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Free Software

AVBOT: Detecting and fixing Vandalism in Wikipedia¹

Emilio-José Rodríguez-Posada

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Wikipedia is a project which aims to build a free encyclopaedia to spread the sum of all knowledge to every single human being. Today it can be said to be on the road to achieving that goal, having reached the 15 million articles milestone in 270 languages. Furthermore, if we include its sister projects (Wiktionary, Wikibooks, Wikisource, ...), it has received more than 1 billion edits in 10 years and now has more than 10 billion million page views every month. Compiling an encyclopaedia in a collaborative way has been possible thanks to MediaWiki software. It allows everybody to modify the content available on the site easily. But a problem emerges regarding this model: not all edits are made in good faith. AVBOT is a bot for protecting the Spanish Wikipedia against some undesired modifications known as vandalism. Although AVBOT was developed for Wikipedia, it can be used on any MediaWiki website. It is developed in Python and is free software. In the 2 years it has been in operation it has reverted more than 200,000 vandalism edits, while several clones have been executed, adding thousands of reverts to this count.

¹ This article was the winner of the 5th Edition of the Novática Award presented to the best article published in 2010 by Novática, journal of the Spanish society ATI. For details, in Spanish, about this edition of the Novática Award please visit <<http://www.ati.es/premio-novatica>>.

Keywords: AVBOT, Bot, Free Software, Mediawiki, Monitoring, Vandalism, Wikipedia, Wikis.

1 Introduction

Wikipedia [5] is the free encyclopaedia that anyone can edit. Any person using a web browser can modify its contents. This is made possible by MediaWiki [6], the software used by Wikipedia. The popularity of this free encyclopaedia has grown exponentially in its first 10 years, until it is now in the top 10 of most visited sites on the Internet, it appears in the first results of Google, and it has reached the milestone of 1 billion contributions [13]. Furthermore, when Microsoft closed Encarta in 2009, in a clear allusion to Wikipedia they said that "*the category of traditional encyclopaedias and reference material has changed*".

Author

Emilio-José Rodríguez-Posada holds a bachelor degree in Computing Engineering, is a scholarship holder in Libre Software and Open Knowledge Office at the *Universidad de Cádiz*, Spain, and is an assisting student in the Department of Computer Languages and Systems. As a free knowledge and wikis enthusiast, he is a veteran Wikipedia user. Most of his contributions to the free software community are related to wikis and his development of bots to perform maintenance tasks automatically. His best known project is AVBOT, a bot to revert vandalism edits in the Spanish Wikipedia,



which was awarded the "Best Community Project" in the *III Spanish National Free Software Contest*, co-sponsored by Novática. He has delivered several talks and workshops about bot development, Wikipedia and MediaWiki. He has also been a member of committees for some free software and knowledge conferences at the *Universidad de Cádiz*. He is currently the main developer of the StatMediaWiki project (a tool for the statistical analysis of wikis) and has developed WikiTeam (a set of tools for wiki preservation and a repository of wiki backups). <emiliojose.rodriguez@uca.es>

However, some persons add profanity or insults (vandalism) to articles, or remove pieces of text (blinking), thereby abusing this open editing model. All these undesired edits can easily be undone using the history of each article, but it is tedious a task for a human and, while the vandalism is being reverted, that Wikipedia page is compromised. As the visibility of Wikipedia has grown, the vandalism problem has worsened, revealing a need for new, automatic, non-intrusive anti-vandalism solutions. This will allow committed users to spend their time adding new content, improving available content, helping new community members, and performing other productive tasks, rather than reverting vandalism.

AVBOT [1][4], an acronym for "Anti-Vandalism BOT", offers an automatic solution to most of the above mentioned acts of vandalism. Generally speaking, computers can easily detect undesired contributions, due to the fact that modifications include profanities or nonsensical text. AVBOT analyses recent edits in the Spanish Wikipedia, searching for bad-faith contributions, and undoes them. AVBOT will never replace a person, due to the fact that human intelligence is better

“Wikipedia is the free encyclopaedia that anyone can edit. Any person using a web browser can modify its contents, via the MediaWiki software”

at analysing texts, but it can revert a great deal of vandalism, saving a lot of community time. Since AVBOT was created, it has repaired more than 200,000 acts of vandalism [3] and this number is growing.

2 Development

AVBOT is developed in Python [7] and it requires the pywikipediabot [8] and python-irclib [9] packages. Its workflow can be described as follows: spotting recent changes in articles, analysing changes, and decision making.

In the first step it obtains a list of recent changes in articles. This log is published in real time in an IRC channel [10] to which AVBOT is connected 24/7. Next, it discards those edits by administrators, maintenance bots and veteran users, since those users are trusted. The rest of the edits are analysed to detect possible vandalism.

The bot compares the text of the previous version and that of the amended one. Then, an analysis module checks for profanity using a configurable list of regular expressions. Each regular expression has a score attached so, if the total sum of the scores for an edit is over a certain threshold, the edit is classified as vandalism and the Wikipedia article is reverted to its previous version. Both regular expressions and scores have been improved using the experience gained over the years the tool has been tested on the Spanish Wikipedia.

Another type of bad faith edit is blanking, in which users remove article content totally or partially. This form of vandalism can be detected by comparing the percent of text removed in the edit and reverting if it is excessive. The exact percentage threshold depends on article size and has been estimated by analysing blanking vandalism over the years.

Since the Spanish Wikipedia has a great many contributions (about 30,000 edits/day), it was necessary to optimize AVBOT in several ways, such as by the use of threads for parallel processing and the pre-compilation of lists of regular expressions.

When AVBOT reverts an edit, it also sends a message to the author asking him or her to stop. If the user continues to vandalize, a report will be generated. This report is sent to the administrators and they will investigate the situation [11].

However, as the bot may fail (the error ratio is under 0.5%, 1 error every 200 undone edits), AVBOT watches to see whether its reverts are discarded by human users. In that case, a notice is sent to the bot operator for future checking. This enables the bot's reversion skills to be improved.

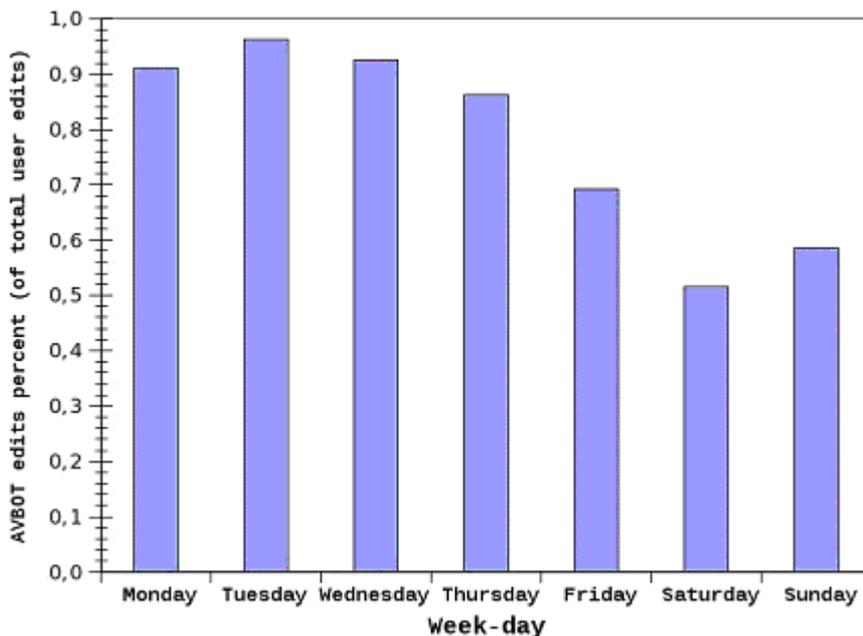


Figure 1: Percentage of AVBOT Edits (of Total User Edits) in the Course of a Week.

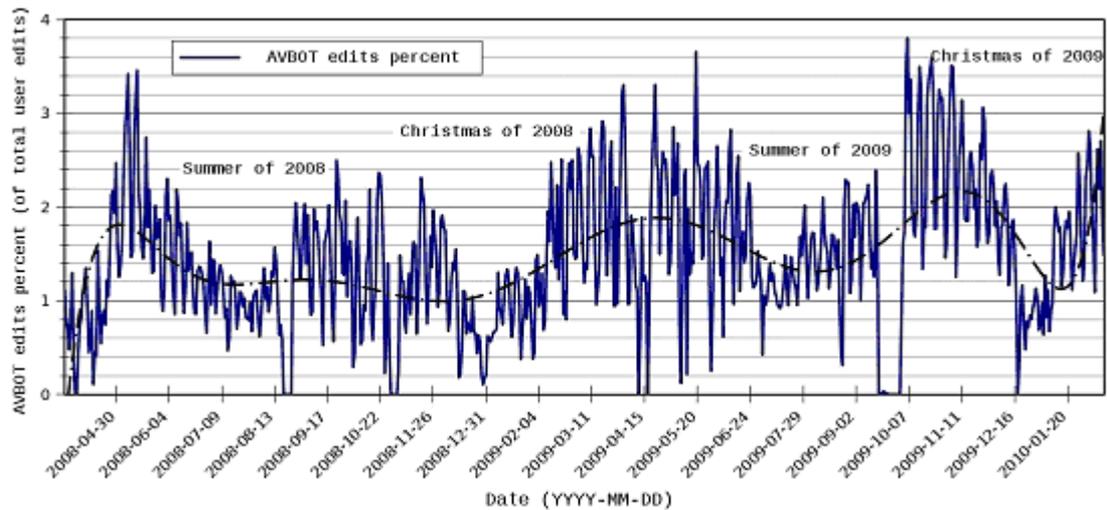


Figure 2: Percentage of AVBOT Edits (of Total User Edits) from April 2008 to January 2010. Low Vandalism Activity at Holiday Times and at Weekends is observed.

Speaking of AVBOT errors, most of them are related to polysemy. A good example is "The Ugly Duckling", which contains the word "ugly", a word used to attack biographies, although it is correct in this case. The error is fixed by adding a regular expression with a counterweight.

Finally, this software includes other features such as an exclusion list for pages which we do not want to monitor, for example, talk pages or Wikipedia internal maintenance pages, because slang is allowed in those places. AVBOT checks new pages (about 400 new articles are created in

Spanish Wikipedia every day), tagging for deletion those which contain test edits by anonymous users and other useless contributions.

3 Results Analysis

AVBOT's results have been satisfactory, with one error for every 200 correct reverts. Precompiled regular expressions used in vandalism analysis allow a very fast response (under a millisecond), so the only latency is due to network communication. Total time between when the article is vandalized and when it is restored is less than 5 seconds, making the effect of vandalism almost invisible.

Moreover, a detailed analysis of vandalism distribution throughout the week shows that it is concentrated from Monday to Thursday (see Figure 1), and during the European evening, because in that time frame both Spanish and Latin American users are active. On the other hand, there is low vandalism activity during holidays like summer, Christmas Day and New Year's Eve.

4 Community

Every bot which runs on the Spanish Wikipedia must pass a request for approval. AVBOT was approved with 19 votes in favour and 0 against [12].

Since the beginnings of AVBOT, the Spanish Wikipedia users have suggested fixes and new features. The

regular expressions list has been improved by community members adding new patterns.

Also, since AVBOT is free software and the source code is publicly available [2], some users have downloaded the code and run clones so, if the main copy of AVBOT does not work momentarily, Spanish Wikipedia is always protected.

The history of the project has been narrated in the official blog [1], which was used as a changelog for the *III Spanish National Free Software Contest*, where AVBOT was presented with the award for the "Best Community Project".

Software customization is possible by using a number of options which

“ As the visibility of Wikipedia has grown, the vandalism problem has worsened, revealing a need for new, automatic, non-intrusive anti-vandalism solutions ”

“ AVBOT, an acronym for "Anti-Vandalism BOT", is a program that offers an automatic solution to most of the acts of vandalism ”

“ AVBOT has been working in the Spanish Wikipedia since 2008, and has reverted more than 200,000 vandalism edits ”

enable AVBOT to run in any MediaWiki community with minor changes. Users from other Wikipedia languages have been interested in using the bot.

With regard to the future, the next tasks to be performed are code internationalization and adaptation to other languages, by creating new regular expressions lists for other Wikipedias and improving the documentation. The project is open to collaboration for everyone.

5 Conclusions and Future Work

The problem of vandalism has grown over the years as the popularity of Wikipedia has grown. AVBOT has been working in the Spanish Wikipedia since 2008, and has reverted more than 200,000 vandalism edits [3], saving the community from a huge workload. The wiki world evolves quickly, so it will be necessary to adapt the software to new changes, adding new features and improving existing ones. Adding machine learning to the bot would be a good step, training it with human reverted vandalism edits. Meanwhile, source code internationalization will help extend the community of users.

Another future line of work is the creation of tools for the analysis and assessment of wikis. A number of educational projects are currently being developed at the *Universidad de Cádiz*, where students are generating free knowledge in the classroom [15]. For example, with the support of the Libre Software and Open Knowledge Office, the Computer Science course "*Programación Funcional*" launched WikiHaskell, a wiki where students create free documentation about libraries for the Haskell programming language. Some projects related to wikis have also been published: WikiUNIX, WikiJuegos and IberOgre [16]. Most of these wikis do not allow anonymous edits during the academic year, but they

are open to edit for everyone later, so AVBOT would help to avoid vandalism. Moreover, StatMediaWiki [14], a tool for wiki analysis, has been developed by Emilio José Rodríguez to assess wiki contributions. Recently, he also founded WikiTeam [17], a set of tools for wiki preservation and a repository of wiki backups.

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Critical Success Factors for the Implementation of an Enterprise Resource Planning System

Kyriaki Georgiou and Kyriakos E. Georgiou

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The implementation of an Enterprise Resource Planning (ERP) system is a very complex and expensive project that places tremendous demands on an organization's time and resources. However, the ERP market is growing fast in recent years showing that the demand for ERP systems is increasing since it provides an integration of the organization's strategy, structure and business processes with the information technology system aiming to empower the organization's effectiveness and efficiency. A review of the literature revealed that Clear Goals and Objectives, Top Management Support, Business Process Reengineering, Project Management, Project Team Commitment and Composition, Communication, Customization, Change Management, and User Training and Education are the most critical success factors (CSFs). The primary research carried out has confirmed these CSFs and also revealed that the collection and analysis of requirements is also a CSF for which limited attention was paid in previous research.

Keywords: Business Strategy, Critical Success Factors, Enterprise Information Systems, ERP.

Introduction

During the last decade ERP systems have received significant attention by both the academic and professional worlds. The literature review depicts that there are many success and failure stories and much have been written on ERP implementation in organizations of various sizes and in different parts of the world. This research conducted a comprehensive literature review that aimed to list the critical success factors examined based on their importance and frequency of use and compare them with the findings revealed from a case study that utilizes the qualitative research method approach. This review of the literature revealed that Clear Goals and Objectives, Top Management Support, Business Process Reengineering, Project Management, Project Team Commitment and Composition, Communication, Customization, Change Manage-



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“ During the 1990s, Enterprise Resource Planning (ERP) systems became the *de facto* standard for the replacement of legacy systems ”

“Today, information systems should use formalized procedures to provide the management at all levels in all functions with appropriate information based on data from both internal and external sources”

ment, and User Training and Education are the most commonly extracted factors by researchers and the research suggest that these critical success factors are very well validated by the case study. The research has also revealed the collection and analysis of requirements as a critical success factor for which limited and insignificant research is identified through the literature review.

Davenport [8] states that maintaining many different computer systems leads to enormous costs for storing and rationalizing redundant data, for re-keying and reformatting data from one system for use in another, for updating and debugging obsolete software code, for programming communication links between systems to automate the transfer of data. During the 1990s, ERP systems became the de facto standard for the replacement of legacy systems [15]. Somers and Nelson [35] claim there are numerous reasons for the increasing demand of ERP systems such as competitive pressures to become a low-cost producer, expectations of revenue growth, ability to compete globally and the desire to re-engineer the business.

Markus and Tanis [23] explain that ERP systems are rich in terms of functionality and potential benefits. Nash [27,28] state that effective business strategy centers on an aggressive efficient use of information technology; for this reason ERP systems have emerged as the core of successful information management and the enterprise backbone of the organization.

Today, information systems should

use formalized procedures to provide the management at all levels in all functions with appropriate information based on data from both internal and external sources, to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible [21].

Research Methodology

In-depth interviews with senior management, vendors, project managers, key users and end users were conducted in order to have a holistic view of the previous experience and lessons learned. During the data collection special attention was given to ascertain the validity of data and also in order to capture the interviewees' opinion concerning the research questions. The interviews were analyzed for recurrent issues and content analysis to highlight and underline the impact of CSFs to the success of the project and identify possible areas of improvement in the organization regarding future implementation process.

According to [26] research regarding information system implementation is best carried out through qualitative research. An interpretive approach is most appropriate in this case since the research is conducted in an area where there are no right or wrong answers. Also it is appropriate in cases where there is a particular concern with understanding views from the participants' own subjective frames of reference. For the purpose of this report this research method was used because it described, translated, explained and in-

terpreted views from the perspectives of the people, offered a holistic view of the situation and reassured that the interpretation was verifiable and credible.

Critical Success Factors (CSFs)

The literature review, on academic papers published in peer reviewed journals, conducted on CSFs for ERP implementations has lead to the development of a critical success factor checklist. This checklist was produced in an attempt to summarize the critical success factors in the existing literature. All journals chosen had a spotlight on empirical or statistical data regarding CSFs that could add to the success of an ERP implementation project.

Goals and Objectives

Goals and objectives was one of the most critical success factors identified through literature review. The organization must carefully define the objectives regarding implementation and the critical business needs that the new system will address [3]. Clear goals and objectives, vision, business plan and the project strategy are very important to the success of the project. The clear definitions of goals, requirements, expectations and deliverables must be carefully explained from the beginning of the project in order to address any problems arising.

Top Management Support

Top management support is one of the most important and crucial factors in ERP system implementation projects [36] that has been the most often cited

“The implementation of an ERP system is a very complex and expensive project that places tremendous demands on an organization's time and resources”

“The critical success factors identified through the literature review are very well validated through this case study”

as both a success and failure factor [20]. Martin [43] suggest that for ERP implementation success top management should redesign its work to strategically concentrate on managing employee behavioral change in order to increase employee acceptance and reassure commitment by specializing its involvement on cultural and environmental contextual factors. This view is shared by Sumner [37] who states that top management's ability to undertake the cultural, political and structural change may be necessary for successful ERP system implementation and [33] who state that top management's commitment is needed in order to keep the users motivated to minimize the resistance to change. Holland and Light [15] however, argue that top management should monitor the implementation progress and provide a clear direction of the project in terms of their willingness to allocate valuable organizational resources

Business Process Reengineering

Hammer and Champy [14] define reengineering as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance. The organization should be ready to change procedures and practices in order to minimize the degree of customization needed. Minimal customization refers to severely limiting the amount of customization to the vendor's ERP product. Limiting customization ensures that vendor upgrades can be implemented with reduced organizational resource allocation and costs. According to [1] business process reengineering can be a big project in-

roducing several challenges to the organization and hence organizations are encouraged to assess the readiness for BPR before launching the effort because ERP implementation brings along work to refine processes and improve their quality which are often rejected by some part of employees [5].

Project Management

According to [19], good project management is vital to the implementation success and it is evidence that the implementation process needs to be managed as a project which needs an organization different from the one of the daily work [40]. Lanning [18] states that the most important elements of project management are to monitor the progress and exercise controls so that the project will meet its targets. In addition, [19] believe that in order to maintain credibility the scope of the ERP implementation project should be established, controlled and defined in terms of milestones, critical paths and deadlines from the early stages of the project and deadlines should also be met to help stay within the schedule and budget.

Project Team Commitment and Composition

Soja [34] has found that both project team composition and team involvement are among the most important elements for project success. Project team should consist of a good team composition. This includes an experienced project manager with skills in coordinating, scheduling and monitoring, the tasks that ensure the achievement of objectives and a competent team which has the ability to support the implementation by work-

ing exclusively on the project fully committed and without interruptions during the process of implementation [20]. In addition, Project management principles including an approved project plan, known specifications and level of complexity clearly defined and understood objectives are significant for the successful implementation of the ERP.

Communication

Communication according to several authors is one of the most difficult and challenging CSFs in ERP implementation. According to [4] communication is the second most critical area in implementation and especially important in the adoption phase. Lanning [18] underlines the communication as a critical factor and highlights the need for its effectiveness. Later [20] adds that communication is not a straight forward and easy task but [3] believe that it is essential for creating an understanding, an approval of the implementation and sharing information between the project team and communicating to the whole organization of the results and goals of the project. However, a view presented by [22] state that excessive and unnecessary communication also poses risk such as the possibility of cost overruns.

Customization

Customization was identified as critical success factors [15,37]. Customization means that the purchased ERP system needs to be configured in order to match the organization's processes by modifying its core source code which is the option used to reduce the gap between the ERP capabilities and the business prac-

“In our survey in-depth interviews with senior management, vendors, project managers, key users and end users were conducted”

““ The collection and analysis of requirements is also a CSF for which limited attention was paid in previous research ””

tices [30]. It is important for the organization however to consider an ERP that fits its organizational processes in order to minimize customization and implementation time.

Change Management

Organizational change is about people's reactions and attitudes to change with technology to be one of the major drivers that are stirring change faster in organizations [6]. Loonam [20] have listed change management as one of the top 10 CSFs in ERP implementation. One of the main obstacles facing ERP implementation is resistance to change [13] The implementation of such technology affects several units and functions that not only induces organizational change but also requires organizational change [40] that will force users to commitment in order to gain the expertise available for the reinforcement of the project. According to [41] in an ERP system implementation the focus is very much on people, and in particular users, as well as on processes and technologies but the primary focus is to achieve project goals as efficiently as possible [18].

User Support, Education and Training

The effect of user support, education and training is investigated by several authors who underline its importance [36,10,42,2]. Al-Mashari [2] state that it is challenge to create appropriate and effective plans for training and [31] argue that the importance of training is dependent on the characteristics of the system. Training with a

focus on the new business processes, technical aspects of the system and end user needs is a key part of successful ERP system implementation [29]. However, in ERP implementations, projects fail due to lack of proper training. The absence of an appropriate plan for training and education fails to increase the users' expertise and knowledge for all features of the new system leading to diminished users' valuable support during the implementation process.

Understanding User Requirements

Through the primary research carried out all the above factors were confirmed. In addition another factor was identified which has received limited attention in previous research. This new CSF relates to the importance of understanding the requirements and expectations of users and management before the selection of the ERP system. The research revealed that although there was a frame facilitating the evaluation of the systems no proper training of evaluators regarding user requirement design, system evaluation and implementation was conducted.

Consequently, implementers of ERP system are usually trying to cope with design and customization of the system in order to meet the idiosyncratic ways of working which involves considerable cost and time overruns and also adjusts the organizations processes and tactics in order to enable the ERP deployment. The reason behind these necessities is the poor analysis of the organization's requirements and business processes.

Conclusion

In response to the growing global competition many companies have embarked upon ERP implementation [9]. The scale of capital invested in these implementation projects however does not match the research that has been published on the subject. Most of the literature has concentrated on project management and technical implementation issues as well as failures and successes without giving much attention on preparedness and post implementation issues. The literature on performance measurement after implementation emphasized its poor use in SMEs [12] and even poorer with regards to the impact of an ERP system on organizational performance [25]. Nonetheless, research studies indicate that performance measurement systems can play a key role in supporting growth in SMEs [11].

This literature searched by ERP research taxonomy, along with the extensive review of ERP literature conducted by other authors found limited research topic that examined in depth each factor separately. However, it is clear that it is important for organizations to understand what it means to be mindful [39] in its approach to investing in an ERP package due to the complexity and costs involved.

In addition, limited research was conducted so far regarding the users characteristics. Age, gender, education level, management level and computer experience which may have an important impact on the ERP implementation process have received limited attention by researchers and further research is needed in order to investigate the impact possibilities.

The results of this research correspond to the expectations and answer the research questions. The critical success factors identified through the literature review are very well validated through this case study. In addition, collection and analysis of user require-

““ All critical success factors observed seem interrelated and interconnected to each other ””

ments are identified as a critical success factor that needs further research and analysis and a framework to be developed in order to empower the successful implementation. Also, recommendations for the empowerment of future ERP implementation is presented aiming to provide a broad view of a future situation and also to offer potential to a successful attempt. The development of a complement team that will empower the communication and facilitate the project, a careful selection of employees to participate in the implementation project, staff participation, training and education during the implementation will reassure the success of the project.

However, the analysis and findings show that all critical success factors observed seem interrelated and interconnected to each other. During the research it was revealed that each factor corresponds directly or indirectly to another highlighting the need for a holistic and integrated view of factors when research is conducted. This correlation could be an interesting topic for future research since no literature review was identified during the research.

In addition, according to [32] research effort is required to provide an ERP system that has the flexible assurance capabilities to evolve with the dynamic changes of a company. However, it is of significant importance the evolution of ERP systems to also assure the flexibility to accept best practices from organizations and through lessons learned to utilize them in order to increase the percentage of success stories at ERP.

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