A methodological proposal to initiate a knowledge management strategy in SMEs in the construction industry

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Abstract- **This article proposes a methodology as an initial step for the development of a knowledge management strategy within an SME dedicated to electrical installations in the construction industry. This process consists of three key steps: a) starting with an observation process; b) applying a survey to project participants, and; c) using a knowledge management maturity assessment tool. These study instruments are expected to provide insight about the state of the organization in terms of knowledge management, identifying enablers, barriers, areas of opportunity and good practices that favor the establishment of the discipline of knowledge management in the company.**

Keywords--knowledge management, site monitoring, maturity assesment.

I. INTRODUCTION

The methodological proposal that is presented is derived from a project that is being developed in an electrical installation company that participates in the construction industry, located in the city of Hermosillo, Sonora, Mexico. It is a family company that, together with a group of workers from different areas of professional and technical knowledge with a great diversity of labor skills, make up its local and mining operative force.

The company has worked since its origins with an effective and sustainable work system; but in practice, multiple projects fail in the search for efficient performance due to the lack of effective coordination, a problem that could be addressed through communication and stored experience; but many times companies do not know what knowledge they should capture [1]. This unstructured way of working does not allow them to establish a system of exploitation and competitive advantage through the use of the intellectual asset of knowledge.

The monitoring of works is an activity present in this organization of priority value for its survival; this action is the way by which the organizations dedicated to construction acquire their economic gains, being these projects the basis of the business economy, and require intensive work in terms of intellectual capital. Often these monitoring tasks are carried out in highly disorganized environments, with little control and registration of activities, which is materialized in the deficient management of information of multiple aspects[2].

In the words of the CEO, he expresses that the organization requires a strategy or initiative that allows it to have the intellectual tools that favor quick and accurate decision making in projects. The knowledge of the projects allows to take advantage of the general and particular competences of the members and processes of the organization, obtaining better results that are reflected in the individual performances and in the quality and elimination of defects [3].

Within the organization, the scope of action for this project will be with the engineers and purchasing personnel, since they are the ones in charge of monitoring the different works, and they are the ones who have the highest knowledge of the field activity, as well as the access to the most relevant information obtained during the development of the installations.

This article aims to show the first stage of a long-term project focused on the development of a knowledge management strategy. The present literature compilation, as well as the development and proposal of the methodology, aims to help the participants to scale up to the next stage of the larger project; highlighting in the process the importance of a correct identification and definition of the elements that will support the strategy.

The structure of this work begins with the introduction section where the problem to be addressed in the development of this project is presented, this section also includes the objective of the study; the following section, theoretical framework and related studies, compiles relevant information on the topic of study, as well as some previously developed works with similar characteristics that allow the reader to identify the type of implementation to be carried out, as well as the potential benefits of the exercise.

Subsequently, the methodology section describes in detail and justifies the path to follow for the execution of the project step by step, delimiting its scope. Finally, the initial conclusions and future work to be developed in the project are described.

II. THEORETICAL FRAMEWORK AND RELATED STUDIES

Knowledge management strategies are not a new topic, multiple examples support this mention; craftsmen had their apprentices, families passed on to new members the wisdom of the business, workers shared their tacit knowledge to their assistants, among other examples; but it was not until the 1990s when managers began to formally talk about this discipline and to generate strategies for it [4].

The important question for these strategies lies in finding out how to apply knowledge successfully, that path depends on the particular characteristics of each organization; the ideal is to think this answer considering a business need and the goal of adding value to operations [5]. For construction projects, an important and valuable business need for customers is the on-time and functional delivery of a facility, so every system in the facility must be in sync with the rest of the facility in quality, timing and functionality [6], highlighting the need to create the necessary knowledge and information strategies that consider the different processes, enablers and practices to enhance organizational performance [7]. Two factors of utmost importance must be considered to achieve these objectives, enhancing communication and collaboration, with the appropriate support for the two types of strategies, coding and customization [8].

Kaltenbrunner, Marhiassen, Bengtsson and Engström [9] used the activity of observation as a method of qualitative and illustrative data collection, as a complementary process to others of the same nature and quantitative methods, where the authors can direct the focus of the dynamics of their actions from their own initiatives or motivated by the environment and the participants. This compilation action can be carried out with different levels of participation; it can be anonymous, without revealing your identity; it can be invisible, observing without being observed; or without influence, with no operational impact on the area you are studying [10].

When conducting social research, surveys have been one of the most common methods for obtaining data; they offer a general methodology for collecting, describing and explaining information from individuals working in the study environment [11]. The application of surveys is a useful method for obtaining the perception of those involved in a study or project [12]. Using this tool is often complicated, response rates reach very low levels, showing a poor participation of respondents, so it is sometimes necessary to use a mixed sequential system of surveys, either through face-to-face interviews, online, telephone, among other relevant methods [13].

Assessing knowledge management maturity is an extremely important activity, Lee [14] takes up the words of an unknown author who mentions "you cannot know where you are going until you know where you have been", indicating with this that this evaluation will allow to define how much energy should be dedicated in the present, how much in the future, and the method to follow to reach the top of maturity in the discipline. Many knowledge management maturity models consist of four to six levels, most of them created from the base of the CMM model "Capability Maturity Model" created by Paulk, Weber, Curtis and Chrissis in the year 1995 [15] [16].

Among the maturity assessment models, the APO model proposed by the association of the same name (Asian Productivity Organization) stands out, a questionnaire designed for organizations to conduct an initial assessment that measures their level of preparation in the discipline to promote initiatives and strategies; highlighting the strengths and weaknesses of the organization from seven separate categories, with 42 questions in total [17]. Rodrigues, Selig y Viegas [18] propose the ICMM model, created from a review of modern literature, its main focus was on intellectual capital, separating its evaluation into three main dimensions: human capital, structural capital and relational capital, composed of 21 questions.

Nourbakhsh, Ramezaninezhad, Rezaeenejad and Naderi [19] applied the APO knowledge management assessment process to a banking organization. These authors centered their main research question around the current state of readiness for knowledge management in the different branches, followed by a focus on knowledge enablers, knowledge processes and another one finally for knowledge outcomes and achievements.

III. METHODOLOGY

This section shows the proposed methodology to be followed for the execution of the identification activity; these proposed actions arise from the research conducted on knowledge management. The initiatives seek to take advantage of and maximize the intellectual assets generated in the organization over the years, but, as the authors Hansen, Nohria y Tierney [4] point out, the company is not always aware of the value of the intellectual capital it possesses, and to support this discipline we worked with initiatives focused on extracting valuable knowledge and information from the organization.

This methodology takes advantage of and discovers the different communication channels that foster collaboration and knowledge sharing [20], with the final objective of

achieving the reuse of knowledge for its exploitation and improvement, with an impact on the company's operational and intellectual benefits [21].

Fig. 1 contains the methodology to be followed, with these proposed actions, it is possible to identify and define the initial status in terms of knowledge management, in order to move forward with the creation of a strategy:
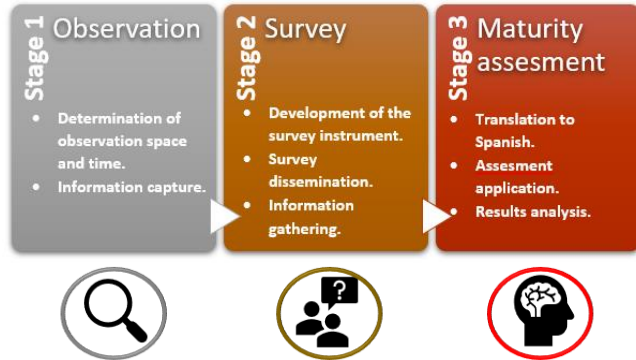

Fig 1. Proposed methodology (own elaboration)

The first stage consists of carrying out observations freely and in agreement with the company's managers for a sufficient period of time (say 1 to 3 months), with visits to the construction site and offices at the desired time, always considering respect for the time and privacy of the participants This interaction is focused on the observation of activities in the field, office and general documents, with the possibility of informal interactions with workers, in order to learn about the work environment. It is proposed to generate a format for taking notes of the observation sessions based on the adaptation made by Rogers et al. [22], with the freedom granted by the activity of direct observation as Arzate [23], highlighting general observations and comments in this regard. It is also important that the company allows the review of its internal documents, which will serve as a complement to the investigation [24], expanding the study environment. All this information should be captured and stored for later stages in the development of the project.

The second stage required the development of an instrument to obtain the knowledge (see appendix 1), it was a survey with key questions that was disseminated to the participants previously established by the project management. According to Carrillo-Villafaña [25], the application of surveys to the participants of a study allows to extract valuable knowledge from experienced people who know the work environment, thus highlighting strengths and weaknesses; they operate as a descriptive exercise that allows to know the perceptions of those involved for the benefit of future interpretations for the project. The contribution of each participant is combined with the observed material to consolidate the information and knowledge that will support the development of the knowledge management strategy.

This dynamic will allow to discover what is in the organization, mainly in terms of work monitoring.

The third stage consists of applying a knowledge management readiness assessment tool, all in accordance with the method proposed by the APO, an instrument recommended by the association of the same name to start the development of any knowledge management initiative, as in this case study; from this, it is possible to know the strengths and virtues of the different relevant categories, and from the gaps identified in the knowledge it was possible to focus the future efforts [17]. It will also require a process of adaptation from its original format to Spanish language and Microsoft Excel file format. This questionnaire will be shared with various stakeholders in the company, and the results obtained should be analyzed to determine the areas of improvement and strengths present across the seven different categories, along with a reliability analysis of the results obtained to validate the conclusions obtained. Table 1 represents the categories and the information to be obtained from each of them.

Among the expected results of the methodology to define a knowledge management strategy for the SME are:

To be able to know the work environment, identify the key participants in the monitoring of works, the personnel in charge of them, the resources they manage and request, various relevant documents and about work progress, among other operational and sensitive information authorized for the organization.

To understand the participation of the main players, their tasks, relevant knowledge, tools used, recurrent problems, interactions, formats used, intellectual needs, among other elements.

To discover the degree of maturity and readiness in the organization to begin the implementation of knowledge management, identifying positive and negative characteristics that allow the proper transition to the growth and sustainability of the discipline.

Table 1. APO maturity assessment scheme (own elaboration)

Categories	Strengths / Opportunities for improvement	Overall average	Cronbach's alpha
Leadership			
Process			
People			
Technology			

Knowledge processes			
Learning and innovation			
KM outcomes			

These results are not expected to be absolute, they will require adequate discernment, seeking to proceed with the proposals best suited to the organization and its processes.

IV. CONCLUSION AND FUTURE WORKS

This proposal will provide the intellectual basis to objectively design the knowledge management strategy for the company. It is an exercise to obtain knowledge so that the people in charge of executing the project can get to know the work environment and the important participants with their respective functions, highlighting barriers and enablers to be considered in the future for the implementation of knowledge management.

In the future, the implementation of a knowledge management strategy will proceed in the same organization. It will consist of three subsequent stages, which include the creation of the strategy in the subject of study, the implementation in the field with the different participants, as well as a final stage of evaluation based on different operational criteria and specific to the subject.

The implementation will have a direct impact on site monitoring, considering documents and field activities.

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VI. APPENDIX

Appendix 1

Participation Survey

1. Participant's name.

2. Job – functions.

3. Main tasks.

4. Technological tools used (devices and/or softwares) Check boxes suggested according to the previously observed environment.

5. In what format do you write, share, or request information?

   Check boxes suggested according to the previously observed environment.

6. Briefly explain how you share information through the different media.

7. In your opinion, what would be the most important knowledge of your position?

8. This project is just getting started. Do you have any suggestions for improving the processes you use to monitor construction sites?

9. What recurring problems do you encounter in information and knowledge management?

10. Which personnel do you interact with? Identify them by position and department.

11. What information do you need to capture and use within site monitoring?