A framework to acquire explicit knowledge stored on different versions of software

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ABSTRACT

Context: In organizations, especially small and medium ones (SME's), explicit knowledge is stored in different sources of hardware or software. These sources have become obsolete due to constant technological innovation and the growing obsolescence of hardware, and have made the knowledge they contain unreachable. These organizations are forced to seek alternatives that allow them to use the knowledge they already possess, but are unable to exploit.

Objective: To present and execute a framework for the acquisition, classification and dissemination of explicit knowledge among the organization for those who may use that knowledge in their daily activities.

Method: A framework is developed to acquire the explicit knowledge from different sources and versions of software. Its efficiency has been verified through its' application in a pharmaceutical company.

Result: The knowledge has been transferred from an unreachable place so that it can be exploited by the organization. Access control has been added for increasing the level of security where the knowledge is stored. In the implementation, the framework was tested with a general application presenting very favorable results.

Conclusions: In general, the effectiveness of the framework was tested, showing that knowledge recovery from different versions of software is possible. In that way, the problem observed on SME's can be solved in an efficient and replicable form.

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1. Introduction

Systems related to information have an accelerated growth as knowledge goes hand in hand with the technological development that is constantly evolving [1]. When a product hits the market, there is already another in line that will replace it, always responding to the rapid changes and the pressure of global competition [2]. This pressure works as a catalyst in advancing technological developments in fast and unimaginable ways [3]. Within organizations, it is common to adopt new technological elements that entail several challenges. One is the risk of loss of explicit knowledge within key systems of organizations, due to incompatibility between the key enterprise software and the hardware where it is contained. This happens because the software that the company has does not have the necessary support for its implementation or they simply cannot be operated under different environments to which they were originally programmed.

In SME's [4], implementation of new technology is considered a cost rather than a benefit, great care has to be taken when the strategic technological tools of the organization have their operation changed. Instead of buying new systems, the company chooses to maintain compatibility between the existent systems [5]. That is, to continue with the same software and hardware as long as possible, mainly because of the cost that the acquisition of a brand new system represents.

SME's have certain characteristics that could be considered as justifications as to why they choose to continue with the same hardware and software for several years, such as:

- The software development is based on lightweight processes aimed to be used by staff.
- They usually have dynamic and flexible structures with a non-traditional and, sometimes free flow administration.
- Typically their management processes are carried out through informal mechanisms based on face-to-face relationships.
- They do not have sufficient staff to perform specialized functions.
- They have little or no budget for buying expertise.
- They are financially vulnerable companies with limited financial resources [6].

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In today's technological era, organizations should have updated systems to meet the needs of business changes [7], that is, there will come a point in which they should upgrade their systems. It will be then when the following questions will arise: what is going to happen with older systems? And what about the information stored in previous hardware?

Organizations should make decisions that affect their future work, such as:

- Continue with no hardware changes to access old systems.
- Perform hardware changes and adaptations for the use of old systems.
- Change hardware for new systems and keep old equipment for consultations.
- Change hardware and data migration to new software.

In either case, the cost involved about having stored data and information should be taken into account, especially when these have been given a real value and are a liability for the company if they are lost or misplaced.

2. Background

Knowledge can be seen as a collection of objects, rules and best practices [8]. It is the state of awareness, understanding and amassed thoughts gained through experience and education. It is present in the form of ideas, judgments, intuitions, competencies and skills of the individual [9]. It has become a key factor [10] in the current environment of change, complexity, uncertainty and rapid economic growth, and with the rapid advances in technology and increased competitiveness [9]. Its management aims to perform a conversion of knowledge from its individual to a collective state [11], and in practice, to improve the organizational capacity through the optimization of the resources of both, individual and collective knowledge; where skills, abilities, experiences and routines are included, without neglecting technology.

There are two classifications in which knowledge can be cataloged: tacit or explicit [4]. The first is knowledge that has not been encrypted and is considered difficult to encode. The second is the encoded knowledge, articulated in words, figures, and numbers. It is objective and can be shared in the form of specifications, standards or data [12]. In this article, the aim is the acquisition of explicit knowledge that is stored in the systems that the company has; and is at risk of being lost when a change is made, regardless of the reason for it.

For organizations within our current globalized era, knowledge and technology have become a focal point [13] and it is considered one of the most important resources of organizations [14,10], because it represents a competitive advantage in the market [15]. This knowledge usually resides in employees [4,16], so it is necessary to understand the role of individuals in the process of knowledge creation, as they are the ones who handle software and systems within companies and decide or know about where and how [17] knowledge has been previously stored.

2.1. Knowledge Management (KM)

The purpose of KM is the conversion of individual to collective knowledge and its transfer may be defined as the transmission of knowledge from a place, person or responsibility to another [18]. For example, between knowledge brokers, who are described as intelligent agents who handle, maintain, distribute, question and communicate knowledge, either as a primary or secondary function, knowledge can be found in many places like human beings or computer programs [19]. They are also considered highly autonomous and as both interactive and fixed components of software [20].

Seven critical factors for KM have been identified in the literature: human resources, information technology, leadership, organizational learning, organizational strategy, organizational structure and organizational culture [8,21,22].

If knowledge is isolated and cannot be accessed, it has no value for the company. That is the reason why diffusion or transfer is necessary. In order to carry that out it is required to recognize, assimilate and apply the knowledge [10]. The agents are considered as autonomous, communicative and perceptive for they are able to perceive and respond to changes in the environment [23]. It also requires knowing how the transfer of knowledge between agents is made, and the different levels that it has. For example, within or across organizational boundaries, between groups or departments within the same or different organizations [24], the flow of data and information forms the basis for the transfer process. Also, there are different ways that can be made either through personal or informal communication, or by using information systems [25,23].

New KM initiatives have to take into consideration several factors such as new organizations, cultures, forms and systems of rewards to improve social relationships [21] and thus, facilitate knowledge transfer. There are studies that emphasize the importance of using information systems to manage collective and individual knowledge, for which they use different combinations of media to share knowledge [26]. The software typically operates in an environment that can be a computer system, existing networks or software in which the software solution is embedded [20]. Database systems are used extensively and effectively helping use corporate information [23].

In the real world, environments and businesses need to change quickly and progressively, and system adaptation is inevitable in order to maintain customer satisfaction [7]. This adaptation means to ensure timely adaptation of the ever more integrated computer systems, in order to maintain compatibility between the systems and the ever-changing circumstances with, within and under which they operate [27]. The system will degrade over time, because the changes tend to increase complexity. The costs of this evolution can scale to very complex changes until the company should decide between reengineering, migration, new development or replacement [28] of the systems that it has.

2.2. Small and medium enterprises

Knowledge has been described as a key element of the organization and must be handled properly to ensure a competitive advantage. When it is integrated in the key business systems, its availability to staff is important since unavailable knowledge is worthless. As time passes systems tend to become obsolete which affects a large number of organizations, regardless of it being a small or medium enterprise (SMEs) where you can observe the problem clearly because system upgrades can be even more complicated than in large enterprises. Nowadays, this situation can be solved using Software As A Service (SAAS), which is a type of rental software that is independent of hardware.

The use of SAAS on SME's is still limited, cloud computing as well as its application of creating value while improving company performance is just beginning, having advantages such as lower cost of access, lower investment capital and new services development [29], also its compatibility with new hardware and latest updates.

When members within companies have adopted software, it is considered institutionalized, which means the innovation has reached a certain degree and invulnerability is taken for granted, considered appropriate or even legitimate and reaches a level of standard. There are three levels of acceptance: partial, the rapid diffusion and saturation or legitimization [30], so the ultimate objective for the framework is to be replicated and institutionalized.

All of the above applies to new systems, so, what about the old systems and the knowledge that they hold? Once the importance of knowledge has been established, we can get an idea of the cost involved when knowledge is misused. It has already been established