

Maturity Model for Knowledge Management and Strategic Benefits

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Abstract: Establishing the value of knowledge management is one of the most difficult tasks for enterprises. The main objective of this theoretical paper is to propose a knowledge management maturity model that relates knowledge management with strategic benefits in terms of absorptive capacity, innovation and organizational performance. The knowledge management maturity model developed in this study is based on an analysis of eight knowledge management maturity models previously published in scientific journals. The analysis considered the number of levels, the key factors, how the model is applied and the association of knowledge management with strategic benefits. The proposed model consists of five levels and four key factors, namely, internal environment (top management support, information technology), content (tacit knowledge and explicit knowledge), process (creation/storage and sharing), and external environment (customers, partners and suppliers). The levels are defined as follows: Level 1 – the enterprise does not recognize the value of knowledge; Level 2 – the enterprise recognizes the value of knowledge; Level 3 – the enterprise introduces knowledge management; Level 4 – the enterprise evaluates and improves knowledge management internally; Level 5 – the enterprise develops knowledge networking, internally and externally. The proposed model also considers the relationship between the key factors in the KM maturity model and absorptive capacity, innovation and organizational performance. In future research, a survey will be conducted to test the relationships between the key factors themselves and between the key factors and the strategic benefits (absorptive capacity, innovation and organizational performance). The hypotheses are: the support of top management influences tacit and explicit knowledge; information technology influences tacit and explicit knowledge; tacit knowledge influences explicit knowledge; the customers, partners and suppliers influence tacit knowledge; tacit and explicit knowledge influence knowledge sharing, creation/storage; knowledge creation influences innovation; knowledge sharing influences absorptive capacity; absorptive capacity influences innovation; and innovation influences organizational performance. The results of this model could provide: 1) an evaluation of the company as well as comparisons between companies in relation to knowledge management, and 2) an evaluation of the strategic benefits of knowledge management.

Keywords: knowledge management maturity model, levels, key factors, benefits

1. Introduction

Knowledge is an important intangible asset for achieving sustainable competitive advantage (Ragab and Arisha, 2013; Chen et al., 2009). This means that companies need to effectively manage this resource (Khalili et al., 2012; Hooff and Huysman, 2009; Jasimuddin, 2007). Knowledge management (KM) consists of a set of processes for creating, storing and sharing knowledge in order to achieve organizational goals (Lee and Yang, 2000).

Establishing the value of knowledge management is one of the most difficult tasks for companies (Chen et al., 2009). This complexity involved in determining the results obtained with KM can be partly explained by the fact that knowledge is an intangible asset (Kankanhalli et al., 2003). According to Ragab and Arisha (2013) and Chua and Goh (2008), there is a gap in the research on the evaluation of KM and of its results.

Several perspectives have been used to study KM evaluation, for example, Darroch (2003) created a scale to measure KM; Goldoni and Oliveira (2010) introduced indicators to the KM processes, and Khatibian et al. (2010) developed a KM maturity model, in which the last level emphasizes evaluation. Maturity models are intended to evaluate certain content over time (Lin, 2007) and typically consist of a matrix showing levels and key factors (Smith et al., 1985).

Maturity models have been adopted in various areas of knowledge, e.g. software development and quality management, among others. The maturity model proposed by Crosby (1979) can be used to assess management quality and consists of five levels and their associated key factors. In the area of information systems, the model developed by the Software Engineering Institute (SEI), known as the Capability Maturity Model Integration (CMMI), is intended to determine the maturity of the software development process (Dayan and Evans, 2006).

Several maturity models have focused on KM, such as Oliveira et al. (2011); Khatibian et al. (2010), among others. However, these models share common failings in that they do not: indicate how they should be applied; breakdown the key factors adopted; establish a relationship with the strategic benefits (innovation, organizational performance, among others). The main objective of this paper is to propose a knowledge management maturity model that relates knowledge management with absorptive capacity, innovation and organizational performance. The results of this research should be of use to both company managers and scholars, as it provides a maturity model that allows the company to evaluate its KM, as well as facilitating comparisons between companies.

This paper is structured as follows: in section 2 the literature on maturity models, focusing on KM, is presented; section 3 describes the methodological procedures used in this research, in section 4, the results of this research are analyzed and discussed; and, in section 5, the conclusions are reported.

2. A comparative analysis of KM maturity models

KM maturity models are based on two theories: the Knowledge-Based View (Grant, 1996), and Life Cycle Theory (Smith et al, 1985.). The Knowledge-Based View considers knowledge to be an important strategic resource (Grant, 1996) that can produce long-term benefits, which justifies the focus on KM. Life cycle theory sees development as resulting from change according to a pattern, segmented into levels (Smith et al., 1985), which is the basic structure of a maturity model. Life cycle theory also considers the influence of the environment and sees the key factors as being cumulative. Thus, one can say that the structure of maturity models is based on Life Cycle theory, presenting levels in sequence characterized by key factors (Van-de-Vem and Poole, 1995).

The maturity models listed in Table 1 have between 3 and 5 stages. The key factors associated with the models are shown in Table 1.

Table 1: The key factors of the analyzed KM maturity models

Key factors	Oliveira et al. (2011)	Khatibian et al. (2010)	Pee and Kankanhalli (2009)	Mehta et al. (2007)	Lin (2007)	Robinson et al. (2006)	North and Hornung (2003)	Lee and Kim (2001)
People		X	X	X				X
Process		X	X	X	X		X	X
Technology		X	X	X				X
Knowledge								X
Results							X	
Evaluation		X			X		X	
Strategy		X						
Social-technical support					X			
Leadership		X						
Culture		X						
Organizational Structure		X						
Internal context	X							
External context	X							
Process	X							
Content	X							

A KM maturity model should have a complete range of key factors, although the number of key factors should not interfere with its application. For example, the KM maturity models from Pee and Kankanhalli (2009) and Khatibian et al. (2010) do not include key factors that consider the environment outside the organization (customers, suppliers, etc.). However, companies need to share knowledge with the external environment, especially those with a small number of employees (Chong et al., 2011; Lim and Klobas, 2000; Desouza and Awazu, 2006). Sharing knowledge with the external environment can leverage opportunities for innovation (Jarrar, 2002; Ndlela and Toit, 2001; Zeng et al., 2010). The model presented by Mehta et al. (2007) was designed to meet the needs of a specific company, which may hinder its use by other companies. The KM

maturity models prepared by Lee and Kim (2001), North and Hornung (2003), Robinson et al. (2006) and Lin (2007) show insufficient detail to allow their application, they merely address the objective of the level and a few characteristics. The model proposed by Oliveira et al. (2011) presents four key factors, which are broken down into 21 constructs, each one of which has 4 or 5 alternatives, which can hinder its use because of the length of time required for its application. The models listed in Table 1 do not associate KM with strategic benefits such as absorptive capacity, innovation and organizational performance. This relationship is important to justify investments in KM. The absorptive capacity is “an ability firms should develop if they wish to adapt to changes in an increasingly competitive and changing environment and to achieve and sustain competitive advantage” (Jiménez - Barrionuevo et al., 2011). Innovation is “the production or adoption of novel and useful systems, processes, products, or services” (Yoo et al., 2011, p. 333). Organizational performance is “consisted of output items such as overall success, market share, growth rate, profitability, innovativeness, and business size compared with key competitors” (Choi and Lee, 2003, p. 407). Ragab and Arisha (2013) identified the need to improve the methods of measuring KM results.

3. Method

This research used a desk research to develop a KM maturity model based on a review of existing models. To begin, a search was carried out in databases to identify the KM maturity models. The keywords used in the search were “maturity model” and “knowledge management”. The KM maturity models identified in scientific journals were: Oliveira et al. (2011); Khatibian et al. (2010); Kruger and Snyman (2005, 2007) and Kruger and Johnson (2010), Lee and Kim (2001), Lin (2007) and Lin (2011), Mehta et al. (2007) North and Hornung (2003); Pee and Kankanhalli (2009) and Robinson et al. (2006) and Robinson et al. (2005). The model identified in Kruger and Snyman (2005, 2007) and Kruger and Johnson (2010) was not compared with the others, because it does not clearly present the levels and key factors used. In addition, the models published exclusively in conferences, for example, Paulzen et al. (2002), and others that are marketed as, for example, Ehms and Langen (2002), have not been addressed in this study because of the limited access to information about them. The present analysis considered the number of levels, the key factors, the means of applying the model and the association of KM with the strategic benefits, which were presented in the previous section (comparative analysis of KM maturity models). The analysis of the existing models resulted in a proposal for a new KM maturity model, which will be discussed in the following section.

4. Analysis and discussion of data

This section is structured as follows: the proposed KM maturity model (section 4.1), an example of the descriptive data analysis (section 4.2), the relationship of KM with strategic benefits (section 4.3).

4.1 The proposed KM maturity model

The four key factors proposed by Oliveira et al. (2011), namely internal context (IC), external environment (EE), content (C) and process (P) were adopted in the proposed KM maturity model. However, the number of constructs adopted in each key factor was reduced to improve the cost-effectiveness of applying the model in companies. These factors and constructs were chosen because they can be used by companies of different sizes, from different areas, with or without formal KM programs. In this study, previously validated scales were used together with newly developed scales to measure the constructs, as shown in Table 2. The scales developed for this study are presented in Appendix A, the other scales can be obtained by consulting the references listed in Table 2.

Table 2: Key factors and constructs

Constructs	IC	EE	C	P	Scales used
Top management support (TM)	X				Lin, 2007
Information technology (IT)	X				
Customers (CU)		X			Developed for this study
Partners (PA)		X			
Suppliers (SU)		X			
Tacit knowledge (TK)			X		Choi and Lee, 2003
Explicit knowledge (EK)			X		
Creation/Storage (CS)				X	Developed for this study
Sharing (SH)				X	Vries et al., 2006

IT is considered a support for KM, contributing both to tacit knowledge, by putting people in touch with each other, and to explicit knowledge, by facilitating access to knowledge (Hansen et al., 1999; Yeh et al., 2006.). Thus, the following hypotheses are formulated: H1 - information technology influences explicit knowledge; H2 - information technology influences tacit knowledge.

The conversion of tacit knowledge into explicit knowledge is called externalization in the knowledge spiral (Nonaka, 1994). According to Dhanaraj et al. (2004), tacit knowledge influences explicit knowledge. Thus, the following hypothesis is formulated: H3 - tacit knowledge influences explicit knowledge.

External knowledge is especially relevant for small and medium-sized enterprises because of the smaller number of employees (Chong et al., 2011). According to López-Sáez et al. (2010), tacit knowledge is the focus of the efforts made by firms to acquire external knowledge. Thus, the following hypotheses are formulated: H4 – customers influence tacit knowledge; H5 - suppliers influence tacit knowledge; H6 - partners influence tacit knowledge.

Hansen et al. (1999) suggests two strategies for KM, personalization and codification, based on the emphasis given to the tacit and explicit forms of knowledge. Nonaka (1994) discusses knowledge creation in terms of tacit and explicit knowledge. Choi and Lee (2003) identified four types of KM based on the emphasis given to tacit and explicit knowledge. Thus, the following hypotheses are formulated: H7 - tacit knowledge influences the knowledge creation/storage, H8 - tacit knowledge influences knowledge sharing; H9 - explicit knowledge influences the knowledge creation/storage; H10 - explicit knowledge influences knowledge sharing.

Top management support “refers to the degree to which top management understands the importance of KM and the extent to which top management is involved in KM practices” (Lin 2011, p. 140). Organizations are unable to leverage knowledge without support from top management (Holsapple and Joshi, 2000). Top management can encourage the creation, storage and sharing of knowledge by promoting activities and influencing organizational culture. Lee et al. (2012) identified that the top management support affects the KM process capabilities. Thus, the following hypotheses are formulated: H11 - top management support influences knowledge creation/storage; H12 - the top management support influences knowledge sharing.

Besides the key factors, maturity models are also defined by levels. The maturity levels used in the proposed model are in accordance with those from Oliveira et al. (2011), ranging from 1 to 5. The levels are defined as follows: Level 1 - does not recognize the value of knowledge; Level 2 - recognizes the value of knowledge; Level 3 – starts KM; Level 4 - internally evaluates and improves KM; Level 5 - develops the knowledge network internally and externally.

The fact that most of the benefits of KM are intangible makes it difficult to measure. This research relates KM to absorptive capacity, innovation and organizational performance. The scales were adapted from: absorptive capacity – Yoo et al. (2011); innovation – Yoo et al. (2011); and organizational performance – Choi and Lee (2003). The relationship between these constructs was based on: Su et al. (2013) and Caloghirou et al. (2004) - who found that knowledge creation influences innovation; Liao et al. (2007) - who identified the influence of knowledge sharing on the absorptive capacity; Roberts et al. (2012), Kostopoulos et al. (2011) and Liao et al. (2007) – who identified the influence of absorptive capacity on innovation, and Kostopoulos et al. (2011) - who identified the influence of innovation on organizational performance. Thus, the following hypotheses are proposed: H13 - Knowledge creation/storage influences innovation; H14 - Knowledge sharing influences absorptive capacity; H15 - Absorptive capacity influences innovation; H16 - Innovation influences organizational performance.

The proposed model, with the hypotheses related to the constructs in the KM maturity model and the influence on business results, is shown in Figure 1.

The KM maturity model is applied in a company using a questionnaire directed to the employees. The resulting data were analyzed using descriptive statistics and structural equation modeling, as described, respectively, in the following sections.

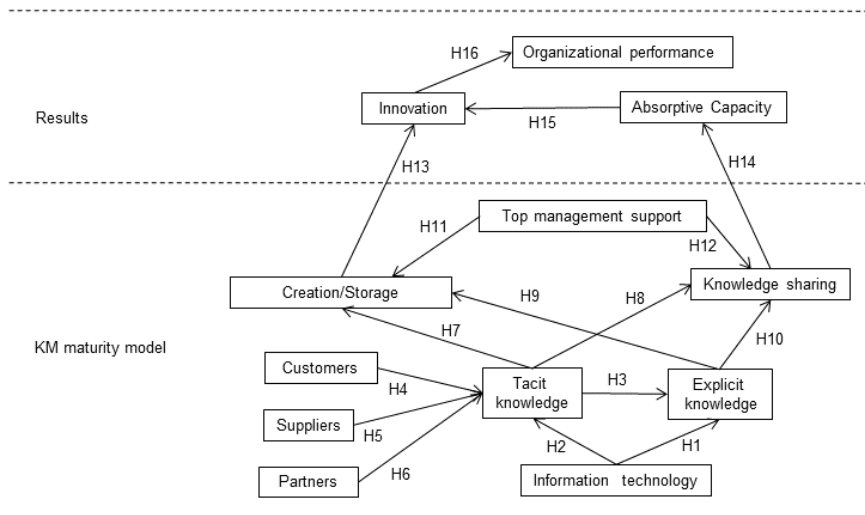


Figure 1: Proposed model

4.2 Descriptive analysis of the data

The descriptive analysis of the constructs allows one to identify the current level of KM in the company as well as the improvements that can be implemented by the company in relation to the key factors. Table 3 shows a fictitious example of how to present the means for the constructs associated with the respective key factors. The mean of the construct represents the means of the items that form the construct.

Table 3: Descriptive statistics of the KM constructs

Key factors	Constructs	Mean
Internal environment	Top management support	3.00
	Information technology	3.10
Content	Explicit knowledge	3.00
	Tacit knowledge	3.50
External environment	Customers	3.55
	Suppliers	3.30
	Partners	2.70
Process	Creation/Storage	2.50
	Sharing	3.60

The result obtained with the KM maturity model can also be viewed in a graph as shown in Figure 2. This result shows that for most of the key factors the company is at maturity Level 3 in relation to KM, i.e., the company has initiated KM, but there is still a need to invest in improvements and evaluation, as well as to strengthen the relationship with the external environment and with knowledge creation/storage.

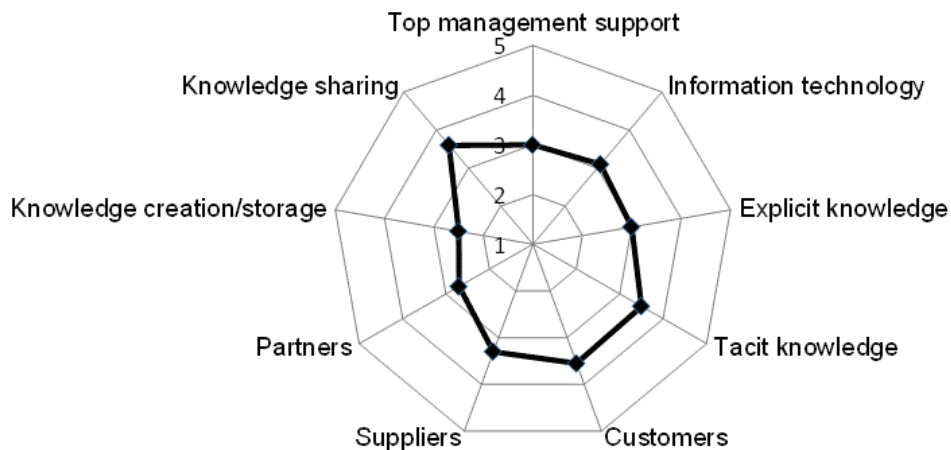


Figure 2: The KM level

The result obtained for each item of a construct allows one to identify the strengths and weaknesses. For example, in Table 4, there is an example of a mean value for the construct Information Technology. The fictitious results indicate that IT is being used more as a support in the internal than in the external environment. In this case, there is an opportunity to explore the use of IT to connect to the external environment and improve the use in internal environment.

Table 4: The descriptive statistics of the items in the construct information technology

Items	Mean
IT_1_Employees use electronic storage to access knowledge.	3.20
IT_2_Employees use knowledge networks (e.g. virtual communities, groupware) to communicate.	2.91
IT_3_The information technology used allows employees to share knowledge with people from other companies.	2.52
IT_4_The information technology used allows employees to share knowledge with people within the company itself.	3.35

4.3 Relationship between the constructs

The relationship between the KM constructs and the strategic benefits is assessed using structural equation modeling (SEM). In this analysis, the extent to which the variance of the constructs in strategic benefits is explained by the KM constructs is calculated in percentage terms, while checking whether the hypotheses (shown above in Figure 1) fit the reality of that company.

5. Conclusion

Identifying the critical aspects involved in KM is not a simple task due to the complexity of KM, the intangibility of knowledge and the length of time required for the results to appear. Reaching KM maturity means following a path based on a consolidated framework that enables one to identify any necessary improvements. Allied to this, it is necessary to check the influence KM has on strategic benefits in order to justify investments. This research has developed a knowledge management maturity model that links KM with strategic benefits. The benefits of this KM maturity model are:

- It includes a framework consisting of five maturity levels, considering a set of nine constructs organized into four key factors. The objectives of each level are clearly defined, as is the method of measuring each of the constructs. The results can be considered in an aggregated form, i.e. through the key factors, or in detail through the constructs and the items that are used to measure the constructs;
- The KM maturity model is related to three constructs that represent the strategic benefits, namely absorptive capacity, innovation, and organizational performance. This allows one to see the strategic benefits of KM. This type of result is also important to justify the investments made in KM;
- Applying this model can help identify different views within companies, both between hierarchical levels and across different sectors of the company. When used at different points in time, this model also allows the company to evaluate its evolution. On the other hand, when applied to a group of companies the model can be used for benchmarking, as well as for identifying actions in specific business sectors or regions;
- The data collection method is simple, and the instrument can be accessed through a web link using a protected password. When collected periodically, the data can be compared, showing the evolution of the company or the business sector;
- This model can be used by companies of different sizes (micro, small, medium or large) and the characteristics of each size should be considered in the interpretation of the results. For example, in the case of small businesses, tacit knowledge is more developed than explicit knowledge, because of the smaller number of employees and their physical proximity. While in large companies explicit knowledge would be expected to be equally or more emphasized than tacit knowledge.

For future research, we intend to apply this model in small and large companies located in different countries, since KM can be susceptible to both the culture of the country and also the size of the company.

Appendix A: Scales developed for this research

These scales were developed based on the literature review and discussions with specialists in KM and entrepreneurs.

Customers:

CU_1_Knowledge is shared with our customers.

CU_2_Customers are asked to share their knowledge with the company.

CU_3_The knowledge gained from customers is incorporated into the company's actions.

CU_4_The knowledge gained from customers is applied in the development of new systems, products, processes or services.

Partners:

PA_1_Knowledge is shared with our partners (universities, associations, etc.).

PA_2_Our partners (universities, associations, etc.) are asked to share their knowledge with the company.

PA_3_The knowledge gained from partners (universities, associations, etc.) is incorporated into the company's actions.

PA_4_The knowledge gained from partners (universities, associations, etc.) is applied in the development of new systems, products, processes or services.

Suppliers:

SU_1_Knowledge is shared with our suppliers.

SU_2_Our suppliers are asked to share their knowledge with the company.

SU_3_The knowledge gained from suppliers is incorporated into the company's actions.

SU_4_The knowledge gained from suppliers is applied in the development of new systems, products, processes or services.

Creation/Storage:

CR_1_The knowledge creation processes or tools (for generating ideas) are formalized in the company.

CR_2_Employees often participate in knowledge creation activities (generating ideas).

CR_3_Employees often conduct knowledge creation activities (generating ideas).

ST_1_The knowledge storage processes or tools are formalized in the company

ST_2_Employees often participate in knowledge storage activities.

ST_3_Employees often conduct knowledge storage activities.

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