KNOWLEDGE MANAGEMENT MODEL FOR PROCESS IMPROVEMENT IN SMALL AND MEDIUM-SIZED MEXICAN COMPANIES

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Abstract: Organizations face irreversible and reflective change derived from the growing trend of using business models based on information technology. Strategies for the digital transformation of business involve human creativity, knowledge, and the technology necessary to generate innovations that provide organizations competitive advantages. Consequently, knowledge management can boost the processes of organizations to adapt to the current socioeconomic environment. This work proposes a knowledge management model for small and medium-sized companies to promote improvements to their processes by collecting available intellectual capital in a highly changing environment. The proposed model includes the stages of diagnosis and planning of knowledge management, acquisition, storage, distribution, use, and transformation.

Keywords: knowledge management, model, small and medium business

JEL Classification: D8, D83, M15

Introduction

In the post-pandemic context, there has been a growing inclusion and use of information technologies in the internal and external processes companies. The implication is that companies have a growing need to use management methods that ensure learning

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and the accumulation of knowledge to generate an experience that supports organizational change. The preceding motivates this work, whose objective is to propose a knowledge management (KM) model that is useful for improving the processes of small and medium-sized Mexican companies.

The classification of the Mexican enterprise as small or medium-sized is determined by the third article, section III, of the "Law for Developing the Competitiveness of Micro-small and Medium-sized Companies" based on the number of workers. The law mentioned above establishes that small companies in industrial and service sectors employ between 11 and 50 workers, and small commercial enterprise employs between 11 and 30 workers. In the case of a medium-sized company in the commercial sector, the range is between 31 and 100 workers, industrial between 51 and 250, and services between 51 and 100 (Table 1). Small and medium-sized enterprises (SMEs) represent almost 5% of the total establishments and employ around 30% of the personnel employed in Mexico (Instituto Nacional de Estadística y Geografía [INEGI], 2020).

Table 1. Stratification of Mexican companies according to number of workers

Size	Sector		
	Industry	Trade	Services
Micro	0-10	0-10	0-10
Small	11-50	11-30	11-50
Median	51-250	31-100	51-100

Source: (Diario Oficial de la Federación [D.O.F.], 2019, p. 2)

SMEs in Mexico and Latin America have a performance gap with other countries, which conditions their accessibility to resources and technology, collaboration networks for knowledge transfer and best practices, the formalization of KM processes, training, innovation, and focus on sustainability, among others.

For example, according to González-Díaz and Becerra-Pérez (2021), Latin American SMEs have a lower level of participation in national exports, gross domestic product (GDP), and employment than their European counterparts. Likewise, in the Mexican case, the maximum income expected is almost 14 million euros, 75% less than the 50 million euros expected for similar companies in the European community. In this way, the proposal of this study seeks one more alternative small and medium-sized companies in Mexico have for the development of KM according to the contingent factors of the economy and the changing dynamics of the environment.

Literature review

The notion of knowledge in this work agrees with what was proposed by Nonaka and Takeuchi (1995), who postulate that the creation of knowledge in the organization is a process that depends on two types of knowledge: tacit and explicit. Thus, people develop tacit knowledge based on their experience, which is difficult to trans-

mit, while explicit knowledge is formal, systematic, and easier to represent. Therefore, knowledge creation depends on the exchanges and conversions between tacit and explicit knowledge subject to an organizational context and a determined time.

KM originates when companies continually improve their strategic processes to boost productivity based on the experience gained. Arrow (1962) discussed the influence of experience on productivity, learning or progress curves, and the "Horndal" effect as evidence to support his hypothesis about the experience as a factor of technical change and the role played by activity in solving problems, whose solutions over time generate learning – a collection of knowledge – that is, learning can only be acquired by means of an attempt to solve a problem, and therefore it only takes place during the activity.

In the 1990s, many companies implemented KM, as numerous models emerged, some of which are described later in this work. The above in part, can be explained by two factors: the development of the information technology sector and the economic environment of globalization (Prusak, 2001; Senge, 1990), both factors, were convergent to the development of the Internet and its application in the commercialization of products and services.

The development of information technologies and their ability to store and exchange information globally paved the way for collaboration between the members of companies and the safeguarding of information in large databases in such a way that organizations were metaphorically visualized as living organisms with the capacity to acquire knowledge (learn), leaving behind the mechanistic paradigm of the company dedicated to infinitely executing instructions previously prescribed by higher hierarchical levels.

In this context, one of the first KM models results from the composition of four stages: building, retaining, grouping, and using knowledge. Each stage is composed of substages and activities (Wiig, 1993). Nonaka and Takeuchi (1995) describe a model to generate value in organizations based on transferring tacit (implicit) and explicit knowledge between people. The premise is to convert tacit knowledge, possessed by people, into explicit knowledge for its use by organizations. According to this model, the conversion is done gradually through refinements that generate spiral-shaped iterations. The model includes individual, group, organizational, and interorganizational dimensions.

Sveiby (2001) proposed a model composed of nine types of knowledge transfer that, each time they occur, generate value for the organization, and that together can constitute the structure of the knowledge strategy in organizations if there is the ability to coordinate them to improve people's ability to act coherently.

Kerschberg (2001) offers a KM proposal for heterogeneous data warehouse environments, a product of organizations' ability to store large volumes of data and information. He proposes a KM model based on five activities: knowledge acquisition, knowledge refinement, storage and retrieval, distribution, and presentation. In addition, the model has an architecture of three superimposed layers: the data sources layer, knowledge management layer, and knowledge presentation and creation layer. Bustelo-Ruesta and Amarilla (2001) emphasize that KM is based on information

management, which is supported by documentation management because the information is in documents.

McElroy (2002) emphasized the need to create a more inclusive vision of KM with people, social initiatives, and processes to move technology out of the spotlight. To this end, he defined and discussed ten key ideas: "1. The Knowledge Life Cycle, 2. KM Versus Knowledge Processing, 3. Supply-Side Versus Demand-Side KM, 4. Nested Knowledge Domains, 5. Containers of Knowledge, 6. Organizational Learning, 7. The Open Enterprise, 8. Social Innovation Capital, 9. The Self-Organization and Complexity Theory, and 10. Sustainable Innovation" (McElroy, 2002, p. 2).

A KM model created by the European Standardization Community in 2004, referred to by Pawlowski and Bick (2012, pp. 92-93), provides a reference framework and guidelines for business and knowledge processes. They are extended through facilitating processes (knowledge capabilities) at the individual level – through skills, competencies, methods, and tools, and at the organizational level – through vision and strategy.

In 2007, Maier proposed a KM model structured in three levels: strategic, design, and organizational, and by types of knowledge linked to generic knowledge activities. In this sense, the classifications and categorizations used by the model are clear and based on research while identifying various factors and solutions for various purposes. The architecture "identifies key aspects of knowledge management as well as potential tools and methods around those (e.g. ontologies, technical architectures, or roles)" (Pawlowski & Bick, 2012, p. 95).

Pawlowski and Bick (2012) present a KM model for globally distributed contexts. The core of the framework is composed of three types of processes: business processes (1) based on knowledge processes (2) that act as KM enablers inside and outside the organization, and external processes (3) that occur globally due to stakeholder relationships. The model recognizes strategies, stakeholders, technology, and culture as the main components of the environment and describes the interrelationships and interactions between these and the other intervening components.

Earl (2015) proposed a taxonomy of the strategies used by various companies that he called "knowledge management schools" grouped into three classes: technocratic, economic, and behavioral. Likewise, each school is described through seven attributes. The purpose of the proposal is "to help managers identify alternative knowledge management initiatives or solutions, understand what is required to make them work, and make sense of and improve the effectiveness of any existing, inherited, or early knowledge management projects" (Earl, 2015, p. 232).

The notion of KM in this work is consistent with Angulo (2017) and with Marulanda et al. (2015) in the sense that organizations must develop the capacity to effectively manage their knowledge flows and ensure their collection, access, and continuous reuse to generate value by improving productivity and organizational profitability.

The aim of the research is to propose a KM model accessible to small and medium-sized Mexican companies to promote improvement in their processes by taking advantage of human capital knowledge in a highly changing environment. The aim is to answer the research question: how can KM be applied to improve the performance of SMEs using the resources available in the organization?

The KM model that is the object of this work describes the processes and interactions necessary for a Mexican SME to implement KM.

Research methodology

A literature review of KM models in Mexican SMEs was conducted to identify the characteristics and support the KM model proposal based on documented case studies (Yin, 2009).

The eligibility criterion was to include publications dating from 2010 to the present. The above allowed us to obtain the description of KM models of 12 companies in the gastronomic sector (Pérez-Soltero et al., 2011) and two software development companies (Maulini & Pollo-Cattaneo, 2018; Payró-Campos & Fuentes Vasconcelos, 2021).

The research results of the mentioned authors were collected, contrasted with each other, and referred to the models described in the scientific literature. Thus, the combination of theory and experience derived from the implementation of the analyzed cases supported the proposal of a new KM model that is expected to minimize the deficiencies reported in the literature and take advantage of the facilitators identified in the case studies.

Findings

Table 2 contrasts the phases of the KM models found in the literature review. It was found that the phases or variables of the KM process are consistent among on another and with the literature, although they differ in the degree of aggregation (5-7 phases). In general, the found phases are sequential. They start by identifying a need for knowledge, then its search, acquisition, or creation, and then storage and internalization in the organization for later use and evaluation. In addition, it was found that knowledge generation is derived from human processes or in conjunction with information technologies. Likewise, the actors involved in KM belong to the organization and, in some cases, to the stakeholders, such as customers and suppliers. Finally, it was found that the knowledge in these companies can be factual, conceptual, explanatory, or methodological.

**Table 2. Comparison of KM processes in small and medium-sized Mexican companies**

Sector	Phases of KM process	Generator of knowledge	Actors
Gastronomic	– Identification – Acquisition – Creation – Storage – Distribution – Use – Measurement	– Human processes	– Company members – Customers – Suppliers

Sector	Phases of KM process	Generator of knowledge	Actors
Software development	– Detection of a need for knowledge – Search – Internalization and organization of knowledge – Utilization – Sharing and validation	– Human processes – Information technologies	– Company members – Suppliers
	– Acquisition – Storage – Transformation – Distribution – Utilization	– Human processes – Information technologies	– Company members – Suppliers

Source: Based on (Pérez-Soltero et al., 2011; Maulini & Pollo-Cattaneo, 2018; Payró-Campos & Fuentes Vasconcelos, 2021)

Based on the above, according to Figure 1, a KM model is proposed that is composed of six sequential and cyclical phases:
1. KM diagnosis and planning,
2. Acquisition,
3. Storage,
4. Distribution,
5. Use,
6. Transformation.
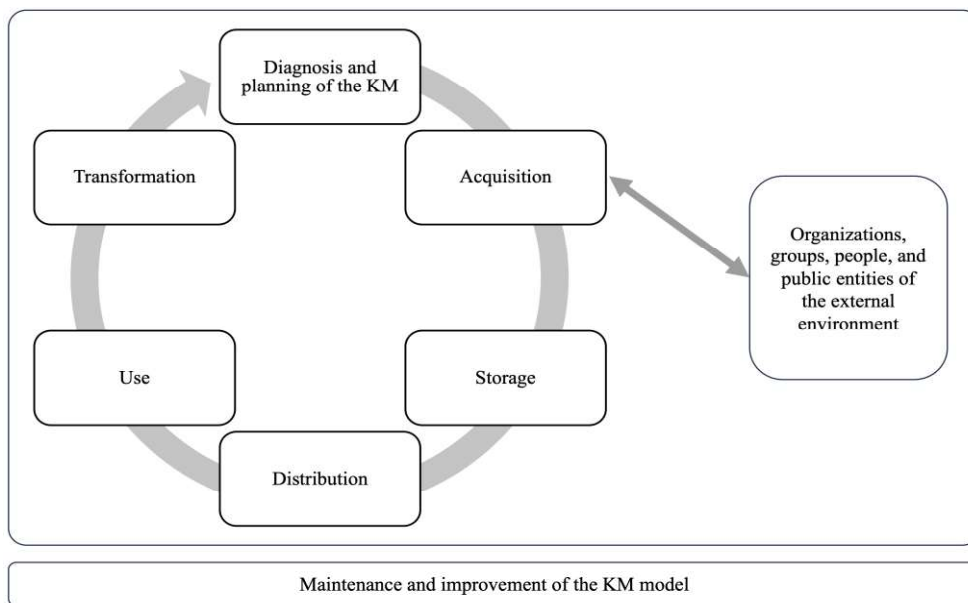
Figure 1. Knowledge management model proposed for SMEs in Mexico

Source: Based on (Maulini & Pollo-Cattaneo, 2018, p. 60)

The proposed model also includes a transversal phase for maintenance and improvement of the model. Likewise, interaction with the company's external environment is considered during Phase 2 (acquisition) to enable the implementation of knowledge exchange strategies with other organizations, public government entities, interest groups, and individuals.

Phase 1 of KM diagnosis and planning consists in identifying the technologies, processes, and talent available for implementing KM and the processes that will benefit by establishing priorities. The results of this stage will justify a KM plan that will guide decision-making and provision of the necessary elements to achieve the future implementation of KM. In this phase, training needs in KM are detected, and a committee can be designated for this purpose with representation from all areas of the organizational structure.

Phase 2 (acquisition) aims to identify helpful knowledge and its sources to document it formally. This knowledge will later be integrated into the knowledge base. If the organization lacks valuable knowledge, it can establish strategies to obtain it from the external environment. The roles and positions related to KM and the organization's processes that require it are also identified. In this phase, we can resort to knowledge collection instruments whose format may or may not be digital.

Phase 3 (storage) involves the administration of a knowledge base and the availability of technological tools so that knowledge is safely stored and easily retrieved and priority criteria and knowledge schemes are met. As a result, the organization will have a corporate memory contained in a documentary repository of valuable knowledge. This phase requires the implementation of accessibility strategies to technological resources for the entire organization to implement the mechanisms for knowledge processing. It also requires determining what knowledge will be integrated into the job definitions and functions provided in the organization's structure. It is usually done by creating or updating organization manuals. Knowledge will also be integrated into the processes through process and procedure manuals, whose information will be helpful for analysis, design, and updating for improvement purposes.

In Phase 4 (distribution), the organization will implement the necessary actions to ensure the accessibility of knowledge to all members and proper dissemination by means of technological tools. It also includes designing and publishing visual documents required in the company's various functional areas.

Phase 5 (use of knowledge) allows knowledge to be applied for the execution of tasks and implementation of the company's operations so that its use generates value. In this phase, knowledge makes it possible to make what is indicated in the strategy a reality: the continuous improvement of processes and decision-making, innovation, and problem-solving is observed, besides achieving organizational goals.

Finally, Phase 6 (transformation) is done gradually, as time goes by, through learning to build experience. The knowledge can be appropriated, enriched, converted, and stored in the organization by repeating the previous phases as new knowledge. In this phase, prior knowledge usefulness is validated to enable the organization to maintain relevant knowledge.

Conclusions

An appropriate KM model for small and medium-sized Mexican companies was proposed based on the models reported in the literature. The proposal improves the nomenclature of the phases or variables of the process to facilitate the understanding of the model by the organizational actors. It also specifies that acquiring knowledge starts, in addition to internal sources, from collaboration with organizations, groups, people, or public entities to facilitate the development of the organization's capabilities around strategic processes. This is useful when one does not have available knowledge in the internal environment. Additionally, the model considers the development of a process of an adjective or transversal nature for maintenance and improvement, which will allow expansion of the organizational capacities through a scheme of evaluation and continuous improvement of the KM process.

The model is expected to give the organization a better understanding of KM objectives and phases to take advantage of its facilitators, such as motivating staff to use and share knowledge and apply best practices at work. Therefore, the proposal is expected to facilitate the institutionalization of KM practices, promote the development of an organizational culture characterized by the search for value generation based on resident knowledge, not only in repositories and knowledge bases but also on people, for a balance in the composition of the organization's socio-technical system through the harmonious development of talent-technology pairing.

Additionally, it is necessary to accompany the model with a regulatory framework that promotes the development of good practices around KM based on the values of transparency and responsibility in the areas of competence of each individual or group in the organization. The socialization of knowledge is fundamental since, by sharing it, human talent develops and motivates self-taught and collaborative learning. It implies that the design of KM systems based on the proposed model first sensitizes people to share and document knowledge so that the organization can learn.

It highlights the model's flexibility for the design of KM systems according to different organizational contexts. Its advantage lies in omitting irrelevant details when seeking to conceptually simplify the KM process and emphasize the purpose, its elements, and the interrelationships between them. With the above, the model will enable the decision-makers of the organizations in the development of KM projects to take advantage of the information technologies available to them.

Finally, although it is impossible to generalize from case studies, future validations and tests of the model will allow us to understand how it contributes to achieving the organization's objectives. It remains for the future to specify how to implement and operationalize the model and evaluate the results when it is implemented in organizations regarding performance, sustainability, and improvement.

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MODEL ZARZĄDZANIA WIEDZĄ DLA USPRAWNIANIA PROCESÓW W MEKSYKAŃSKICH FIRMACH MAŁYCH I ŚREDNICH

Streszczenie: Organizacje stoją w obliczu nieodwracalnych i refleksyjnych zmian wynikających z rosnącego trendu wykorzystywania modeli biznesowych opartych na technologiach informatycznych. Strategie cyfrowej transformacji biznesu obejmują ludzką kreatywność, wiedzę i technologię niezbędną do generowania innowacji zapewniających organizacjom przewagę konkurencyjną. W konsekwencji zarządzanie wiedzą może przyspieszyć procesy adaptacji organizacji do obecnego środowiska społeczno-ekonomicznego. W pracy zaproponowano model zarządzania wiedzą dla małych i średnich firm w celu promowania usprawnień ich procesów poprzez gromadzenie i dostęp do kapitału intelektualnego w bardzo zmieniającym się środowisku. Proponowany model obejmuje etapy diagnozy i planowania zarządzania wiedzą, pozyskanie, przechowywanie, dystrybucję, wykorzystanie i transformację.

Słowa kluczowe: zarządzanie wiedzą, model, mały i średni biznes