Knowledge Management: Review of the Critical Success Factors and Development of a Conceptual Classification Model

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Abstract: Knowledge management is a critical issue in today's business world. Knowledge is considered as one of the most strategic resources of the firm and sources of competitive advantage. This research provides a comprehensive review of the literature on the Critical Success Factors (CSFs) and identifies eight major factor's clusters that influence the success of KM implementations in organizations. In order to enhance our understanding of these CSFs, it also develops a conceptual classification model.

Keywords: Knowledge Management, Critical Success Factors, Classification Model, Factor Relationship, Review Paper

I. INTRODUCTION

Knowledge has become one of the most critical driving forces for business success and value creation [1]. Also many firms are exploring the field of knowledge management (KM) in order to improve and sustain their competitive advantage. A growing recognition in the business about the importance of KM as a critical resource for the firm can be recognized [2-5]. KM creates a new working area where tacit knowledge and experiences can easily be generated and shared, leading to an increase in efficiency and effectiveness of the organization. Firms are becoming more knowledge intensive, while they hire "minds" more than "hands", and try to leverage and capture the value of knowledge [6]. While KM has become a very fashionable subject in recent years and businesses spend more resources to improve their KM systems [7], less than 25% of KM projects meet their promises and achieve significant performance impact [8-10].

Critical Success Factors (CSFs) have been demonstrated and recognized as fundamental elements for firm success and performance in several activity domains [11, 12]. These factors refer to the limited number of areas in which satisfactory results will ensure successful performance for the individual, department, or the firm [13, 14]. In the existing literature, KM enablers or barriers are defined as critical success or failure factors [15]. The existence and performance of critical factors affect the organizational decision in favor of developing KM systems and also stimulate the creation, sharing, using and storing of knowledge [16, 15]. In other words, critical KM factors are organizational and environmental mechanisms for supporting knowledge consistently [17]. These factors provide managerial guidelines to focus attention on the major tasks that need to be performed effectively in order for the business to implement KM successfully [11].

To date, little systematic attempt has been made to classify the CSFs for KM implementation. In addition, the literature is also limited by systematic framework that provides a comprehensive overview of critical success factors for executing KM [6]. This paper aims at reviewing and classifying the critical factors suggested in the literature by using literature review method for the success or failure of KM implementations. The literature survey is based on a search for the keyword indexes "critical success factors" and "knowledge management" on the Elsevier and web of knowledge online databases. We designed multi aspect model of CSF. The suggested model incorporates both organizational (internal) and environmental (external) factors. The conceptual classification of critical success factor illuminates two major divisions in the environmental factors and six major factors in the organizational factors. The structure of the paper begins with a general overview of the critical factors for implementing KM, followed by descriptions of each critical factor and relationship between factors. The paper concludes with limitation of our research and extending to suggestions for future investigation.

II. CRITICAL SUCCESS FACTORS FOR KNOWLEDGE MANAGEMENT

The knowledge management literature has identified a broad range of factors that can influence KM implementation. Although many KM critical success factors have been suggested by various writers, no systematic researches exist for classifying a collective set of CSFs for executing KM in the firms [6] and relationship between CSFs. The conceptual classification model (Figure 1) is the outcome of an organized research effort to illuminate and illustrate the KM critical factors in a comprehensive, integrated, organized way. The authors identify critical factors from two perspectives. On the one hand, some researchers dedicate that the external (environmental) factors play an important role in implementing KM [18-21]. On the other hand, other scholars introduce internal (organizational) factors as a critical issue in developing KM systems. Below, we define these two dimensions and explore CSFs already identified

within each of them in the literature (see Figure 1 and Table 1). Several authors have provided different types of critical success factors for KM.

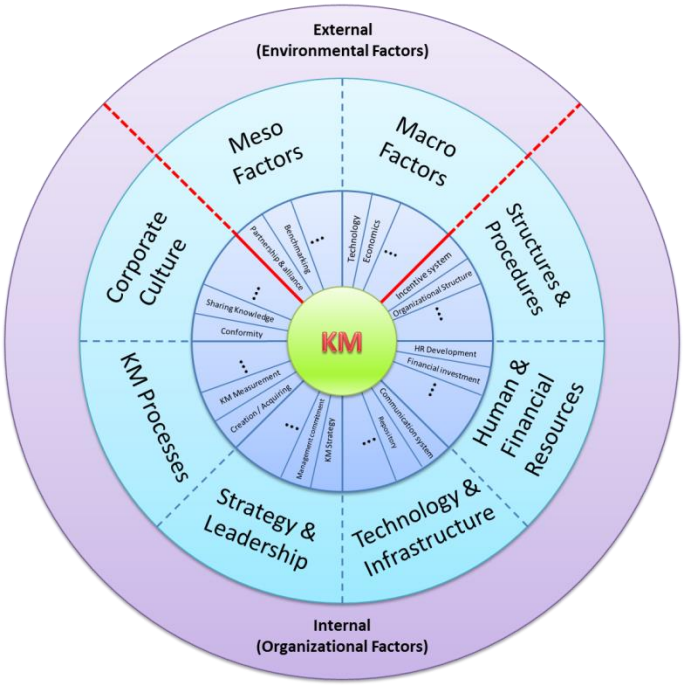

Figure 1. Conceptual Classification Model of knowledge Management Critical Success Factors

III. Environmental (External) Factors

The firms work in a turbulent environment and continuously interact with it. [22]. Particularly, KM, differing from traditional information management systems, is strongly related to the external environment [23]. Organizations have limited control over environmental factors, which can act as enablers or barriers for fostering KM [19]. Several external factors influencing KM success have been proposed by researchers. These can be classified into two types.

A. Macro Factors

In the context of globalization, firms are increasingly concerned about their business environment to business development and the priorities for new projects [24]. The macro environment imposes opportunities and threats for implementing KM in organizations. These include legal, economic, political, technological, social, educational, and globalization factors that affect the internal organizational factors to implementing KM programs successfully [20]. These factors change by environmental situation and organization disable to control factors effectiveness. Changes in the macro factors have a consequent effect on organizational processes and procedures.

B. Meso Factors

The Meso environment refers to the market segment and industry in which the firm operates and competes. The meso factors include, among others, KM benchmarking and strategic partnerships of the firm. The strategic alliances make a baseline network for running knowledge management projects. KM benchmarking is used to compare a firm's KM performance metrics with those of the industry bests and the best practices from other industries. In the process of benchmarking, firms identify the top companies with respect to KM, where similar processes exist, and compare their KM performance against them [25-28].

The capacity of firms to react rapidly and successfully to environmental change depends on understanding of external environments and the free transfer and flow of information to approve that expertise is available in a respectable situation. Therefore, analyzing all aspects of external factors plays an important role to improve performance and the integration of KM functions in order to react quickly to market changes [18, 29].

TABLE1. Critical Success Factors

Aspect	Factors	Sub Factors
Internal (Organizational) Factors	Culture	Sharing knowledge
		Conformity / Individualism
	Structures & Procedures	Structure
		Incentive system
		Channels for knowledge transfer
		Size
		Network / Community of practice
		Coordination
	Human & Financial Resources	Human resource management
		Familiarity
		Employee involvement and training
		Teamwork skill
		Empowerment
		Financial investment
	Technology & Infrastructure	IT / communication system
		Connectivity
		Usability
		Repository / Access
		Security IT
		Searching IT
		Intellectual property
	Strategy & Leadership	KM Strategy
		Management support / top management commitment
		Change management
	KM Processes	KM Measurement
		KM processes and activities
External (Environmental) Factors	Macro Factors	Legal
		Economic
		Political
		Social
		Educational
		Technological
		Globalization
	Meso Factors	Partnership and alliance/Supplier
		Benchmarking

IV. Organizational (Internal) Factors

The internal factors relate to the organizational participants who are responsible for the management of knowledge resources and infrastructures. Organizational factors shape by organizational procedures and processes. Although these factors are affected by the environmental factors, they are internally controlled by the organization. Internal critical factors can be classified into six categories.

A. *Culture*

Organizational culture is an imperative factor for successful implementing KM [30-32]. Organizational culture is defined as "a pattern of shared basic assumptions invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration" [33]. Organizational culture is a source of sustained competitive advantage [34] and research that shows it is a critical factor for developing KM within organizations. Culture does not directly lend its influence on KM project's effectiveness; rather, it exerts its influence through shaping the behaviors and values of organizational employees [35]. All the components of KM should fit with the culture of the firm [30, 36]. A knowledge-oriented culture includes several components. Employees' belief that knowledge supports the firm's competitive advantage is one of the important factors in implementing KM systems [37]. Culture impacts on organizational learning in that corporate culture determines values, beliefs, and work systems that could encourage or impede knowledge creation [38-40, 29], and ultimately, decision making process [41, 42, 33].

Since culture has several aspects. One cultural characteristic which is critical for KM is collaboration. Collaborative culture is an important factor for knowledge sharing between employees and teams. This is because knowledge transferring needs individuals to come together to interact, discuss and share knowledge. Collaboration has been shown to be an important contributor to knowledge creation [43, 36, 6].

The positive perception of employees about sharing knowledge can play an important role in the success of KM practices. In many firms, especially bureaucratic ones, employees and managers are discouraged from sharing knowledge and expertise [44]. Knowledge is often considered a source of power, and hoarding it from others is not only expected but is often rewarded [45]. The "greatest challenge for the manager of intellectual capital is to create an organization that can share the knowledge. When skills belong to the company as a whole, they create competitive advantages that others cannot match" [46]. Some companies like Johnson and Johnson have established 'Knowledge Fairs' or 'Knowledge Exchanges' to promote informal gatherings between employees to encourage knowledge sharing culture. Researchers feel that 90% of the success of KM projects are due to building a supportive sharing culture while developing KM systems [47]. A culture of confidence and trust is essential to encourage the application and development of the KM project within a firm [20].

Trust is also another important feature of an organizational knowledge culture [48, 36, 16, 6]. The lack of trust may be increased skeptical employees' behavior about sharing knowledge and thus, people try to hold their knowledge. Preparing a trustful environment between employees and groups will support to facilitate knowledge sharing and dissemination process [6].

As another component of corporate culture, an individualistic attitude could affect creation, sharing and transferring knowledge within an organization. Individualism stands on the opposite of a knowledge sharing culture. Without a high level of a joint trust among employees, they will refuse or resist to share knowledge [49].

B. *Structures & Procedures*

Organizational structures and processes consist of activities and procedures such as task allocation, coordination, standards and supervision, which are directed towards the achievement of KM objectives. This includes structures and procedures to organize communication flows between departments as well as regulations and policies to help create, transfer and use of knowledge within the firm. Organizational structure improves trust issue between employees for knowledge sharing. In the real world, with the employee concerned about building their own empires, free knowledge flow across such boundaries is a rarity, only when employees trust each other does knowledge sharing happen [44]. Structural elements and policies support a network of knowledge and a fostering Community of Practice (COP) within the organization [20, 50]. Organizational structures, whether formal or self-organizing, support leveraging information transferring as well. The optimization of knowledge within functional structural organization can many times sub-optimize the distribution of knowledge across the organizational structure. The flexibility of organizational structure encourages sharing knowledge and collaboration within the firm and across the supply chain [39]. For example, Nonaka, Takeuchi [51] design a new organizational structure that enables their five step process of knowledge creation within organizations. The structure made by the composition of hierarchical structure and non-hierarchical structure to improve the flexibility dimension.

Along with policies and procedures, reward systems and incentive mechanisms can identify the knowledge transfer channel and promote the flow of knowledge [40]. The incentive systems are defined as any factor (financial or non-financial) that motivates people to support KM processes. Designing new incentive sources to improve participation in knowledge sharing system is a constant challenge for managers [30]. Incentive systems should be organized by the firm so that employees are motivated and rewarded for taking the time to create new knowledge, share their knowledge, and support the KM system [52-54, 28]. Incentive system to encourage employee more effective behavior should be long term and should support with the general appraisal and compensation system [30, 55]. In particular, rewarding employees with a focus on team performance will induce a higher level of knowledge sharing. In addition, approaches to motivate employees and appraise their participation could also be tied to their job performance and assessment system [56, 57]. The incentive systems consist of push and pull rewards. Rewarding employees as part of their performance appraisals according to participation to sharing knowledge is an example of push reward. Preparing platform for incentivize employee to sharing knowledge and implement their ideas with visibility in the organization is an example of pull rewards [58].

Another important factor within this class is coordination. Coordination discusses to manage relationships between organizational activities [59]. KM should be planned by managers. This requires coordination activities, including identifying of what kind of knowledge activities to be performed in what sequence, which people

to be involved , and what knowledge resources to be used [19]. Coordination contains not only managing dependencies, but clarifying necessary abilities for implementing various activities, arrangement of those activities in time, and aligning knowledge processing with an organization's strategy. Coordination approaches used to organize dependencies in KM projects include linking incentive system to knowledge distribution, establishing communications of practice for knowledge sharing and erecting programs to encourage training programs [19, 60].

C. Human & Financial Resources

Human resources are another important critical factor that needs to be considered in managing knowledge in a firm. People are at the heart of creating organizational knowledge [61, 62, 19, 63-66]. It is people who create and share knowledge. Therefore, managing people who are willing to create and share knowledge is important [67]. This statement is supported by several empirical studies, which all reach the same general conclusion about the importance of knowledge sharing and human resource management [68-70]. Also, this view is supported by several researchers, who argue that employees are the driving factor that determines the success or failure of KM projects [71-73].

Therefore, a key factor for a firm to be successful in organizing KM is the process to encourage people to communicate and share their knowledge with others [51]. Organizations should manage employees and integrate in the concept of KM into their human resource management strategy [74]. This point was reiterated by Scarbrough and Carter who argue that it is difficult to suppose that firms represent a harmonious environment where people are willing and happy to share their knowledge [75].

Training programs are usually prepared to the employees, leading to a positive effect on the understanding of and familiarity with the KM concepts [76, 77, 20]. Raining programs include how the KM program and technological system work, enabling successful participation in the program. Moreover, training programs provide a common language and perception of how people can define and think about knowledge. Training program helps employees to ensure that they can use the full features and capabilities offered by technological tools for managing knowledge. In addition, this program clarifies their new roles for doing knowledge management tasks. These programs develop them with the skills to foster innovation and knowledge sharing [6]. Horak [78] introduce communication, networking, peer learning, team building, collaboration and creative thinking as the basics of a suitable training program for implementing KM. The proper training programs actively encourage employee participation in KM for implementing KM systems.

Teamwork is another important factor in the human resource category. It is the action performed by a team towards a common goal in the KM system. In this respect, knowledge creating teams such as cross-functional teams and learning groups shall be encouraged. Hence, employees' teamwork skills should be improved during implementing KM [79-81]. Beside, employee empowerment helps employees own their work and take responsibility for sharing knowledge and fostering KM [20].

Financial resources support KM systems and clarify the kind of knowledge that is important to the organization. Financial constraints put a ceiling on what can be expended for KM programs. It is required if an investment in technological capabilities is made [82, 6]. Financial resource availability may also affect the execution of leadership, coordination, control, and measurement of KM [19].

D. Technology & Infrastructure

Technological infrastructure of the firm comprises an important role [83]. It is multifaceted, such that the firm should be investing in comprehensive technological infrastructure such as information technologies and communication systems for the purpose of KM [84]. There is a wide-ranging collection of technologies that supports KM which can be implemented and integrated into a firm's technological platform [6]. Some technological infrastructure that we don't ordinary think of in this field can be useful in improving KM. For instance video-conference, telephone, chat room can use for transferring tacit knowledge. These technologies don't capture or disseminate structured knowledge but enable employees to share tacit knowledge [85]. However technological infrastructures allow employees to collaborate and negotiate for creating and sharing knowledge within the organization [86]. Also, it can help the firm to discover knowledge that is either internal or external to the firm [39]. These technologies can give a great opportunity to the organization's ability to disseminate and sharing knowledge without geographical limits [87]. As examples, repositories, codifying systems, and search technologies stand at the heart of technological infrastructure [88].

Information technology is an important component of the technological infrastructure required for KM [89, 85, 47, 90, 91, 15]. According to Luan and Serban, Information technology can be classified into the following categories: business intelligence, knowledge base, collaboration, content and document management, portals, customer relationship management, data mining, workflow, search, and eLearning [92]. An Important factor that should be considered in the development of a KM technological system contain simplicity of technological interface, comfort of use, appropriateness to users' desires, relevancy of knowledge content and standardization of a knowledge [6].

Information system must enable knowledge to flow within the firm in order to support efficiency, effectiveness, innovation, and business excellence. In order to support KM systems, IT application research is concerned with three issues: comprehensiveness of IT structure, knowledge structure and maintenance software, and facilitation of knowledge generation, search, and dissemination [93]. Beside IT systems can enable employees to search, access and share knowledge, and supports communication and accelerate relationship [38, 94, 73]. Technology is able to conquer the barriers and forces of time and distance that would otherwise be limiting factors in KM activities. The key is therefore to understand how technology is most appropriately developed and aligned to the knowledge processes and strategy [95]. Therefore, it can play an important role to support and manage an organization's KM processes [38, 6]. Furthermore, the technical infrastructure should

support the network of experts and create a user friendly area for penetrating knowledge within the firm [8]. Moreover the security and protection of knowledge have been identified by firms as a critical factor for implementing KM systems; users want to know that what they share is secure [58]. The role of KM software in fostering inter-functional cooperation and the coordination of knowledge depends on the firm's ability to integrate procedures which support two directional knowledge flows between local and global knowledge [96].

E. Strategy & Leadership

KM is considered as a key part of the firm strategy to use expertise to create a sustainable competitive advantage [97-102, 35]. Strategic planning in KM includes defining objectives and goals clearly and trying to make the connection between the KM strategy and the business strategy of the firm. In other words, the KM strategy should be aligned with the business strategy such that the leaders make and share a vision on KM and continually plan on achieving the agreed upon KM objectives [103, 6]. Most KM scholars argue that KM strategy is critical to KM effectiveness and also in managing knowledge for greater organizational performance [104, 43, 105, 67, 106]. Knowledge can be considered the most important strategic resource [107]. The ability to create, integrate, store, disseminate and apply knowledge are the most important capability for building and sustaining competitive advantage [108].

KM strategies were classified in several forms by Liebowitz [47], the first one; KM strategy could be focused on a particular core competency of the organization. A second KM strategy is to create corporate knowledge centers or Centers of Expertise. The third approach uses KM Project Offices as a facilitator of KM strategy [85]. The last one; KM strategy is to provide knowledge repository ontology and knowledge management tools to employees throughout the firm to let their teams or departments develop their own knowledge repositories. In order to improve these KM strategies and link them to business strategy, Maier and Remus suggest a process oriented knowledge management style to connect the gap between human and technology [109].

The literature indicates the support of top management form KM projects as one of the critical factors for implementing KM [30]. The lack of commitment of top managers to sharing organizational knowledge is an important reason for failing KM projects. Nevertheless, there are too limited role models exist to illuminate desired top management behavior [110]. Leaders must ensure about transformation of information to knowledge and accessibility of it throughout the organization [111]. The leaders should attend to creating conditions that allow people to use KM system and cultivate experiences and skills, to participant their own individual knowledge to the knowledge repository, and to have easy access to relevant knowledge. In developing success KM projects, it is essential to support all steps of KM implementation [19]. Closely related to the top management supporting is the designing of a suitable vision for a KM project. It is important that employees agree with this vision and believe that can be attainable. In addition, clear objectives and goals need to be set and agreed with the employees [6].

Firms exist on the edge of chaos and they need to react in an unstable environment. The leaders should be considered the change management for a KM system [112, 20, 58]. The leaders help to shift individuals, teams, and organizations from a current state KM situation to a desired future state. It is an organizational process aimed at helping employees to accept and embrace changes in their current business environment.

Although several surveys discuss the issues of how to develop a KM strategy and implement the KM successfully, few of these have fostered methods which can assess and guide the KM strategy involving several complex factors systematically [113]. Choosing what kinds of KM strategies to develop is dependent on the business and corporate strategies and organizational vision.

F. KM Processes

A KM process introduces something that can be done with knowledge in the firm [114]. KM processes include activities gearing towards creating and sharing knowledge and harvesting knowledge from either employees or external sources. Many researchers have developed models for the KM process [38, 115-121].

The implementation of KM processes and activities lies at the heart of creating a successful knowledge-based firm [13, 89, 82, 90, 58, 6]. Knowledge management is defined as a process of creation, storage, sharing and transferring knowledge for applying expertise [38, 6]. Thus, the process-based view of KM plays an important role in executing KM system. KM processes help leaders to translate the KM program to employees' daily work activities [6]. In all the KM process models assumed that steps and sub processes are often concurrent, sometimes repeated, and not always in linear sequence [38, 122, 102, 121].

KM processes omits duplication of employee efforts and align KM Process with the organizational propose. Therefore, KM professionals' attention should also be drawn to design KM processes align with KM strategy, through working with the KM team to explore ways to connect processes and organizational strategy [123].

As the final element within this category of CSFs, measurement of the KM success as well as the resulting efficiencies attained in processes and practices are essential [124, 125, 8, 44, 19, 82, 126]. Measurement mechanisms identify the gap between the performance of KM and KM objectives. The performance measurement of KM may include reviews of the knowledge technologies and evaluating commitment to the KM goals [58]. They also try to make connections between KM results and economic performance measures or industry values. As examples, some authors propose financial metrics as a measurement system [127, 128, 6]. Although it is a difficult area, measuring knowledge performance and linking KM outputs to financial results is feasible [19]. In the new approaches for measuring KM, traditional hard measurement mechanism supplemented by managerial, nonfinancial criteria in order to provide a more comprehensive approach to measuring KM performance [127, 6]. Some of the models being designed intellectual capital criteria [129, 130, 21] and the balanced scorecard approach [131, 132]. As a CSF, measurement is very vital since KM is a dynamic program and grows with the

organization as it changes in the surrounding turbulent environment. As a result, impacts should be continuously appraised to ensure that KM is updated with current needs of the firm.

V. Relationships between critical factors

The CSFs were explained in the previous section. We attempt to elucidate affiliation of CSF of our conceptual classification model. Since little research has focused on KM CSFs from the interrelationship viewpoint among factors. As we mention in the first of the study, the external factors effect on internal factors, which can act as enablers or barriers for fostering KM. Firms manage tasks in the organizational domain and disable to manage environmental factors. They shaped internal factors such as culture or structure by forces and barriers of external factors. In the internal view, organizational factors interact and affect with each other. For instance culture shape structure and also structure change the culture during the time. The dash type border between factors in our conceptual classification model illuminates relationships of factors.

VI. Conclusions & Recommendations

We have surveyed the literature of success and failure factors of implementing KM systems. Critical success factors are crucial for successful implementation of KM practices and policies. Firms benefit from a comprehensive understanding of the factors that are critical to the implementation of KM. The main contribution of this study is to provide an extensive literature review of CSFs of knowledge management and develop a conceptual model for classifying them. The result of our survey classifying critical success factors in eight main clusters. Two clusters illuminate environmental factors and remain six clusters denote organizational factors. Our finding provides a comprehensive conceptual model to identify critical factors and facilitates us gaining a better understanding of the themes of knowledge management CSFs by tracing the research paths.

We believe this article might be used for both academic and practitioners, however, our research method could not eliminate a number of limitations. The non-English articles are not considered in this survey to determine critical factors that effect on implementing KM projects. Moreover the purpose of this investigation is to design a comprehensive conceptual model that identifies and characterizes critical success factors for implementation KM projects. Therefore, the focus is on addressing the main critical factors that manage implementation of KM within a firm. The conceptual model does not attempt to assess the importance of relationships between critical success factors and organizational outcomes. Future research is stimulated to overcome our survey limitations.

In this article, the illumination of KM critical success factors is not considered about the importance level of each factor, because other methodologies, such as statistical method were not used. However, qualitative research is a common approach to survey in social studies, but importance of critical factors needs to use quantitative tools such as questionnaires or interviews. Therefore, determining factor's importance through quantitative research methods may include the importance of KM CSFs issue in future researches.

Organizational culture is a broad issue. Several aspects integrate with each other to shape corporate culture. Firms try to define these characteristics and set their programs and satisfy all cultural aspects. Many authors talked about organizational culture, but it seems all attribute of corporate culture didn't illuminate during the years. New research can explore deeply about all aspects of corporate culture for executing KM.

Many researchers worked on human resource approach in KM issue, but other resources such as financial resources eliminate during academic studies. Financial resource can play a facilitator or barrier role in implementing KM. Thus, new explorations need to concentrate about financial resources.

It seems after several years we don't have an absolute method and comprehensive mechanism for measuring KM performance in an organization and this is a novel field which is still being explored by academics and practitioners. Moreover, corporate culture is a broad issue. Next studies could be investigated and explore about corporate culture and modify new aspect of culture for implementing KM.

There is a lack of studies measuring the impact of environmental factors on the knowledge management performance. Thus, new investigations need to focus on the surveying macro and meso factors around the firms.

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