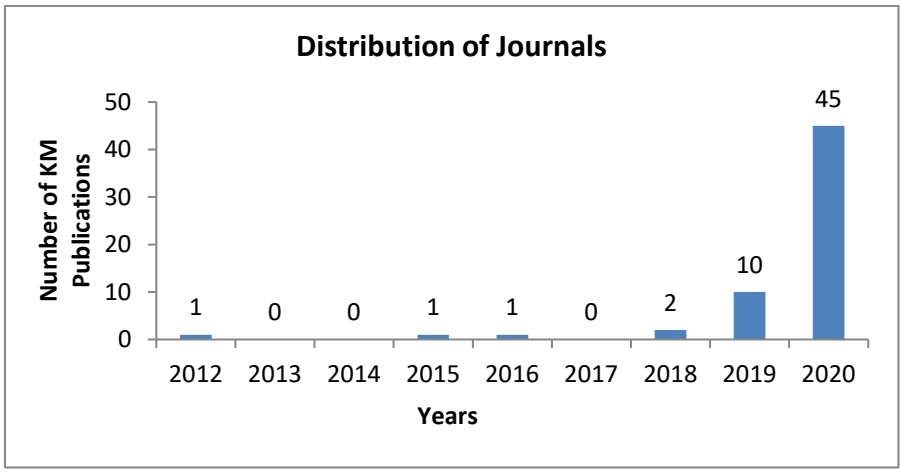

Figure 5: Distribution of the reviewed journal articles per year across the period of the study.

Finally, we summarize the previous two histograms in Figure 6 with the total distribution of papers between 2005 and 2020. Results can provide the reader with a view of the publication chosen on this study across time. The findings show that the highest number of publications was in 2020 which was 45 papers, followed by 2009 with 21, then 2019 with 16 and 2012 with 14. The distribution of the total number of papers between 2005 and 2020 is shown in Figure 7 below.

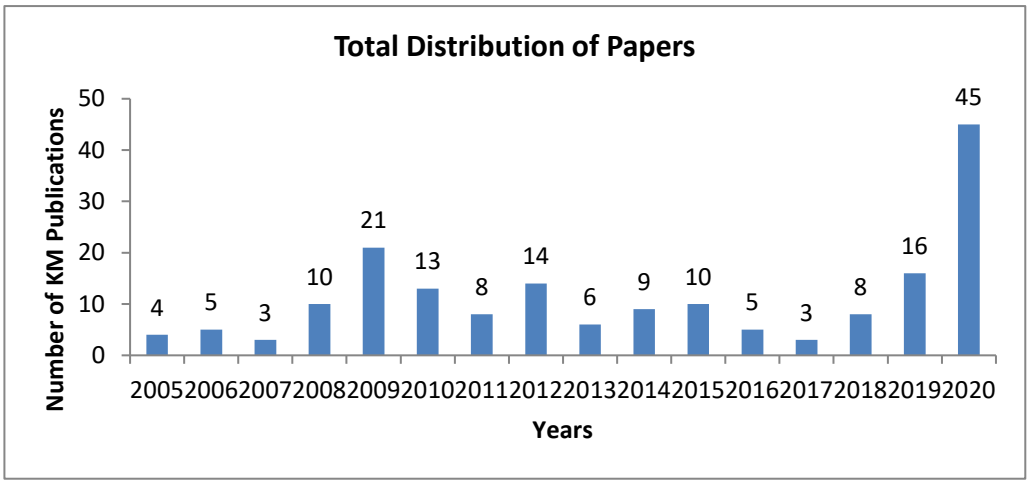

Figure 6: Total distribution of the reviewed conference and journals articles per year across the period of the study.

Following we present the result of our extended taxonomy study. Indeed, the hypothesis statement is confirmed during the studies showing that most of the KM outcomes in published papers are relate to KMs as abstract or theoretical idea(s), with **64.44%**, while a minor part focuses on empirical KM with **28.89%**. The research outcomes corresponding to Terminated elements, not classified due to the Step 2 conditions, in the classification scheme were **6.67%** (some articles were also considered terminated because they violated a copyright law and the publisher unpublished them). The results presented in Figure 7 show that even in different types of publications, i.e., journal and conference papers, research outcomes with KM conceptual ideas are more common among researchers in the last fifteen years. This also make evident the interdisciplinary essence of KM [7, 9] and its strong connection to other research disciplines such as healthcare and political science which may attract the attention of KM researchers, but still lack of empirical applications elements and knowledge representation which are also required in the field, but considered by the reserachers as one of the most important areas as to advanced towards a real knowledge era where KM can lead real societal advances.

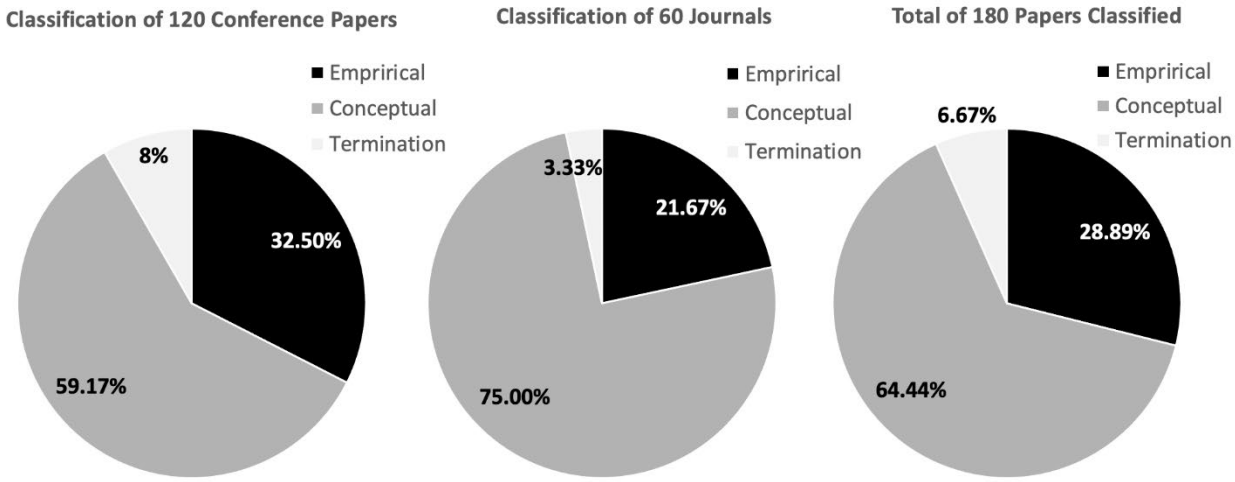

Figure 7: KM Research Outcomes Classification Results.

We also add that almost every KM paper includes interchangeable synonyms, various spellings, and abbreviations that highlight the ambiguous terms used by the KM community making difficult to conduct searches in databases and fail to generate satisfactory or desired search results. In addition, some papers have been assigned to their respective categories due to being related to the KM theme. For instance, five synonyms of the keyword KM were identified during the analysis: Knowledge Process, Knowledge Collaborative Behavior, Knowledge Exchange, Knowledge Reuse, and Knowledge Structure.

This study provides a helpful method to try to find a common understanding and gaps in KM. The classification scheme can guide the authors' search for prospective research ideas by focusing on the underrepresented category. Conference editors and journals should make use of the findings of the analysis when describing the call for papers by focusing on topics derived from the scheme's categories. In addition, researchers and practitioners can use the resulting classification system as an indicator for improving the standard terminology, preventing the inclusion of redundancy or vague definitions that may establish clarity towards the KM community.

5. Conclusions

This study suggested the creation of a classification scheme for KM publications on the basis of Nickerson et al. [23] and Fteimi and Lehner's [11]. The scheme has been developed using 180 KM publications toward a manual content analysis. The categorization data resulted in a higher portion of conceptual outputs (64.44%) against empirical publications outputs (28.89%) in the range of fifteen years.

It is also important to note that during the writing of this paper, difficulties were encountered. First, the proposed scheme was conceptually developed. Although empirical data in the form of count lists of KM publications were used as an input to the categorization procedure, all categories were derived subjectively based on authors' perceptions. As a result, the publications that often present content similarities were automatically assigned to the same category. Another challenge is that the focus of this publication was limited to the range of 180 academic articles, and even though the quantities fulfill statistical numbers, and we have extended the number of publications, 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 as this scheme represents the first step towards classifying the KM field in more effective ways. As a guide, the paper also includes the graphical distribution of conference and journal papers, and of the total distrubution of papers between 2005 and 2020. Finally, a further limitation concerns the publication language as just publications written in English were selected; publications written in other languages, such as Portuguese or Spanish, were neglected, which can be also be expanded by future researchers by adding an analysis of non-English texts in the scheme.

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