Research in Progress: Understanding the process of implantation IT Enterprise Applications in Small and Medium Enterprises (SMEs)

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Abstract

This research deals with the implantation of IT enterprise applications in Small and Medium Enterprises (SMEs). It comprises two main phases. The first phase aims at deepening the existing understanding of the process of adoption and implantation of IT Enterprise applications in SMEs. Besides a literature review this phase includes the realization of case studies and interviews of the different players in the adoption and implantation process. The second phase aims at producing models and methods to guide SME in implantation of IT enterprise applications. This phase follows is being carried out under the Design Science Research (DSR) paradigm.

This document presents the advances and results obtained in understanding the problem and determines the work to be done soon. The main findings to date are: Government regulations are the main motivations for implanting IT enterprise applications in SMEs, the cost is not the main selection parameter for SMEs with previous experience in applications, it is necessary a person inside the company that knows the core of the business, to save costs it is not necessary to migrate all the data of previous solutions

Keywords: *IT enterprise applications; business applications, implantation; SMEs*

1. INTRODUCTION

Undoubtedly, IT enterprise applications and the use of the Internet have acquired great importance at the individual, group and organizational level in all fields of the world today, such as education, entertainment, production, administration, communication, commerce, etc. This has induced drastic changes in the behaviour of individuals, organizations, and society. Thus, the implantation of a IT application to support enterprise activities becomes indispensable to the survival of all enterprises, including small and medium enterprises (SME).

To understand the implantation of IT enterprise applications, the TOE framework has been used, TOE posits that the process adoptions and implementation of technological innovations, is influenced by three elements: the technological context, the organizational context, and the environmental context (DePietro, Wiarda, & Fleischer, 1990).

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1.1. Problem

The research problem is the high failure rates in software application implantation projects in small and medium-sized enterprises, and to recognize the causes, it has been considered three contexts: Technological, Organizational and Environment. Among the main technological causes is the **heterogeneous and incompatible infrastructure** (Douglas, Wainwright, & Greenwood, 2010; Serrano, Chen, & Serrano, 2010); **the few capability's and technological competences of SMEs (**Ahmadi, Yeh, & Martin, 2013; Alshawi, Missi, & Irani, 2011; Caldeira & Ward, 2002; Deltour, 2012; Douglas et al., 2010; E. Hustad & Olsen, 2011; T. H. Nguyen, Newby, & Macaulay, 2015; T. Nguyen, Newby, & Waring, 2012; R. Seethamraju, 2015; Shahawai & Idrus, 2011; Winkelmann & Klose, 2008**)**; **the complexity of the these systems** (Equey & Fragnière, 2008); **its fit and customization in the enterprise** (Deltour, 2012; Equey & Fragnière, 2008; Ghobakhloo, Hong, Sabouri, & Zulkifli, 2012; E. Hustad & Olsen, 2011; Shaul & Tauber, 2012) and, **poor data quality and security** (Jha, Hoda, & Saini, 2008; Sahran, Goni, & Mukhtar, 2010; Shaul & Tauber, 2012**)**.

The main organizational causes are: **Poor leadership** (Shaul & Tauber, 2012; Sumner & Bradley, 2009); **low strategic planning** (T. H. Nguyen et al., 2015; Reicher, Komáromi, & Szeghegyi, 2015); **direct and indirect costs are poorly estimated** (Jha et al., 2008; R. Seethamraju, 2008); **Errors in the initial stages scale to the following** (E. Hustad & Olsen, 2011; Eli Hustad & Olsen, 2013; Ravi Seethamraju & Seethamraju, 2008); **A deficiency in the structure of the organization and informal processes** (Ahmadi et al., 2013; Boumediene & Kawalek, 2008; Čelar, Mudnić, & Gotovac, 2011; Christofi, Nunes, & Peng, 2009; Douglas et al., 2010; Equey & Fragnière, 2008; Leyh, 2014; Reicher et al., 2015; Ravi Seethamraju & Seethamraju, 2008; Sia, 2008; Winkelmann & Klose, 2008); **Lack of required resources (knowledge, skills, finance, management, time)** (Caldeira & Ward, 2002; H. Chen, Lee, & Wilson, 2007; Ferneley & Bell, 2005; G. Buonanno et al., 2005; Ghobakhloo et al., 2012; Johansson, Laurinavičius, & Venckauskaite, 2013; T. H. Nguyen et al., 2015; Salim, 2013; R. Seethamraju, 2008; Serrano et al., 2010; Sia, 2008, 2008; Sumner & Bradley, 2009; Wang, Wang, & King, 2003); **low levels of management (projects, change, risk)** (Deltour, 2012; Equey & Fragnière, 2008; R. Seethamraju, 2008)**; the selection de software package and implantation are difficult** (Eli Hustad & Olsen, 2013; Jha et al., 2008; Winkelmann & Klose, 2008); finally have neglected social aspects such as **User resistance** (E. Hustad & Olsen, 2011; Shaul & Tauber, 2012); **Informal communication** (Eli Hustad & Olsen, 2013; Sahran et al., 2010; Sia, 2008); **Inadequate training and preparation of end users** (Deltour, 2012; Equey & Fragnière, 2008; Ghobakhloo et al., 2012; Eli Hustad & Olsen, 2013; Jha et al., 2008; Sahran et al., 2010; Shaul & Tauber, 2012; Sia, 2008).

The main causes of the environment are: **changing government regulations** (Alshawi et al., 2011; Li, Yu, Zhao, & Li, 2012; Salim, 2013; R. Seethamraju, 2015); **the constants market pressures**

(Alshawi et al., 2011; Serrano et al., 2010; Shahawai & Idrus, 2010; Shaul & Tauber, 2012), **the difficulty of accessing software packages and consultants that fit the organization** (Sahran et al., 2010; Sia, 2008).

It should also be considered that due to the many differences between SMEs and large firms, several authors have argued that techniques and models from large firms do not apply to SMEs (Alshawi et al., 2011; Caldeira & Ward, 2002; Derzy, 2010; G. Buonanno et al., 2005; Johansson et al., 2013; Kale, Banwait, & Laroiya, 2010; Leyh, 2014; Serrano et al., 2010; Shahawai & Idrus, 2011; O. Zach & Munkvold, 2011; Ondrej Zach, 2011). Also, few models of strategy making for large firms were applicable to small firms. Furthermore, small businesses need a different type of organizational theory (R.-S. Chen, Sun, Helms, & Jih, 2008; Cragg, Caldeira, & Ward, 2011; Ramdani, Chevers, & Williams, 2013).

1.2. Justify

Among the main reasons for implanting IT **enterprise applications** on SMEs, the following are detected: **Get competitive advantage** (Boumediene & Kawalek, 2008; Ferneley & Bell, 2005; B. Johansson & Sudzina, 2009; Li et al., 2012; T. Nguyen et al., 2012; Ramdani et al., 2013; R. Seethamraju, 2015; Serrano et al., 2010); **Replacement of legacy system** (Hallikainen et al., 2002; E. Hustad & Olsen, 2011; Kale et al., 2010; O. Zach & Munkvold, 2011; O. Zach & Olsen, 2011; Ondrej Zach, 2011); **Cost saving** (Hallikainen et al., 2002; B. Johansson & Sudzina, 2009; Sousa, 2007); Expansion the enterprise or grown (Čelar et al., 2011; Leyh, 2014; Sousa, 2007); **Customer demands** (B. Johansson & Sudzina, 2009; Sousa, 2007); **Improved productivity** (B. Johansson & Sudzina, 2009; Leyh, 2014); **Need to integrate existing system** (Čelar et al., 2011; Kale et al., 2010); **and improved communication** (Kale et al., 2010; Ondrej Zach, 2011).

With the implantation of software SMEs expect to have benefits at different levels such as: **Operational** (cost reduction, cycle time reduction, productivy improvement, quality improvement, customer services improvement); **Managerial** (better resource management, improved decision making and planning, performance improvement); **Strategic** (support business growth, support business alliance, build business innovations, build cost leadership, generate product differentiation, build external linkages); **IT Infrastructure** (build business flexibility for current and future changes, it costs reduction, increased it infrastructure capability); **Organizational** (support organizational changes, facilitate business learning, empowerment, built common visions) (Sousa, 2007).

To justify the project is also necessary to emphasize that there are no global solutions to this problem, finding solutions if partially, such as software selection, preparation of SMEs, Critical Success Factors (CSFs), among others. On the other hand, also it is necessary recognize that there

is a lack or isolated scientific knowledge for these repeated failures in organizations, because the field of information systems is relatively new and there is little accumulated knowledge.

At this point it is important to recognize that there are many investigations regarding the implantation of software package in SMEs, especially in ERP, however approaches are to particular problems, neglecting the integral or holistic process that must be carried out in the acquisition and implantation of software.

The purpose of this study is to understand the implantation process of IT Enterprise Applications (ERP, CRM, POS ...) in small and medium-sized enterprises and, at a later stage, to develop a conceptual framework and a set of appropriate methodological recommendations for such projects.

2. RESEARCH METHODOLOGY

The research will be conducted using the paradigm Design Science Research (DSR) from two perspectives, influenced mainly by the article "Positioning and presenting design science research for maximum impact" (Gregor & Hevner, 2013): Knowledge by Understanding and Knowledge for Propose, and from these approach the following results are expected:

Knowledge by Understanding

- Understanding the process of implantation of Software Applications in SMEs in an integrated way, and contribute to the accumulation of knowledge in the process of implantation of Software Applications in SMEs; This paper present partial result about this stage.

Knowledge for purpose

- Prepare and evaluate a framework for the process of acquisition and implantation of software applications in SMEs, the same that will guide: The installed software meets the expectations of the organization; Buyers, consultants and software vendors are satisfied; There are optimization of resources (financial, personnel, time, etc.); SMEs have high-level processes, applications and data integration; and finally, SMEs remain at important level of competitiveness.
- The framework should contain guidelines, procedures or methods for the following content
    - Initial phase: Purpose, vision, selection of consultants, project planning, others.
    - Preparation Phase: Identification of the current situation, identifying technological opportunities for digital transformation and Planning of the desired situation, others.

- Implantation phase: Selecting the software that best fits the requirements of the organization, installation, customization, training, others.
- Phase operation and maintenance: Management software availability, continuous training, maintenance and updating of software, others.

Figure 1 presents the proposed research method, based on DSR, in the first place a literature review is carried out regarding the proposed theme to detect the existing gaps; in a second stage a Case Study will be prepared with the purpose of understanding in situ, the existing problems and their possible solutions; in a third stage they will be realized interviews with actors involved in the process of implantation of IT enterprise applications in SMEs, among them are: owners or CEO of software development companies, resellers, consultants related to the company providing software, independent consultants, owners or CEO of small and medium-sized enterprises, and in a later stage of being necessary, a survey will be conducted with experts on the subject.

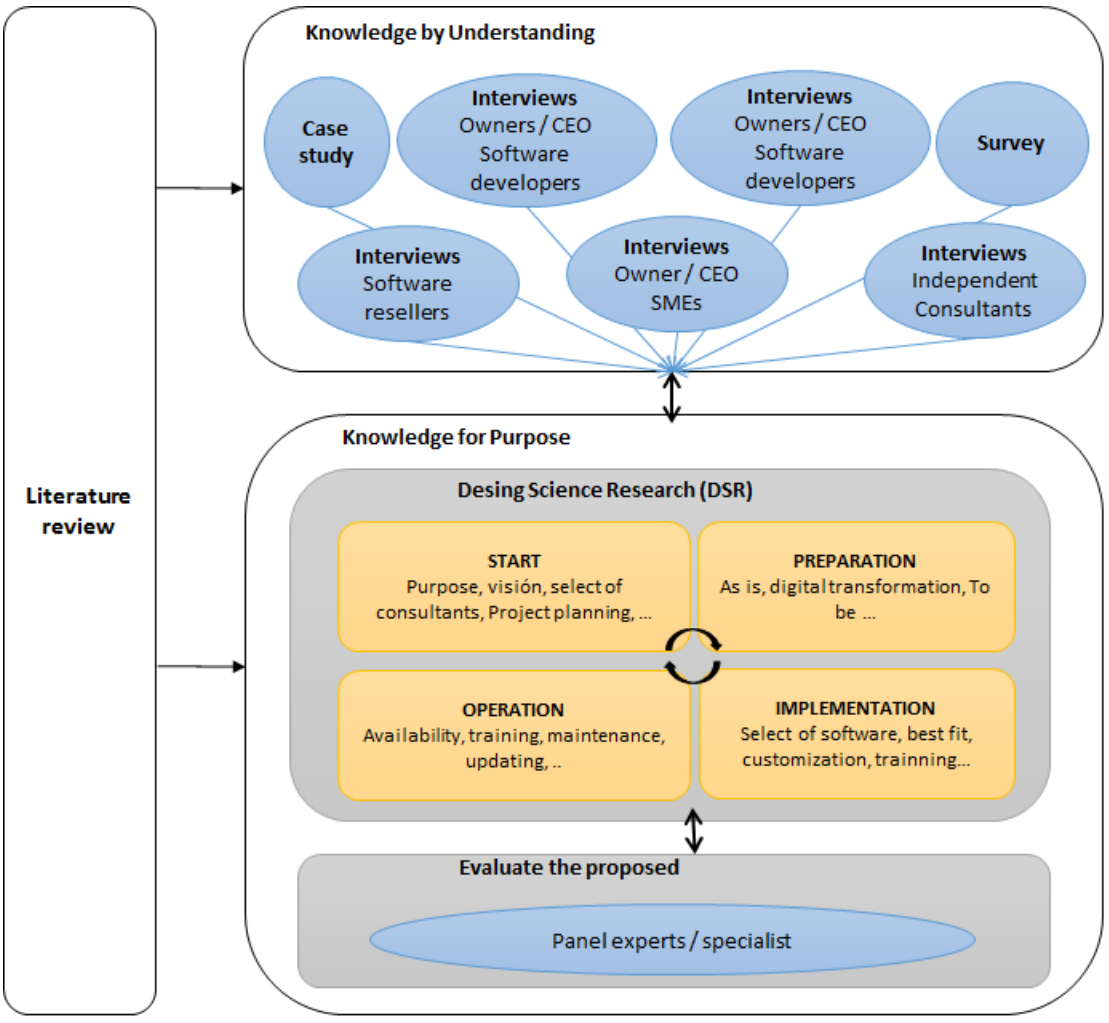

Figure 1: The proposed method research based in Design Science Research (DSR)

Once known and understood the problem, it can move to the next stage, which is to propose and evaluate solutions (Knowledge for a purpose); In this case, the preparation of a framework or handbook for the process of acquisition and implantation of software in SMEs will be proposed, this handbook would be designed in stages (start, preparation, implantation, and Operation), and its design is necessary to use an approach Design Science Research (DSR).

Finally, should validate the proposed framework, through a panel of experts / specialists, experts will feedback the proposed artefacts.

3. PRELIMINARY RESULTS

So far, we have worked partially on the understanding stage of the problem, and it is on this that the partial preliminary results are presented, and can eventually change once this stage is finished.

3.1. Literature review

The objective of the literature review was to identify the major difficulties and the main factors that influence the implantation of software applications in small and medium enterprises, for which the search engines of Scopus and AIS eLibrary were used, following the recommendations from the article "*Analyzing the Past to Prepare for the Future: Writing a Literature Review*" (Webster & Watson, 2002).

The search strategy was divided into four parts: the first deals with problems, the second is implantation, the third refers to software applications and the fourth relates to SMEs. Each section uses synonyms or keywords related to the topic to be treated, in order to try to cover many articles of the topic investigated. The strategy used was as follows:

("Issues" OR "Problems" OR "Difficulties" OR "Challenges" OR "Success") AND

("implantation" or "implementation" or "adoption" or "selection") AND

("software package" OR "Commercial off-the-shelf OR COTS" OR "IT application" OR "Information Systems" OR "Enterprise application" OR "Enterprise systems" OR "Enterprise Resource Planning" OR "ERP" OR "Customer Relationship Management" OR "CRM" or "Content Management System" OR "CMS" OR "Document Management System" OR "DMS" OR "Enterprise Content Management" OR "ECM" OR "Ready Use Software Product" OR "RUSP") AND

("Small and medium enterprise" OR "SMEs")

After the search, the following results were obtained: In Scopus 29 items found and in AIS e-Library 50 items, to April 1, 2016, from the year 2000, of which 54 articles for subsequent analysis was chosen, the discarded items were not due to the issue framed in research and / or did not refer

exclusively to SMEs. To delve into some topics, have also been considered backward and forward references.

As a result of this literature review, In the figure 2, are presented the main factors that influence the implantation of IT enterprise applications in SMEs, for this, a cross between the papers found versus the factors that each author pointed out. The term influence factors have been chosen to cover all the factors that have been found, some authors classify them as Critical Success Factors, but because of the number of factors that exist and that the authors do not necessarily agree that are successful, it has been preferred to call them Factors that Influence. This factor are presented classifying them according to Technology-Organization-Environment (TOE) framework.

It should also be noted that Software Package acquisition is the more realistic option for SMEs (Daneshgar, Low, & Worasinchai, 2013), as well as models of Software such as services (SaaS) (Seethamraju 2015).

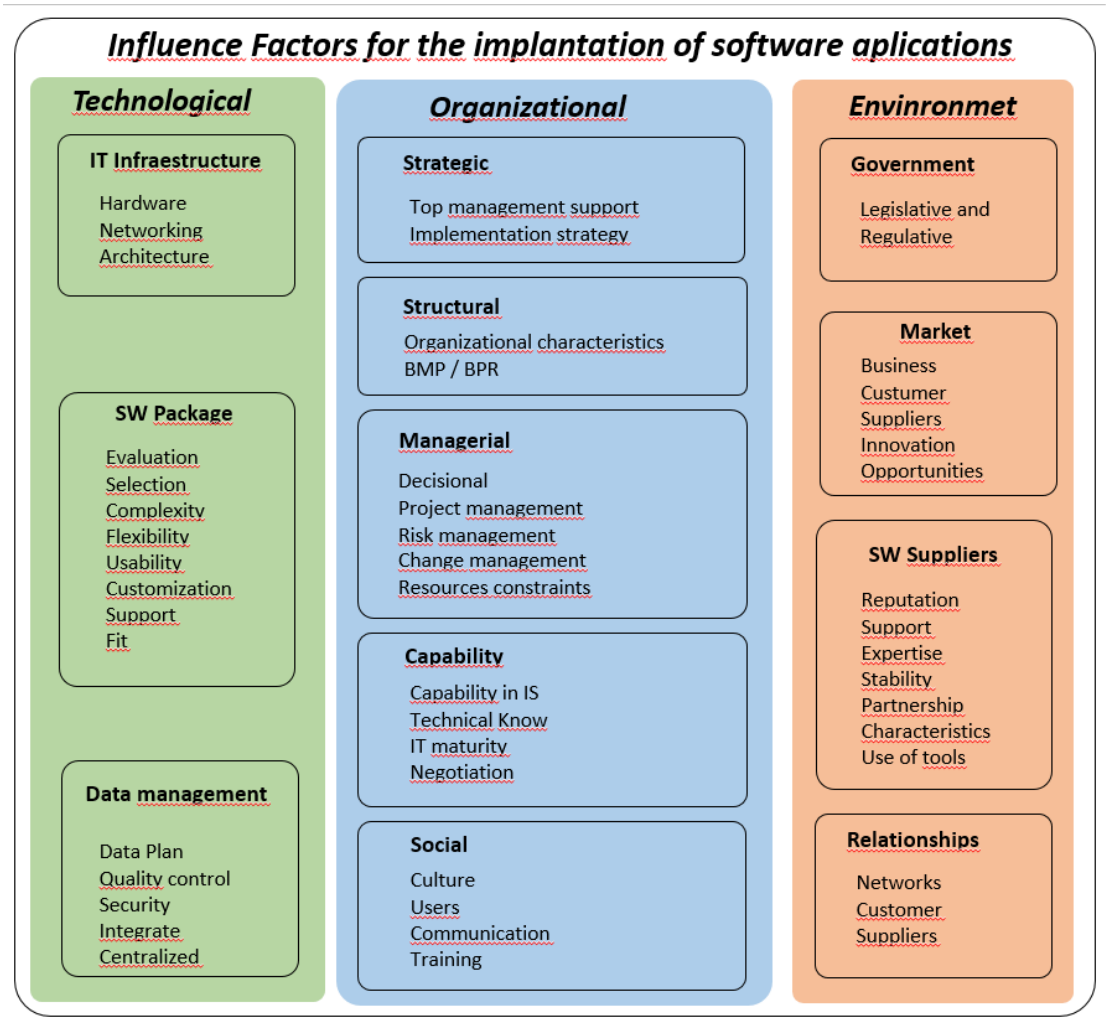

Figure 2: Summary of influence factors for the implantation of IT enterprise applications in SMEs

3.2. Case Study

The case study was carried out at a vehicle sales dealer in northern Ecuador, this dealership has three main areas: sale of vehicles (light, heavy and used), sale of spare parts (inventories) and workshop services. At the end of 2016 it had about 200 employees in six locations. The purpose of this case study is to understand how small and medium enterprises implement new software applications in their organizations, the unit of analysis of this case study is the process of implementing a software application and research questions are as follows:

- *Why do Small and Medium Enterprises implant software applications?*
- *How do small and medium-sized enterprises carry the software application implantation process?*

For the realization of the present Case Study, the methodology suggested by Yin was used. This research method is used in many situations to help expand our knowledge of individuals, groups, organizations and related phenomena (Yin, 2014). For this, in the first instance, the company's authorization was requested and subsequently interviews were planned with several company actors, including the technology director, the quality manager and the accounting director, in addition an interview with the implanter of the computer solution was also carried out. The results of these interviews are collating with the documents generated during the implantation process. It is necessary to emphasize that still the Case of study is not closed, since it is necessary to interview the director of accounting.

The interviews were carried out via Skype with an approximate duration of 60 minutes, and the interviewee accepted that the interview was recorded, later it was transcribed to text using two computer tools, the one to reproduce the audio slowly and the other to dictate the reproduced audio in a word processor. The tools were ***oTranscribe*** (http://otranscribe.com/) for audio playback and ***voice writing from Google Docs*** (https://www.google.com/intl/en/docs/about/) for transcription. For the encoding of the interview and other documents compiled from the software implantation project in this concessionaire, MaxQDA 12 was used, following the recommendations of Grams (Grams, 2001).

3.2.1 Summary of Case Study Findings

- Although the company has been working with an ERP about five years ago, a government regulation pushed for the company to analyse the implantation of a new application. Before this problem, the company had two options. The first was to buy a credit module (which the government requested) and integrate it with the current ERP, and the second option was to look for another ERP that has all the Integrated modules.

- Evaluating the advantages and disadvantages of these options, in addition to their costs, it was determined that the second option was better, despite its cost was 25% higher, and with this information the board approved the purchase of a new ERP
- It is difficult to find an ERP that suits all areas of the organization and is also integrated,
- Once the new ERP was selected and the respective contract was signed, a project charter was drawn up between the company and the application provider. This document includes the managers of the project by the supplier and the company, the description of the project, a detail of activities to be carried out, detail of deliverables, detail of milestones, establishes the means of communication, a risk assessment, Areas and human resources participants and finally the times that should take the development of the project.
- It was planned to do a process reengineering, that was the reason why the process team was included in the project, but in the end did not happen, what was done was an adaptation of the company to the new ERP, due to That the functionalities were similar between the previous ERP and the new one, finally the processes were documented according to the new system.
- The implantation was carried out by the experience of the software provider, firstly the installation of the base software was carried out and some configurations or parameterizations such as creating agencies, creating chart of accounts, creating lines of business, etc. All this with the participation of each manager who knows his area of business, also included the accountant, as any inconvenience in any of the areas ends in the accounting area.
- For data migration, the structure of the two ERPs was first reviewed by the software provider in conjunction with the technical manager of the company. To migrate the data, scripts were generated from the database of the old system and a tool developed by the vendor transformed the data into the new database, in parallel, testing and verifying that the information was in the right place.
- Through past experience in ERP implantation, this time it was decided to involve all areas throughout the implantation process, including the software selection process. Subsequently for the implantation, main users and secondary users were designated by each one of the existing areas in the organization.
- But resistance from users will always exist, as mentioned by the technology manager of the organization: "I was involved in the change of the previous system, and there was also resistance, resistance will always exist, because they start to change the screens, the application, how to call the application, then if there is a resistance of the users. Even users who are not as complicated complain and users who are complicated say it does not work, and often that is not useful because they do not know how to use. " **IT Manager**.

- On the other hand, there were also drawbacks in the loss of functionality in some areas, so there were some claims that were justifiable, since users were accustomed to having some functionality that the new system did not have, but in general they earned more than Which was lost, since the whole company is functioning in an integral way.
- The training was given two or three weeks before going to production, It was not trained from the beginning because the users were going to forget. But when the date of production was already given, then each area was notified and trained.
- In order to inform all employees, a project launch was launched, which was a strategy of personnel in the process area, and in which all the employees of the different areas of the company were present. In this launch participated: Presidency, general management, software provider, IT and process area. This meeting was key to engaging all staff.
- The project constitution document states that the general manager led the project, but due to his occupations he delegated to the process manager these tasks, the process manager participated actively at the beginning of the project, but later he did not get involved much more and were left in charge of the project the financial director, the area of accounting and the area of systems.
- All ERP modules were put into production at the same time, because if it was done in phases it would require a lot of work for the staff. That was a management suggestion, which is why a system was cut and the new one was continued.
- In the support of functionality there are no drawbacks, that is, the company requests support and the supplier resolves it quickly, the inconvenience arises with supports for new developments and that was one of the fundamental reasons for the company to change ERP, since the support that Were getting by the previous provider did not meet expectations, despite maintaining multiple meetings and requesting this service. Even with the new supplier has drawbacks when requesting new developments that the organization requires.

3.3. Interviews

In order to conduct the interviews, as in the case study, a question set was designed to determine how the process of implanting software applications is carried out. To date, three interviews have been conducted with independents consultants who have implanted software applications in the last year, an interview with the director of technology of an SME that plans to install an IT enterprise applications in the near future, two interviews with owner/CEO of software development companies, two interviews whit consultants of software development companies. Of these interviews only a set of three interviews has been codified and processed, with the purpose of fine-tuning future interviews.

In addition, it is planned to conduct interviews with owners / CEO of software development companies, consultants of these companies, resellers and independent consultants.

4. CONCLUSIONS

The conclusions of this work are preliminary as it is a research in progress and only focuses on the first stage of research that is to understand the problem of implantation of IT enterprise applications in SMEs.

The literature review revealed the main factors that influence the implantation of software applications, which help to understand the problems faced by SMEs, as well as the main problems that the SME faces in the process of implantation of enterprises applications.

From the work carried out so far, the following can be concluded:

- Government regulations are being one of the main motivations for SMEs to implant IT enterprises applications.
- In SMEs with experience in the implantation of software, the cost of the new product is not a major restriction, as they give much importance to the functionality and technical support.
- For the implantation of IT enterprise applications, it is important to have a person inside the SME who knows the business of the company. Competencies in informatics or project knowledge is not crucial.
- If the SME has data from previous systems, migrating data that is needed is the fastest and most economical option. Migrating all the data is a complex task and can take months to get ready.
- The resistance of users to a new system, always exists, the success of the system depends on users, therefore it is necessary to be very tactful to the deal with them.

5. FUTURE WORK

This research is only in its initial stage, reason for which, the following activities are still expected to be performed: To conclude the case study initiated, it is necessary to conduct interviews with other actors of the company; A review of the literature on digital transformation was done, but it is necessary to find a way to link to the theme of IT adoption; To propose the solution, a more detailed planning should be carried out leading to the realization of the research, but this can only be done when the problem is known in depth.

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