

KEYWORDS ■ knowledge management ■ knowledge dissemination ■ SECI model ■ PMO

ANALYSING THE STAGES OF KNOWLEDGE MANAGEMENT IN A BRAZILIAN PROJECT MANAGEMENT OFFICE

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✉ ABSTRACT

This paper aims to analyze and identify the stages of knowledge management, adopting the SECI model, in Project Management Office (PMO). Results from a case study conducted in a Brazilian company shows that the main difficulties encountered were associated with encouraging employees to share their tacit knowledge when asked to assist in project development. Organizational culture presented itself as a major factor influencing this process of knowledge sharing among the employees in the company that was studied.

INTRODUCTION

The design and dissemination of effective tools and processes to capture and share knowledge within an organization are the objectives of knowledge management.

Knowledge management is not a new concept and has been researched over the years. Some of the most influent studies on knowledge management (Nonaka, 1991, 1994; Nonaka & Takeuchi, 1997; Davenport et al. 1998; Hansen et al., 1999) adopt the strategic

perspective, focusing on knowledge management models.

However, a significant research stream explores tools and activities in an isolated manner. Several works have proposed or discussed tools to support knowledge management in projects, in general, by exploring the relationships between knowledge transfer and information technology (IT) applications (Aldea et al., 2004; Burkhard & Meier, 2005; Corso & Paolucci, 2001; Dave & Koskela, 2009; De Paoli & Loregian,

2007; Gardoni, 2005; Heier & Strahringer, 2006; Lau et al., 2003; Li, 2006; Monticolo et al., 2007; Newell et al. 2001; Nicoleta, 2007; Scherf & Bohm, 2005; Woo et al., 2004;).

Meanwhile, organizations have applied different knowledge practices to produce assets and services, although these practices have predominantly been informal and not systematic. In some cases, knowledge sharing depends entirely on the individual and his/her social networks, and employees are often not motivated to share their knowledge (Fong & Kwok, 2009).

Some studies suggest that there is a lack of research with regard to strategic and process perspectives (Frank & Ribeiro, 2012; Garavelli, et al., 2002; Hansen, et al., 2005; Szulanski, 2000).

Knowledge management has played a vital role in most organizations, affecting both organizational and project performance (Andersson & Linderoth, 2008; Davenport, et al., 1998). However, only recently has knowledge management been incorporated into project management (PM) literature, making it a new and challenging process (Donk & Riezebos, 2005). The bodies of knowledge (BoKs), such as PMBoK for the Project Management Institute (2013), focus more on communication rather than KM. In the Project Management Journal, this theme has been explored in recent years, but there are still a few papers that are strongly aligned with the KM theme (Ajmal & Koskinen, 2008; Alin, et al. 2011; Aubry, et al. 2011; Bower & Walker, 2007; Gasik, 2011; Glad-den, 2009; Johansson, et al., 2011; Koskinen, 2012; Müller, et al., 2013; Petter & Randolph, 2009; Reich, et al. 2008; Tukul, et al. 2010).

Studies that explore the intersection between PM and KM highlight the role of the project management office (PMO) as a critical factor (Aubry, et al. 2011; Müller, et al., 2013; Pemsel & Wiewiora, 2013).

Ibert (2004) warns that the learning mechanisms of projects and firms, considering ‘memory’, ‘experience’ and ‘reflection’, have opposing features. Knowledge accumulation is more likely to occur at the organizational memory level, while projects promote structural change and acquire new knowledge assets.

Thus, from the organizational perspective, the PMO appears to complement the learning mechanisms that attempt to mitigate these opposing features between projects and firms. One of the

functions of PMOs is to create and disseminate a PM methodology that synthesizes the best practices. Moreover, a PMO has a central role in organizing the PM communities of practice (Aubry, et al. 2011) and fostering the networks and knowledge flows of project managers (Müller, et al., 2013; Pemsel & Wiewiora, 2013). PMOs can support knowledge management by facilitating the centralization of knowledge acquired during the project life cycle, gathering the lessons learned and converting the accumulated knowledge from project portfolios into routines, practices and processes, i.e., explicit organizational knowledge (Aubry, et al., 2011; Denford & Chan, 2011; Elonen & Artto, 2003; Hobbs & Aubry, 2010; Rose, 2011; Unger, et al., 2012). The KM functions pose several challenges for PMOs since these functions depend not only on investments on organizational memory in the form of software and other IT skills, but also on all stakeholders that should be committed to sharing knowledge in projects. To transform the tacit knowledge that is created in projects into explicit knowledge, the PMO must also manage several processes, such as project reports, lessons learned, project revisions, post-project review, and stakeholder perceptions.

In this context, this paper aims to analyze the stages of knowledge management in a PMO by identifying the organizational factors that influence knowledge socialization, externalization, internationalization and combination in PMO.

Due to the exploratory nature of this study, the case research method was selected to be conducted in a Brazilian company. The information has been gathered by in loco observations, interviews with PMO managers and employees, and document analysis. To understand the process of transforming tacit knowledge into explicit knowledge, the SECI model (*socialization, externalization, combination and internalization*) proposed by Nonaka and Toyama (2003), was applied.

Considering the aforementioned objective, a summarized theoretical framework is presented to support the study in Section 1. In Section 2, the research methodology is presented. The proposed study surrounding the cases and their analysis are discussed in Section 3, and the conclusions are presented in section 4.

1. Literature Review

1.1 Knowledge Management

Knowledge is a fluid mixture of framed experiences, values and contextual information that provides a framework to assess and incorporate new experiences and information (Davenport & Prusak, 2000). Knowledge is originated and applied in an individual's mind and in organizations, often in the form of documents, archives, organizational routines, processes, practices and rules. For this reason, knowledge must be well managed.

Knowledge management (KM) emerged in the academic world in the 1990s, becoming an especially relevant topic for companies and technology leaders (Frappaolo, 2002). Some of the most influent studies in this decade were those of Nonaka (1991, 1994); Nonaka and Takeuchi (1997); Davenport, et al. (1998); and Hansen, et al. (1999).

The knowledge management approach in organizations is characterized by a company's ability to create knowledge as a corporate asset, to understand the need to manage it and to treat it with the same care as in the achievement of other tangible assets (Nonaka & Takeuchi, 1997).

Therefore, KM can be identified as the use of collective knowledge to increase the capacity of reaction and innovation and the reuse of experiences and practices. It is comprised of three basic elements: people, processes and technology. The effort of these elements, in percentage, is approximately 70%, 20% and 10%, respectively (Cong & Pandya, 2003; Frappaolo, 2002).

Davenport, et al. (1998), the authors of one of the most frequently cited studies, list KM objectives as follows: reduce cycle time; reduce costs; obtain more efficient use/reuse of knowledge assets; enhance functional effectiveness; increase organizational adaptability; increase the value of existing products and services; and create new knowledge-intensive products, process and services. Moreover, Davenport, et al. (1998) highlight the importance of knowledge and innovation culture sponsored by top management committed to knowledge creation.

However, knowledge sharing depends on the employees involved. Consequently, organizations must use methods and techniques through which employees can share their knowledge and companies can capture, store and use it in the

future. Additionally, organizations should design processes and tools to help employees during this knowledge-sharing stage.

According to Randeree (2006), KM essentially consists of processes and tools that are able to capture and share data. Those processes can apply and share knowledge between individuals within an organization. Hansen, et al. (1999) propose a knowledge management strategy based on a model considering customization and coding.

Various studies present KM tool implementation and its effects on team communication and information sharing (Aldea, et al., 2004; Gardoni, et al., 2004).

One stream of research on KM explores the relationships between knowledge transfer and information technology (IT) applications (Corso & Paolucci, 2001; Dave & Koskela, 2009). Some studies focus on software that assists in search and store activities (Aldea, et al., 2004; Burkhard & Meier, 2005; De Paoli & Loregian, 2007; Dustdar, 2004; Gardoni, 2005; Gardoni, 2005; Heier & Strahringer, 2006; Kotlarsky, et al., 2007; Li, et al., 2006; Monticolo, et al., 2007; Newell, et al. 2001; Nicoleta, 2007; Scherf & Bohm, 2005; Woo, et al., 2004). Issues related to learning and lessons learned from past experiences to be reused in future projects have been explored in several studies (Cummings & Teng, 2003; Davenport & Prusak, 1998; Hsu, 2008; Szulanski, 2000).

According to Watanabe et al. (2011), organizational culture largely determines how the members of an organization interact with one another. For example, an organizational culture that is open and that encourages discussion, will promote communication and knowledge sharing, whereas an organizational culture that nurtures mistrust and power struggles, will inhibit the free exchange and sharing of knowledge, which is a source of power among members of the organization.

In addition to promoting an open culture and encouraging discussion, Donk and Riezebos (2005) note that organizations must develop methods, tools, techniques, and values through which they can acquire, develop, measure, and distribute knowledge and provide a return on their intellectual assets.

Organizations attempt to use technologies and systems to capture tacit knowledge from the minds of their employees and to share this knowledge within the organization. When knowledge is stored, it becomes a resource that can produce competitive advantages, reduce work, facilitate processes, and reduce costs (Huang, et al., 2011; Martensson, 2000).

Tacit knowledge is found in the minds and life histories of individuals. This type of knowledge is often difficult to share in contrast to explicit knowledge, which is documented and materialized in projects and reports (Nonaka & Takeuchi, 1997).

Nonaka and Toyama (2003) propose the SECI model to represent the knowledge creation process. This model presupposes that knowledge is created by the interaction between tacit knowledge and explicit knowledge, as shown in Figure 1. Thus, the model proposes four different ways to convert knowledge:

- Socialization: turns tacit knowledge into tacit knowledge
- Externalization: turns tacit knowledge into explicit knowledge
- Combination: turns explicit knowledge into explicit knowledge
- Internationalization: turns explicit knowledge into tacit knowledge

In the socialization process, individuals share knowledge and create tacit knowledge through direct experiences. Within organizations, individuals can embed tacit knowledge of clients through experiences based on their interactions with such clients (Nonaka & Takeuchi, 2003).

In externalization, conversation is an effective method to articulate this process. Therefore, tacit knowledge is shared and may differ among individuals. Thus, knowledge is shared and becomes explicit. Another technique for sharing knowledge is to use analogies and metaphors, allowing individuals to establish connections to the real circumstances in which they live (Nonaka & Takeuchi, 2003).

Explicit knowledge transformation is articulated in the form of explicit knowledge through the combination process. This type of knowledge is acquired inside and outside of organizations. Thus, this knowledge is processed and combined to become shared knowledge.

Explicit knowledge is created and shared throughout an entire organization and is then converted into the tacit

knowledge of individuals through the internationalization process. In this stage, an organization can offer training to employees, write manuals, create documents, and conduct experiments and simulations of the products and services offered, which can enrich individuals' tacit knowledge base.

According to this model, the knowledge conversion process is not cyclic but rather spiral. Knowledge is always improved upon, and acquired knowledge is added. The process of generating knowledge in a spiral is infinite. In the creation spiral of knowledge, the interaction between tacit and explicit knowledge is amplified by the four conversion modes. The spiral increases in scale as higher ontological levels are attained (Nonaka & Takeuchi, 1997; Nonaka & Toyama, 2003). This spiral illustrates the creation of a new concept in terms of a continual dialogue between tacit and explicit knowledge (Nonaka, 1994). Knowledge that is created by the SECI process can trigger a new spiral of knowledge creation moving through interaction communities that transcend departmental and organizational boundaries expanding horizontally and vertically. This knowledge can assist organizational departments in the innovation process (Nonaka & Toyama, 2003).

1.2 The Project Management Office - PMO

Projects are sources of knowledge and are often regarded as efficient means for combining knowledge and thereby optimizing value from investments (Pemsel & Wiewiora, 2013). For this reason, the management, storage, interpretation, and sharing between project teams is essential for organizations to maintain records, archives, documents, processes, reports, and group learning. In project-driven organizations, PMOs typically serve in this role.

The PMO concept emerged in the late 1950s and the early 1960s (Kerzner, 2001). However, the PMO functions vary significantly (Dai & Wells, 2004) and assume distinctive archetypes (Desouza & Evaristo, 2006; Hobbs & Aubry, 2008). Hobbs, et al. (2008) argue that PMOs are unstable structures that are affected by company environments and organizational changes (Aubry, et al., 2010; Hobbs & Aubry, 2007; Hurt & Thomas, 2009;) and influence performance (Aubry & Hobbs, 2011; Liu & Yetton, 2007).

According to Patah and Carvalho (2009), a PMO is a structure that aims to connect a project and an organization as a whole. Thus, PMOs consist of a structure for project management concepts and applications within an

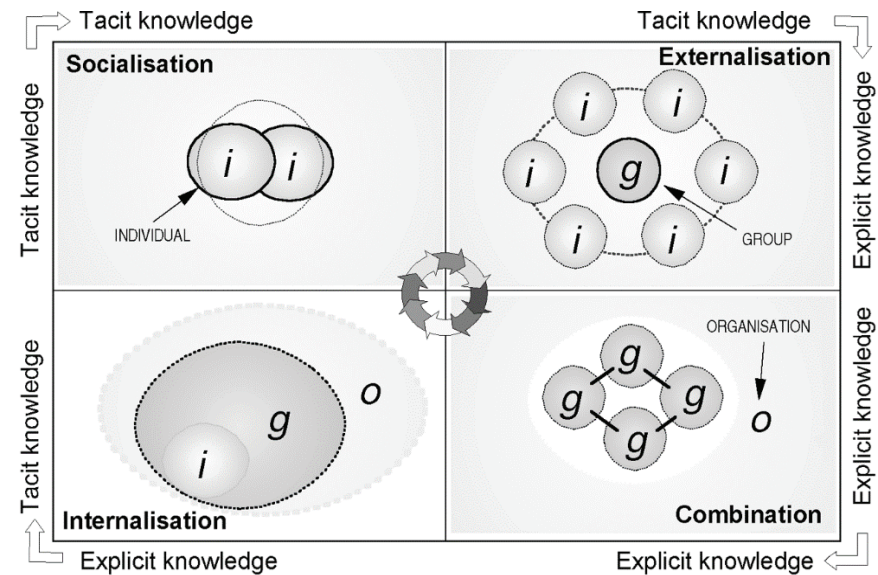


FIGURE 1. The SECI model of knowledge creation. Source: Adapted from Nonaka and Toyama (2003, p. 5)

organization, assuming different functions: from a simple division to help with project control, to a department that is in charge of all projects within the organization.

Following Dai and Wells (2004), a PMO can be defined as an organizational entity that is established to support project managers and organizational teams with respect to principles, practices, methodologies, tools, and project management techniques. PMOs consist of a structure that is geared toward the application of project management concepts, which can support the transformation of organizational strategies and results through project management (Carvalho & Rabecchini Jr., 2005).

Aubry et al. (2008) suggest that a PMO is an essential aspect of project management in a corporate domain because it aligns strategies, projects and structure. Successful project management requires filling in the gap between a company’s vision and its projects in progress. In this way, the PMO has substantial power to support the transformation of a company’s strategies and the results of project management. The PMO can support the achievement and assessment of information in the evaluation and selection of strategies and in the control of strategy implementation through successful project execution, which results in the accomplishment of organizational goals (Dinsmore, 1998; Patah & Carvalho, 2009).

Dai and Wells (2004) report that it is possible to identify six main responsibilities for a PMO: development and standard maintenance of project management methods, development and project

record maintenance, administrative support for projects, human resources supply and recruitment assistance, project management consultancy and guidance, and organizational project management training.

PMO members are responsible for the coordination of their company’s projects, and according to Prado (2000), the functions of this department are the following: advising senior management and project managers; auditing projects; becoming involved with other sectors with the aim of enhancing the efficiency of processes; designing and maintaining methodologies, rules and standards; training project participants; ensuring project quality; providing support for the creation of proposals; registering and disseminating “better practices”; practicing visual management; graphically depicting project development and the communication of project controls; and sending adequate information to project participants (Brown & Duguid, 2001; Oduoza & Harris, 2011).

A PMO can develop and maintain a company’s rules and methods. Procedural standards must be sufficiently detailed to provide guidance. However, such standards cannot be too strict because excessive strictness can inhibit team creativity. A PMO must be capable of managing retrospective learning, which refers to generating knowledge from past projects, and prospective learning, which refers to transferring knowledge from past experience to future projects (Pemsel & Wiewiora, 2013).

Moreover, according to Aubry, et al. (2011), one of the key tasks of PMOs is the management of PM – related knowledge – that is, establishing

the means and ends for project managers and PMO members to share and access knowledge when needed. The manner in which project offices are structured in an organization and their tasks, vary from one organization to another. However, there are three main areas of responsibility for project offices: development, support and control.

The development functions are those that involve the recruitment, training and development of project managers. The support functions are those that help project managers to enhance their work performance by offering guidance and clear project management processes. The control functions are those stemming from functional management and include: project manager assessment, the allocation of managers from one project to another, guarantees that project deliverables will be produced and presented with proper quality, and the establishment of standards. PMO implementation can be challenging, but they are not untapped territory. Many organizations, both large and small, have observed the benefits that consistent project control can offer (Hallows, 2002; Koskinen, 2004; Marra, et al., 2012; Patah & Carvalho, 2009).

A PMO can centralize the collection and storage of project knowledge, the lessons learned, and the models and methods used. These records related to project performance, such as status reports, variable analyses, changes in initial plans, risk lists, and other information pertaining to successful or unsuccessful previous projects, can be stored in a database of lessons learned that can be used for future projects (Dai & Wells, 2004; Elonen & Artto, 2003; Hobbs & Aubry, et al., 2011; Rose, 2011; Unger, et al., 2012). Martins, et al. (2005) emphasize the relevance of the project management office respecting the company culture, especially with respect to the skills development of project managers.

In this literature review, different aspects of knowledge management (KM) in general were presented, and the PMO’s role in this context was described. Despite the vast body of literature available, it is clear that there is a lack of research concerning KM in PM. Table 1 presents different

perspectives that affect KM that will be explored in this study.

The theoretical framework that is presented in Table 1 will assist in analyzing KM in a PMO of Brazilian companies.

2. Research Methods

As noted in the introductory section, this study aims to analyze the stages of knowledge management in PMOs by identifying the organizational factors that influence knowledge socialization, externalization, internationalization and combination in a project management office.

The following research questions were addressed:

How are the stages of knowledge socialization, externalization, internationalization and combination performed in a PMO? What organizational factors influence knowledge dissemination in a PMO? How is tacit knowledge converted into explicit knowledge during the stages of knowledge management in a PMO?

Because of the exploratory nature of the research questions, the case research method was selected; the case study was selected as the methodological approach and was developed based on guidelines from the literature (Eisenhardt & Graebner, 2007; Flynn, et al., 1990; Voss, et al., 2002). According to Einsenhardt (1989), the case study method is an investigation into the comprehension of the dynamics of a unique configuration. Such an investigation typically involves the collection of data from files, interviews, questionnaires, and in loco observation. The case study method is a research strategy that is appropriate when it is necessary to empirically study a phenomenon in context (Hautala, 2011).

As suggested by Voss, et al. (2002), the starting point for case research is the construction of a conceptual framework to explain the general constructs presented in Table 1. The evidence collected in case studies can be qualitative, quantitative, or both. Qualitative data is useful to under-

Theoretical Perspectives	References
Strategic perspective of KM	Davenport et al., 1998; Hansen et al., 1999
KM Models	Hansen, et al., 1999; Nonaka, 1991, 1994; Nonaka & Takeuchi, 1997
IT infrastructure for KM	Aldea, et al., 2004; Burkhard & Meier, 2005; Corso & Paolucci, 2001; Dave & Koskela, 2009; De Paoli & Loregian, 2007; Dustdar, 2004; Gardoni, 2005; Heier & Strahringer, 2006; Kotlarsky, et al., 2007; Li et al., 2006; Monticolo, et al., 2007; Newel, et al., 2001; Nicoleta, 2007; Scherf & Bohm, 2005; Woo, et al., 2004.
PMO roles	Ajmal & Koskinen, 2008; Aubry, et al. 2008; Hallows, 2002; Hobbs & Aubry, 2010, Rose, 2011, Unger, et al., 2012.
KM and PM	Alin, et al., 2011; Aubry, et al. 2011; Bower & Walker, 2007; Gasik, 2011; Gladden, 2009; Johansson, et al., 2011; Koskinen, 2012; Müller, et al., 2013; Pemsel & Wiewiora, 2013; Petter & Randolph, 2009; Reich, Gemino & Sauer, 2008; Tukel, et al. 2010.
PMO roles on KM	Studies that explore the intersection between PM and KM highlight the role of the project management office (PMO) as a critical factor (Aubry, et al., 2011; Denford & Chan, 2011; Elonen & Artto, 2003; Hobbs & Aubry, 2010; Müller, et al., 2013; Pemsel & Wiewiora, 2013; Rose, 2011; Unger, et al., 2012.

TABLE 1. Theoretical framework to analyze KM perspectives of the PMO

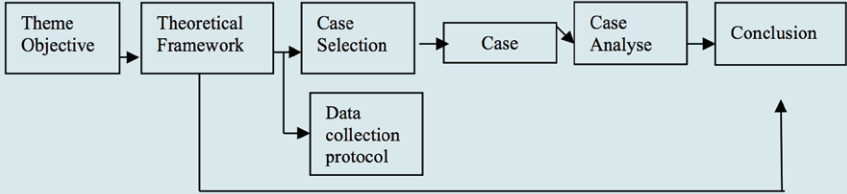


FIGURE 2. Research methodology structure. Source: Yin (2003)

stand theory and to relate quantitative data, whereas quantitative data can show relationships that cannot be emphasized in qualitative research (Eisenhardt, 1989; Yin, 2003).

For this study, a Brazilian company was selected. The qualitative method of the case study in a Brazilian manufacturing company has been used in the present study. The unit of analyses is the PMO. The case selection criteria included the following aspects: having a PMO, developing knowledge management practices, and being available for the research and visits from the researchers.

Based on Yin’s research (2003), **Figure 2** shows the research methodology that is proposed for this study.

The main elements investigated in the field study were: the company characterization; the project management structure available; the activities developed by the PMO; the characteristics of the PMO; and the stages, transmission techniques and methods, and knowledge storage.

The collection of this information was conducted during two visits to the company in April 2012. The data collection tools used were: in loco observation, document analysis, procedures related to processes and projects, and semi-structured interviews with PMO managers, analyzed with varying levels of intensity. The interviews were conducted in the companies and involved the following aspects:

- Project management, more specifically, the project management structure, the importance of the PMO, and its main roles and goals;
- Knowledge management, emphasizing the transformation of tacit knowledge into explicit knowledge with a focus on the SECI model.

The interview script was divided into three sections. The first section aimed to obtain general information about the companies, including the project scope and the number of people participating on teams. In the second section, we attempted to understand the importance of PMO in the organizations, considering the products manufactured, how long the PMO existed, its goals and functions in the organization, organizational structure, and the coordinators’ objectives in knowledge management. The third section was concerned with issues surrounding the organizations’ knowledge management, particularly the process of transforming tacit knowledge into explicit knowledge and organizational knowledge storage techniques based on the model.

Two interviews were recorded and transcribed in the selected company; one of the two interviews was conducted with the project manager, and the other was conducted with the most experienced employee (*these interviews were conducted on different days*). The transcribed interviews were shown to the

interviewees to ensure validity and reliability. The PMO archival data and interviews were employed to achieve triangulation, as presented in the following sections in Tables 2 and 3. Discrepancies among these sources of evidence were noted and discussed. We thus proposed the SECI model and sent it to each company to validate the structure shown in the table.

This information was also used to establish a relationship between the structures of the project management of the analyzed organization with their strategies in manufacturing. After the interviews were conducted and the results obtained, the case was presented through charts and tables and with the theoretical framework to support the conclusions of this study.

3. Results

For this study, the company selected was located in the countryside of Sao Paulo. This company met the selection criterion of having PMOs formally established within an organizational structure. To preserve the identity of the selected company, they will be referred to as Company.

3.1 The Company

Currently, more than 3 000 employees work in seven subsidiary companies of the major group. The products that are manufactured include: agricultural supplies, gym equipment, plastic containers, other pieces, hoses and pipes, and other goods. The PMO is located at a strategic level that reports directly reports to the higher management level and is more involved in the company’s strategic decisions (*see Table 2*). This PMO encompasses the seven subsidiaries of the group, with 22 employees. Four employees work exclusively on R&D, and the other employees work on projects that are focused on new products to meet market demand.

The company exports approximately 30% of its goods to other countries, including countries in Latin America and Australia. In addition to manufacturing, the company imports products from Japan that have the company’s name, such as pulverizers and other types of agricultural supplies.

The PMO is coordinated by a mechanical engineering doctoral candidate who is informed by reading articles, books and reports about knowledge management in PMOs. This manager admits that many knowledge storage processes must be improved. However, because of the lack of time, this goal is not a priority for this department.

The departments of projects, sales, R&D, quality and production, work together as a team, organizing many meetings with the aim of developing and designing new products and improving existing products. When a project is successful, all members are praised because they all contribute to its success.

All meetings are recorded because there is always a new idea from an employee that may not be used presently, but could be useful in the future. All progress is documented and stored at the beginning of each project. Frequently, the members hold meetings to share opinions regarding the stages of development. Whether successful or not, the stages are recorded and stored to ensure that the members can refer to the topics discussed.

For this PMO, its functions and organizational goals are clear to the remainder of the office team. Everyone is aware of the PMO’s importance and is stimulated to design new methods to improve knowledge sharing among employees. One employee had an idea to create notice boards called “Communication Management”, which are located in strategic places and scattered over the entire shop floor. The project, quality and production departments communicate through a tool known as “Communication Management”. In addition, all employees can see and understand the current and subsequent stages of a project. Additionally, these notice boards have specific information about the meetings and what must be remembered during the stages of the projects. This technique has proven to be important, particularly for the shop floor employees, who previously felt excluded from the meetings and believed that they were the last to know about changes within the company. Now, the employees feel more involved in the organization and in other departments. This “Communication Management” can be a good knowledge-sharing method among employees.

The interviews and analysis of documents and observation in loco helped to characterize this Company and provided more information about their structure. **Table 2** presents summarized information of the company. The selected company has projects involving the development of new products, aiming to meet the demand and new market niches because the product market is highly competitive.

The directors of the Company have a strong influence on project decision making, and this influence often causes uneasiness among the employees. In addition, the president influences the decision-making processes and often provides ideas for new products. Often, those ideas, as reported by the area manager, are not appropriate, based on research and market needs. This discord leads to conflict between the employees and the president. It is important to highlight that the company is a family-owned enterprise, and the higher-level management team is composed of heirs of the company’s founders. It was is observed that decision making is centralized in this company, which Elonen and Arto (2003) refer to as decisions based on the power of stakeholders. This centralization causes a sense of insecurity in employees, inhibiting their initiative and autonomy (*empowerment*).

According to the reports by Company, the most unsuccessful projects were managed by family members in higher-level management who insisted on the design of products that did not meet the needs of the market. The accumulation and sharing of knowledge between individuals depends on the structure, culture and technology that are available in organizations (Randeree, 2006). The company analyzed has organizational structure and available technology that serve as fundamental tools for the retention and sharing of knowledge between individuals, but the organizational culture includes a PMO manager who is with his team daily.

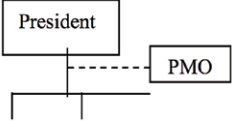
	Company
Number of Employees	3 000
Employees in PMO	22
Average number of projects	8/year
Types of projects developed	New product design and development of new technologies applied in current products.
Professionals with certification in projects	No, the manager is on probation.
PMO position in the organizational structure	
Software to store knowledge	Yes. They store information on each project for future inquiries and record each change, stage and additional information.
Team or employee to design methods of knowledge management	Yes, the PMO manager increases the awareness of the team.
Use of collaborative techniques	In the innovation gateway, projects related to new products are initiated by sharing knowledge. Through the suggestion box, employees from all departments have access and can give tips on how to improve technology and new product design.
Knowledge sharing, learning and best practice techniques	Meetings Brainstorming Discussion groups every two weeks
Use of benchmarking tools in the projects	Yes. With software, the information is stored and checked for similar future projects.

TABLE 2. Characterization of company and PMO

As may be observed, the organizational culture can enhance mutual trust in an organization and can help to enable more effective knowledge transfer (Isaa & Haddad, 2008). Furthermore, the failure of many knowledge transfer systems often occurs as a result of cultural factors rather than technologies (Ajmal & Koskinen, 2008). Although the company makes structure and technology available and uses techniques to maintain and share knowledge, the selected company has an organizational culture that encourages open discussion and promotes communication and knowledge sharing (Watanabe, Benton & Senoo, 2011).

3.2 Knowledge Management Analysis in the PMOs

The PMO of Company is already well-structured, and many questions related to knowledge management have already emerged. The greatest difficulty reported by the companies is the conversion of individuals' tacit knowledge into explicit knowledge.

According to Nonaka and Takeuchi (1995), it is often difficult to express tacit knowledge directly in words; the only means of presenting tacit knowledge is through metaphors, drawing and various forms of expression that do not involve the formal use of language.

The SECI model proposed by Nonaka and Toyama (2003), assists in understanding the stages of the process (see Table 3). In the socialization

process, companies seek the transformation of a tacit knowledge into tacit knowledge through integration with the final clients and the production department. The company seeks interaction between production productions departments and final consumers, the technique of brainstorming in meetings to understand the socialization process.

The externalization process seeks to turn tacit knowledge into explicit knowledge. In that phase, the Company uses analogies and metaphors to develop products and to name its projects. For products that are developed by the selected company and which are similar to parts of the human body, the project names include references to the human body.

In the transformation of explicit knowledge into explicit knowledge, called combination, the company expects participation and interaction among the PMO team and the production, sales and quality departments. Also this Company seeks suggestions from departments to improve product technology.

In internationalization, which is the process of transforming explicit knowledge into tacit knowledge, the companies seek to maintain documentation of all stages of projects. When required, Company sponsors training for its clients. In this manner, the organization can learn about possible difficulties encountered by users, determine what

can be improved in future projects, and learn about market needs. Moreover, the company has a testing room in which its project team can evaluate the developed products to improve their design and technology.

Based on the SECI model, once the PMO is structured, activities and routines can stagnate. The team involved no longer develops methods to maintain and share knowledge, as confirmed by the subject who we interviewed. The manager who was interviewed understands and raises awareness of his team regarding the relevance of sharing and knowledge management before, during and after projects. According to this manager, this process depends on the organizational culture and on the relationship of the PMO team.

These results are consistent with the emptying process suggested by Pellegrinelli and Garagna (2009) in which PMO members share their knowledge in an organization only to a certain point, such as the point at which the PMO has no more value to add. Thus, Müller, et al. (2013) suggests that new knowledge to be developed within the PMO would require exchanges between PMO members, which appear to occur more in formal meetings than ad hoc in day-to-day work.

In addition, the benefits of knowledge management by the PMO are apparent. Among the benefits is the improvement of the decision-making process as a result of the greater involvement of the team. The answers to the problems that arise during project execution materialize faster, thus reducing rework and improving productivity. Consequently, the relationships among employees improve and increase the teamwork efficiency.

The difficulty is to make employees share their tacit knowledge to support project development. Sharing explicit knowledge within the group is also difficult; however, there is a need to maintain this knowledge within the company. Table 3 presents an analysis according to the SECI model structure.

The growing complexity of project work means that an increasing member

of technical and social relationships/interfaces must be considered by project managers in adapting knowledge and experiences from the daily work of a company and from earlier projects. Project team members frequently need to learn things that are already known in other contexts; in effect, they must acquire and assimilate knowledge that resides in organizational memory (Ajmal & Koskinen, 2008).

4. Conclusion

In this study, the qualitative research method using a case study was appropriate because it enabled us to describe, interpret and understand the company to achieve our objective of analyzing and identifying the stages of knowledge management in a PMO.

To understand the process of transforming tacit knowledge into explicit knowledge, the SECI model (socialization, externalization, combination, and internationalization) proposed by Nonaka and Toyama (2003) was applied.

Given this objective, the following research question was answered: what organizational factors influence knowledge dissemination in PMOs? We found that the organizational culture is a factor that can influence knowledge organization, primarily because the project managers apply some methods and techniques, however infrequent but not. Some employees cannot recognize this importance as much as others, and knowledge management can be lost.

The organizational culture can largely determine how the members of an organization interact with one another. For example, an organizational culture that is open and that encourages discussion will promote communication and knowledge sharing, whereas an organizational culture that nurtures mistrust and power struggles, will inhibit the free exchange and

sharing of knowledge, which is a source of power among members of such an organization (Watanabe, et al. 2011). By identifying the main organizational factor that can influence knowledge dissemination in PMO, we were able to conclude that some organizational actions need to be taken, such as those listed under the Managerial Implications heading.

Analyzing the PMO in this study, we found that they centralize the collection and storage of project knowledge, the lessons learned, and the models and methods used. These records of project performance, such as status reports, variable analyses, changes in initial plans, risk lists, and other information regarding successful or unsuccessful previous projects, can be stored in a database of lessons learned that can be used for future projects, as proposed by Elonen and Arto (2003); Dai and Wells (2004); Hobbs and Aubry, et al. (2011); Rose (2011) and Unger, et al. (2012).

It is difficult for the company to make employees share their tacit knowledge to support project development. Furthermore, sharing explicit knowledge within the group is difficult; however, there is a need to maintain this knowledge and make it accessible within the company.

The SECI model assisted in visualizing the process of transforming tacit knowledge into explicit knowledge and in understanding that knowledge must be incorporated into operational practices, rules in databases, and company history. In this manner, increasing the awareness of employees is the first step to initiating the process.

The company studied concurred that the PMO's function is to create, manage and disseminate acquired knowledge in projects.

Finally, it is possible to observe that the organizational culture appears to be a primary factor in influencing the process of sharing knowledge among the employees of the company studied.

This paper may stimulate further research focused on aspects related to organizational culture as a motivating factor rather than knowledge management in PMOs and research focused on the effectiveness of knowledge management within PMOs. Thus, future research could seek to analyze whether the information that is stored can truly be used in future projects.

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TABLE 3. The SECI model application

FROM TACIT	To Tacit	FROM TACIT	To Explicit
	SOCIALIZATION: Interaction with the final consumers and production departments. Brainstorming.		EXTERNALIZATION: Analogies and metaphors in the development of product projects.
FROM EXPLICIT	To Tacit	FROM EXPLICIT	To Explicit
	INTERNATIONALIZATION: Documentation. Consumers' training. Product functionality testing.		COMBINATION: Participation of sales, production and quality departments. Improvements in product technology.