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Segmenting critical factors for successful knowledge management implementation using the fuzzy DEMATEL method

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ABSTRACT

Knowledge is a key source of sustainable competitive advantage. In response to increasingly drastic and competitive environments, many organizations wish to better utilize and manage knowledge for business success. For the purpose to execute formal knowledge management (KM) effectively, some works have suggested several critical factors of KM implementations. However, in a strategic view, such a list of critical factors must be further honed to increase practical usefulness, as not all critical factors necessarily share the same importance. Moreover, assessing the importance of critical factors inevitably involves the vagueness of human judgment. Hence, this study presents a favorable method combining fuzzy set theory and the Decision Making Trial and Evaluation Laboratory (DEMATEL) method to segment the critical factors for successful KM implementations. Also, an empirical study is presented to illustrate the proposed method and to demonstrate its usefulness.

1. Introduction

In Taiwan, many firms recognize that utilizing and managing corporate knowledge provides the competitive advantage and improved performance, and try to employ a variety of ways to enhance their rate of knowledge creation and utilization. Some firms manage knowledge with formal knowledge management (KM) initiatives and structures, while other organizations do indeed manage knowledge informally as part of their normal activities without the use of the terminology and concepts of formal KM structures [20]. Knowledge has the ability to utilize information and influence decisions, as well as the capability to act effectively [2]. The power of knowledge is a very important resource for preserving valuable heritage, learning new things, solving problems, creating core competences, and initiating new situations for both individual and organizations [32]. Therefore, numerous firms desire to better activate and leverage the knowledge for achieving value creation and business success. In order to implement the KM effectively, some creditable works have provided several critical factors of KM implementation [38,53], involving business needs, KM purposes, top management support, technology, communication, culture and people, sharing knowledge, incentives, time, measurement, cost, and so on.

However, in a strategic view, those critical factors are all significant but not necessarily to implement at the same time. Even a same critical factor may be differently important to individual firm with the varied priorities; due to each organization has its own purposes, strategies, conditions of resources, and capabilities in KM implementation. Especially, it is hard to obviate the possibility of the causal relationship within those critical factors. If the kind of causal relationship can be profoundly disclosed, the critical factors are able to be well prioritized and segmented into some meaningful groups. Hence firms can properly adjust the importance of critical factors according to the strategic needs of different KM phases. A list of critical factors is required to be further decomposed for higher practical usefulness. To determine the importance of critical factors is a qualitative decision-making problem and inevitably involves the vagueness of human judgments [33].

Thus, in terms of the critical factor segment, it is better to employ an effective method which can deal with the vague judgments of human and model the causal relationship within critical factors. The fuzzy set theory is a mathematical way which can handle vagueness in decision-making [1,68]. The Decision Making Trial and Evaluation Laboratory (DEMATEL) is a potent method which helps for generating a structural model and visualizing the causal relationship by offering a causal diagram [11–13,18]. Hence, this study proposes a favorable method combining the fuzzy set theory and the DEMATEL to segment the critical factors for successful KM initiatives. An empirical study is presented to illustrate the proposed method and to demonstrate its usefulness and validity. The rest of this paper is organized as follows. In Section 2, some of the prior literature related to the critical factors of KM implementation is reviewed. In Section 3, the proposed method is developed. In Section 4, an empirical study is illustrated. Finally, according to the

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findings of this research, concluding remarks and suggestions are presented.

2. KM implementation

Reacting to an increasingly rival business environment, numerous organizations are emphasizing the importance of KM to create competitive advantage, and basing the KM strategy on their unique resources and capabilities. For implementing the KM successfully, it is a wise way to starts with a well understanding in terms of critical factors of KM implementation. The concept of knowledge and the related critical factors are discussed below.

2.1. The concept of knowledge

As [26] emphasize, competitive advantage depends on how efficient the firm is in building, sharing and utilizing the knowledge. There are some peculiar characteristics of knowledge, such as: it is intangible and difficult to measure, is volatile, is embodied in agents with wills, sometimes increases through use, has wide ranging impacts, often has long lead times, and can be used by different processes at the same time [63]. Especially, [31] argues that knowledge inertia may enable or inhibit one's ability on problem solving, which is stemming from the use of routine problem solving procedures, stagnant knowledge sources, and following past experience or knowledge; to conquer the problem of knowledge inertia, it is necessary to update and share knowledge. Additionally, for knowledge to make contribution, it needs to be converted into competencies, and competence is only important as a strategic resource when it is relatively distinctive to its competitors [25].

Concerning the distinction between data, information, and knowledge, as [50] states, if data becomes information when they add value, then information becomes knowledge when it adds insight, abstraction, and better understanding. In fact, data is mainly considered as raw numbers that once processed becomes information and when put in specific context, this information becomes knowledge; the knowledge as a state of mind posits that individuals expand their personal knowledge through the inputs received from their environment [2]. According to [38], in the transformation process, data is organized and structured to produce general information, and then the information is arranged and filtered to produce contextual information for specific users, next individuals assimilate the contextual information and transform it into knowledge.

Ref. [24] raise many types of knowledge, such as: systemic knowledge, explicit knowledge, tacit knowledge, hidden knowledge, and relationship knowledge. Although many categories have been suggested, the most frequently used distinction is tacit versus explicit knowledge [47]. Explicit knowledge is provided by the conventional classroom instruction, which bases in data and is converted into information; by contrast, tacit knowledge bases in practice and experience, which leads to mastery provided the awareness related to the task at hand [25]. According to [40], explicit knowledge can be expressed in words and numbers and shared in the form of data, scientific formulae, specifications, and manuals, it can therefore be readily transmitted between individuals formally and systematically; whereas tacit knowledge includes subjective insights, intuitions, and hunches, is highly personal and hard to formalize, as well as is difficult to communicate or share with others. As [39] indicates, organizational knowledge is created by a continuous dialogue between tacit and explicit knowledge, and there are four patterns of interaction including socialization, internalization, externalization, and combination within a "spiral" model.

2.2. Issues of knowledge management

Organizations need to discover how to motivate their people to share the tacit knowledge which is the most valuable form of knowledge and is recognized as a strategic asset, though the tacit knowledge is usually very subjective and resides inside one's head so that is difficult to communicate, comprehend and quantify [15]. The explicit knowledge is easier to be digitalized and transferred, so that it can be captured and shared with others by the use of information technology [24]. Additionally, overemphasizing on explicit knowledge, especially by IT investments, may lead to a situation that companies lose their valuable tacit knowledge, whereas overemphasizing tacit knowledge may lead to a result that tacit knowledge on its own does not enhance innovation [24]. Indeed, organization's work with KM should focus on transposing tacit knowledge into explicit knowledge and converting individual knowledge into organizational knowledge [38]. Especially, it is important to make tacit knowledge explicit at the organizational level through thrust and relationship building processes [24]. Further, in order to achieve sustainable competitive advantage, companies need to emphasize the total knowledge base of the company, i.e. the explicit-and tacit knowledge, both internally and externally [24,26].

KM is the organizational optimization of knowledge to achieve enhanced performance, increased value, competitive advantage, and return on investment, through the use of various tools, processes, methods and techniques [28]. Also, KM is a systemic way to manage knowledge in the organizationally specified process of acquiring, organizing and communicating knowledge, in order to enable employees to perform more effective and productive works [2]. KM and related strategy concepts are promoted as important components for organizations to survive, because KM is regarded as a prerequisite for higher productivity and flexibility in both the private and the public sectors [38]. There are numbers of frameworks have developed to promote the KM implementation. Most frameworks of the KM can be classified as prescriptive, descriptive, and a combination of the two; the prescriptive frameworks direct the ways to engage in KM activities, whereas the descriptive frameworks identify significant attributes for the success of KM initiatives [48]. According to [2], those different frameworks have many similarities: most of the life cycles are articulated in four phases where the first one is a "create" phase; and the last phase concerns the ability to share and use knowledge.

The issues of KM can be studied into several aspects with different views. Some studies deal with the topics covering entire KM activities, such as: the successful KM process requires understanding the operations of the four stages [8]; KM can be split into four separate activities, each dealing with a particular aspect [62]; a model of knowledge creation consists of three elements, namely, the SECI process, workplace, and the knowledge assets [41]; the knowledge manipulation activities need to be properly altered and deployed by timely knowledge valuation [17]; and the knowledge development cycle as the process of knowledge generation, knowledge storage, knowledge distribution and knowledge application [2].

2.3. Successful KM implementation

In the knowledge economy, a key source of sustainable competitive advantage and consequent profitability relies on the way to create, share, and utilize knowledge as a strategic resource [9,22,37,51,52]. For a solid implementation of KM, organizations need to emphasize the knowledge base on not only explicit and tacit [24], but also internal and external [26], even individual and organizational [38]. Moreover, the frameworks of KM should consider purpose/objective, knowledge, technology, learning, and