



PROPOSAL OF A CONCEPTUAL STRUCTURE TO EVALUATE ENTERPRISE RESOURCE PLANNING SYSTEMS (ERP)

Gleison Lopes Fonseca^a, Ildeberto Aparecido Rodello^a

^a São Paulo University

Abstract

The investments in Technology and Information Systems, among which there are the ERP (Enterprise Resource Planning) systems, have become indispensable for companies to have better conditions to survive in competitive scenarios. To reach the benefits from its implementations, high investments in time, money, and internal resources are necessary. Because of these counterpoints, some studies tried to discuss the benefits generated by the adoption of ERP systems in regards to the investments necessary to such adoption. These studies applied different perspectives to evaluate the value of ERP systems, finding different results as well. It is necessary to understand how companies can, effectively, evaluate the value that the ERP systems are able to proportionate and the resulting differences of each evaluation. In this sense, this study aims to proportionate a conceptual structure of an evaluation of the value of ERP systems. For such analysis, this research was based on a qualitative and exploratory approach, with the use of review of literature as the method. As a result, a conceptual structure to evaluate the value of ERP systems that integrates different perspectives of evaluation of the value of these systems, thus demonstrating that, when using many perspectives of evaluation, any bias found in each perspective will be reduced or eliminated, which improves the evaluation and allows that the value generated by the ERP system to be fully recognized, thus avoiding that the attention is centered in financial indexes and in elements linked to the operation of corporations.

Keywords: ERP system. ERP value. Information Systems.

1. INTRODUCTION

The investments in Information and Communication Technology (ICT), and consequently in Information Systems (IS), represent one of the great differentials in modern companies, both in the definition of strategies (Alaghehband *et Rivard*, 2010) and in supporting the optimization, management, and distribution of information (Stallings, 2010). In a research published in 2014, performed in 562 corporations of different segments, located in 64 different countries, founded that the projects for the implementation of ERP systems generated costs 55% over the budget, and more than 70% of the projects went over the time set in the implementation schedule, in 2014. It is believed that only 59% of these projects achieved more than half of the benefits expected before the implementation of the ERP system (Panorama Consulting Solutions, 2015).

The data show that, even with a planning stage before the implementation of the ERP system and the experience and knowledge acquired by the consulting enterprises of the field, the high level of sophistication of this system and its wide organizational impact lead to unsuccessful implementations (May *et al.*, 2013). Similarly, at the time the ERP systems become more popular, studies regarding the adoption of such systems have been performed, using different format to evaluate, and at the same time, finding different results (Morris, 2011).

These diverging results indicate the existence of important gaps to be filled in the literature, regarding the investments in ICT and IS – in special the ones done in ERP systems – and specially, regarding the value generated by this investment. As



more companies start to use these systems, more the discussion regarding the value generated by the ERP systems have acquired importance (Addo-Tenkorang *et Helo*, 2011).

Aimed to contribute to this discussion, this article has the objective to propose a conceptual structure to evaluate the value of ERP systems. In order to proceed, a theoretical approach was used to analyze different views regarding the value of information systems. The composition of this structure is based specially by the works of Irani *et Love* (2002), Jain (2008), Sanchez *et Albertin* (2009) and Chen *et al.* (2010), who present different perspectives of the topic.

To better present the article, next session is composed by the methodology chosen for the research. The session after that, the main concepts regarding ERP systems will be presented, calling attention to the challenges in the evaluation of their value. Right after this presentation, there will be a discussion about the different perspectives of evaluation of value form ERP systems found in literature, presenting a conceptual structure of the main theories involved. In the end, the conclusion will be demonstrated.

2. METHODOLOGY

In regards to the approach, the qualitative one was used in this research (Richardson, 2012). The qualitative research is different due to the fact there is no statistical instrument as the core of the process of analysis of the issue observed, which means to say it does not have the intention to number out homogeneous units or categories, once many times qualitative researches have an elevated level of complexity, which makes it almost impossible to present data with exactitude, which could also compromise the goals to be achieved (Richardson, 2012).

In regards to that, this research is classified as qualitative, with no intention to guarantee some precision on the data presented, but searching for a wider understanding in regards to different views about the value ERP systems aggregate to the companies that use them.

On the method, the review of literature (or bibliographic review) was chosen, as it provides the researcher a general view about a certain field of study, with identification, achievement, and consulting to the bibliography and other materials that can be useful to reach the goals of the study (Sampieri *et al.*, 2006; Schlichter *et Kraemmergaard*, 2010). This research has an exploratory objective, aiming to develop the concepts of topics that have had little attention from researchers, with an intention to establish a general perception of a specific element, in order to create a structure that future studies will be able to be more precise regarding the discussion originated in this article.

In this sense, this study is characterized as exploratory in its stage of collection and analysis of the perspectives to evaluate the value of ERP systems. For such, it was divided in two phases, first performing a search and selection of studies in scientific databases do be included in the review of literature, and the second, analyzing the articles selected (SCHLICHTER; KRAEMMERGAARD, 2010).

During the phase of search and selection of articles, it was defined to limit the search to the database *Scopus* and *Web of Science*. The types of publications selected were defined if they were peer revised; the year of publication was limited to the past 10 years; and the setting of keywords to be used in the search, using the terminologies "IT Value", "ERP Value", "Integrated Management Systems", "Value of Information and Communication Technology", "Benefits of ERP Systems", and their translations in Portuguese (Rabechini Junior *et Carvalho*, 2009; Schlichter *et Kraemmergaard*, 2010).

On the following phase, of analysis of selected articles, it was set after the reading of the articles abstracts, and then identifying those which could better assist to achieve the objectives of the research (Powell, 2012), in the sense to select the articles that would contribute to build a conceptual structure to evaluate the value of ERP systems. Theoretical articles and reviews of literature with general results were prioritized, avoiding case studies.

According to Sampieri *et al.* (2006), after a consultation to the material acquired for the research, it is necessary to extract and recompile the information considered important and necessary to respond to the proposed problem in the study. Then, based on the objective of the research, the main concepts found were compiled in a review of literature, generating a conceptual scheme of evaluation of value of ERP systems. This article was produced from the compilation of the information extracted from the main references studies, such as the articles by Chen *et al.* (2010), Irani *et Love* (2002), Jain (2008) and Sanchez *et Albertin* (2009).

3. EVALUATION OF THE AGGREGATED VALUE GENERATED BY THE ERP SYSTEMS

In this section, the challenges found in the evaluation of the value of ERP systems are discussed, and the different perspectives of evaluation found by the review of literature.

3.1 Difficulties in the evaluation of the value of ERP systems

For Addo-Tenkorang *et Helo* (2011), the discussion regarding the value of the ERP systems has achieved a higher importance due to the necessity that companies have to jus-



tify their investments in ICT, besides a collective effort that these projects require. According to the authors, the studies regarding the value of ERP systems focus on questions such as: does the ERP system valuable to the organization? Which values will arrive from the use of an ERP system to the organization? How to evaluate the value of an ERP system?

Ranganathan *et* Brown (2006) point out important reasons that collaborated to the idea to the increasing importance of the discussion of the value of ERP systems, which are: i) a higher importance that ICT investments now have inside companies in some countries, as for example, in the United States, where these investments became one of the major capital expenses of the corporations; ii) the necessity to evaluate the return of investment ICT bring to the companies, being this return measured by the potential value of the system, or by the value perceived in terms of business (company-wide).

It is also seen that the relation between costs and benefits generated by the ERP systems in organizations is not clearly defined, seeing as difficult to evaluate, because it involves financial and non-financial factors, as it englobes tangible and intangible aspects. Gattiker *et* Goodhue (2005), Ranganathan *et* Brown (2006) and Rhodes *et al.* (2009) stress that the largest part of the value generated by ERP systems are in intangible areas, such as: the improvement of interactions throughout the whole company, reduction of the response time to obtain data, integration of business processes, availability and quality of information, improvement in communications, individual productivity and management control, among others.

Even with an increased significance to evaluate the investments in ICT, the challenges found to evaluate the value of ERP systems persists. The difficulty to assess the systems can be seen through the characteristics of ERP itself, once it has a vast, broad use and many functionalities, storing data generated from the result of a large number of transactions, without restricting the information inside one specific department, or limited due to functional issues of the corporation. On the contrary, ERP system is an integrated body to be used by multiple users at the same time, for multiple ends, and in different places (Gupta, 2000).

To improve the process of evaluation of the value of ERP systems, there are companies that assess the ICT investments using the method of real options for investments. These companies invest in projects that will provide them rights, but not the obligation, to acquire the benefits of a technology in the future, opening to potential growth that may be accessed through the technology (Fichman, 2004).

The investments in ICT in companies cannot be evaluated only by the monetary value of the propriety acquired, once,

in many cases, there is a necessity to invest in other areas of the company that are not directly related to ICT. An example is the present investment in ICT that end up demanding from the companies certain expenses using complementary resources from different areas, such as training of human capital, adequacy of business processes, and additional improvements in the physical structure, among other demands (Ranganathan *et* Brown, 2006).

The integration of parts of the business itself, one of the characteristics of the ERP systems, demands the redesigning of processes, work fluxes, and new skills from the people that will work on the system (Melville *et al.*, 2004). This is a clear example of investments, and possible benefits, that will be required when adopting an ERP system. In this sense, Ruivo *et al.* (2014) proposed a framework of integrated evaluation, assessing how ERP and CRM systems are integrated and used based on the systems and processes of integration. The proposed model is based on the theory Resource-Based View (RBV).

For Albertin *et* Albertin (2008), the search to identify the value that ICT generates to a company, it is necessary to analyze the variables that affect and will be affected by its use, considering different contexts, benefits provided, relationships types of use of ICT in organizations. This is necessary as the value can be understood upon different aspects, which will influence its evaluation.

In cases when there is the acquisition of ERP systems, when the decision regarding the spending or not of resources of investment is challenged by the level of uncertainty and irreversibility, Fichman (2004) defends the adoption of a decision process under the notion of real options, which enable to adequately structure the evaluation and the management of opportunities of investments. The management of opportunities of investment is defined by the new options that will become available through the initial investment, as the investment in an ERP system would enable the performance of other projects.

Considering that the ERP systems are an ICT, and corroborating to the theory that they provide a different value to the companies, according to their strategic importance to business, Yusuf *et al.* (2006) call attention to some of the benefits generated by these systems to manufactures located in China. The authors demonstrated that both the segment of the corporation and cultural elements influenced in the way how the benefits that arrived from the adoption of the system was perceived on the companies researched.

Among the most important benefits listed by Yusuf *et al.* (2006) present in the post-implementation stage, the turnover and the reduced inventory levels, the time and speed for deliveries to the client, the decreased levels of production



errors, the improvement of customer service rates, the ICT cost reduction, and the increased working capital available.

In the same spectrum, Gupta (2000) summarizes the three main benefits offered by the ERP systems to the managers, which are related to the client-server environment, the work flow, and to the information shared in real-time. In a client-server environment, the data are stores in a single databank, keeping its integrity and consistency, with the processing of users' requests from their machines (computers and the like). In regards to the work flow mode, the ERP system enables applications for work groups, the preview of reports and financial analysis – such as cash flow –, the extraction and analysis of data, among other tools that can be aggregated, collaborating to the flux of information in real time throughout the company (Gupta, 2000).

The fact that Yusuf *et al.* (2006) and Gupta (2000) mentioned more frequently the issues related to the improvement of inventory management as the main beneficial element of the ERP systems indicates that ICT in these corporations has the role to provide better support to the business strategy adopted than influencing the core of corporate strategy.

In the assessment of the aggregated value by the investments in ERP systems, it is necessary to evaluate under which perspective of the company/business it is being considered the generation of value. The information systems aggregate many benefits, according to the objective to which the system was developed and desired by the corporation.

In the case of ERP systems, the focus of the activity is in the operational level of the corporation, which does not impede them to generate benefits in other areas, characterized as from tactical or strategic level. Despite this possibility, the main effects and/or changes that occur from the implementation of ERP are still seen in the operational level of enterprises (May *et al.*, 2013).

In general terms, the evaluation of the value of investments in ICT will be the combination of benefits brought directly by the adoption of new systems, and the benefits that are aggregated indirectly. Therefore, there are many examples found in operational areas of corporations, such as in inventory control, due to the reduction of inventory levels, improvement in the process of storage; in production, with lower numbers of process errors and rework; in human resources, with optimized work flows, management and distribution of information to all enterprise; in financing, with an overall improvement in the process of revenues, calculation results, and generating information; in marketing, with an improvement in responding to internal and external clients; among others.

Different perspectives to evaluate the value of ERP systems

As seen in the context here presented, the value of ERP systems to companies varies according to the directives and/or propositions used for this assessment. Based on this angle that in the literature is possible to find different perspectives to evaluate described by the authors, which are grouped in this paper and denominated as propositions to evaluate the value of ICT, in accordance with the discussion to be demonstrated in the following topics.

3.2.1 The macro and micro perspective of ICT value

The macro and micro perspective analyzes from a broader view the value of ICT, up to narrower points of view. The broader level of this assessment is seen by Jain (2008) as the sublevels of evaluation of ICT value. According to this conception, the evaluation of the value generated by ICT can be seen by its effects on the economic, industrial, organizational, procedural, or individual levels.

All sublevels of analysis proposed by Jain (2008), as demonstrated on Chart 1, can be measured by different indicators, and in some cases, are set to have a broader analysis, such as the economic and industrial levels, or narrower view, such as the indicators from individual or organizational processes sublevels. Each one of these sublevels has measurements that aim to measure the value of ICT, as seen on Chart 1.

For Hitt *et al.* (2002), the researches that focused on the evaluation of ICT value based on the idea of Jain (2008), regarding the sublevels of the organization (Individual, Procedural, Organizational, Industrial and Economic) demonstrate that the investment in ICT has a positive effect both over the measurements regarding the internal performance of the organization – such as inventory turnover and margin of profit, among others considered micro level measurements – and over wider performance measures, for example, the ones that measure the levels of total productivity of the factors analyzed. The investment in ICT demonstrated to have a positive influence either in the performance observed individually in the company or its market value (an assessment considered to be broader than others).

The proposal to divide the levels of analysis of ICT value by Jain (2008) and echoed by Hitt *et al.* (2002), reflects the coverage of systems such as ERP can provide to corporations. The evaluation of the generated value by ICT will be the combination of the benefits brought directly by its adoption and the benefits aggregated indirectly, observed in macro and micro levels.

Therefore, many examples can be mentioned of benefits seen in micro level, observed in the operational areas of the companies, such as in inventory control by the decrea-



Levels	Sublevels	Measurements of ICT value
Macro	Economic	Global productivity, productivity index, GDP.
	Industrial	General productivity from factors.
	Organizational	Return of investment (ROI), customer market quota, general satisfaction, profitability.
Micro	Procedural	Transfer rate.
	Individual	Individual performance.

Chart 1 – Levels of analysis of ICT value.

Source: Jain (2008).

se of inventory levels, improvement in storage processes, and an increase of the rate of sales per employee; as in production, by lowering the rates of errors and rework; as in human resources, in optimization, management, and distribution of information company-wide; as in finances, with the improvement of the whole revenue process, result calculation, generation of information, and management of accounts receivable; as in marketing, improving internal and external customer care; among others (Hitt *et al.*, 2002). In a macro level, the improvements reported are specially in the performance of business, the increase in productivity, and company's market value (Hitt *et al.*, 2002; Jain, 2008).

3.2.2 Perspective of ICT value based on corporate strategy

Chen *et al.* (2010) propose an evaluation model for ICT value linked to the adopted corporate strategy. For the authors, there are two types of predominant strategies of IS inside the enterprises today, classified as Innovative and Conservative, apart from those which do not have any strategy, classified as corporations with an Indefinite strategy.

Corporations that have IS Innovative strategies are characterized by investing in the experimentation of new alternatives, with uncertain feedbacks, in long-term projects, or with expected negative impacts, in a quick response to first signs of new investment opportunities in IS. IS Conservative companies, on the other side, are seen by have adopted an approach that aims to be safe and stable in developing their IS strategies, analyzing carefully new technologies and adopting those clearly promising.

In the evaluation of the value these systems can aggregate to the organization, both the characteristics of the company and the expected results by the adoption of a new ICT can influence the final result acquired, as for Chen *et al.* (2010) demands managers to consider a third aspect, related to the strategic importance of ICT for the company. According to the authors mentioned, ICT can be admitted into the company under three different roles for the strategy of the organization:

- Information Systems used as support to corporate strategy;
- Information Systems used as core plan of corporate strategy;
- Information Systems used as means to a shared view of the organization.

In an organization in which information systems only support the strategy of the company, the results and the aggregated value from the investments in an ERP system will be focused to support and develop businesses. The value of the ERP system to the company in this case would be evaluated according to the performance and adaptation of the system to the necessities of company's businesses.

On the other side, in a company in which the IS strategy has a central role, for both the expected results from the investments in ICT and the aggregated value by ERP system will be assessed under another perspective, wherein the IS strategy of the company is treated as fundamental. Yet according to Chen *et al.* (2010), the IS strategy can be defined isolated from the business strategy, and later, the enterprise will adapt the corporate strategy to the defines IS strategy, which implicates in a different perspective, when the company would adapt to the IS actives available for the execution of activities, such as the ERP system.

On Chart 2 the three different IS strategy concepts that are most commonly found in companies are presented.

The strategic importance that IS represents for the organization is one of the determinant factors at the moment of evaluation of value of these systems. Both the characteristics of the organization and the expected results from the adoption of a new ICT can influence the value acquired. When considering this difference, the value perceived by the ERP systems will take distinct roles, as the costs and the tangible and the intangible benefits will have different weights and importance in corporate strategy.



3.2.3 The perspectives of IT value according to the nature of benefits

In the definition proposed by Irani *et Love* (2002), the challenges that are taken into account when measuring the value of ERP systems originate from the necessity to evaluate the benefits generated in various levels of the organization, and according to their different predominant nature in each level. The authors propose a division of the organization in the following levels: strategic, tactic, and operational; and relate each of these levels to a predominant benefit of intangible and non-financial vs. tangible and financial nature, as demonstrated in Image 1.

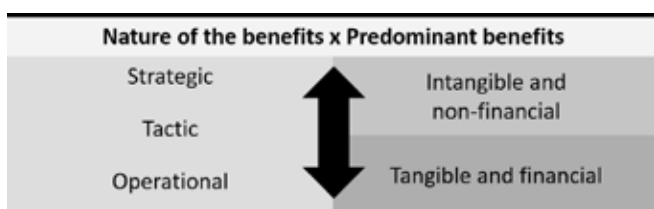


Image 1 – Organizational levels and the benefits generated by IT.
 Source: Irani *et Love* (2002).

The organizational levels more connected to strategy have benefits that are of intangible and non-financial nature, while the levels that are more linked to the operational side of the company present, in general, benefits that are of tangible and financial nature.

In this classification, there is no exact division of the proportion each benefit will have in each level of the organization. Despite the fact the authors consider the predominance of tangible and financial benefits, as discussed in the operational level, this fact does not annihilation the possibility of these same benefits to be perceived in the strategic level, where there is the predominance of intangible and non-financial benefits. This relationship and the predominance of each benefit will vary according to corporate profile.

3.2.4 The perspective of ICT value through continuous use

Clark *et al.* (2009) defend the idea that the benefits that arrive after the adoption of an ERP system do not have a linear characteristic, with well-defined or sequential phases. On the contrary, the benefits have a dynamic nature, in a complex construction, determined by the relationship between the elements involved in its usage. Feedbacks are provided in a constant manner, which feed the system and enabling that the real benefits offered by ERP get closer to what is expected by the users, thus demanding a constant change on the behavior of the system and its users.

The definition of elements in the context treated by the authors can be either a reference to final users of the system or characteristics of the ERP system itself, the organization that is using it, or even the critical factors of success in the implementation of ERP systems described in literature.

The model to acquire the value in the use of ERP systems proposed by Biancolino *et al.* (2011) demonstrates that, through an extensive use of ERP systems the organization is able to achieve the benefits intended, once necessary adaptations may be required in both the enterprise and the system, in order to clarify any existing gap after the adoption of the system. The process to maximize the benefits up to the desired highest level is the same process described by Clark *et al.* (2009), in which using the system’s feedback mechanism, the enterprise can achieve those goals in benefits over time.

The division between achieved and desired benefits can be extended to a third category: the potential benefits. Many corporations may have overestimated or underestimated the possible benefits of the implementation of an ERP system, either due to the lack of understanding of the functions of the system or due to the fact they have not taken into consideration of the value ERP can aggregate to the corporation.

Concepts in IS strategy			
IS Strategies	Point of view of the development of IS strategy	Relation between IS and business strategy	Desired impact of IS strategy
IS as support to corporate strategy	Business in the center of the strategy	IS strategy developed as inherent to corporate strategy, depending on it. It is not seen on itself	Ensure implementation and coverage to defined corporate strategic position
IS as core plan of corporate strategy	IS in the center of the strategy	IS strategy is developed isolated from corporate strategy. IS strategy is seen as a functional level of corporate strategy	Identify the IS actives necessary for the company and ensure they are properly allocated
IS as means to a shared view of the corporation	Corporation in the center of the strategy	IS strategy can be developed separately from corporate strategy. Is strategy is a level of corporate strategy	Provide a common understanding for the whole organization to guide investment decisions in IT and its implementation

Chart 2 - Three IS strategy concepts inside companies.

Source: Chen *et al.* (2010).



The characteristics of the company are one of the most important variables to estimate the potential value an implementation project for ERP system can aggregate, contributing to increase the value of investments in ICT. This increase of value can be explained by the fact companies that invest more in redesigning their business processes and dedicate more efforts to increase the value given by the client – such as offering better quality, punctuality, and convenience – through ICT had higher productivity and corporate performance rates (Hitt *et al.*, 2002).

In this sense, the ERP systems have higher potential value to companies, and generate more perceptible benefits when the corporations themselves are better prepared to adopt such systems. The analysis of the potential value to be achieved by the implementation of ERP systems also demands the observation of which are real benefits offered by the system and which are being observed by the organization.

3.2.5 The perspective of ICT value according to its potential, perceived, and performed value

An unsuccessful implementation is possibly caused by the failure in interpretation, as Sanchez *et al.* (2009) define as ICT potential value, ICT perceived value, and ICT performed value. The relationship between potential, perceived, and performed values can be divided in well-successful cases, demonstrated in Image 2, and unsuccessful to adopt the technology, as seen in Image 3.

In the cases considered well-successful, it is considered that:

- **Potential value \approx perceived value \approx performed value:** the potential value to generate benefits by the system is near the value perceived, which could be generated in the moment of implementation, also it is too near to the total benefits performed or delivered.
- **Potential value $>$ perceived value \approx performed value:** in this case, despite the potential value being too superior to the real perceived value, the organization considers that the implementation was a success because it did not visualize, in the moment of implementation, all the benefits that could be derived from the adoption of this technology, being the perceived and the performed values of ERP near to each other, which gives the impression of a well-successful investment.

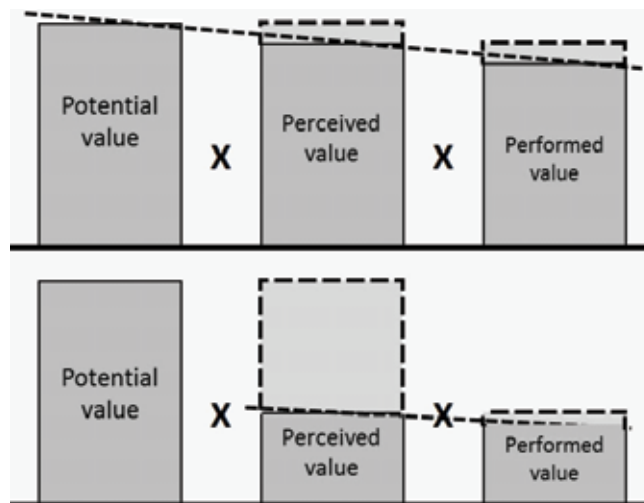


Image 2 - Well-successful cases in adopting technology.

Source: Sanchez *et al.* (2009).

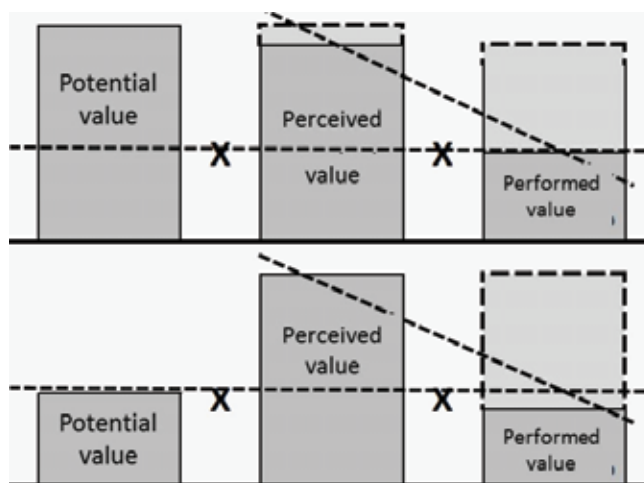


Image 3 - Unsuccessful cases in adopting technology.

Source: Sanchez *et al.* (2009).

In the cases considered unsuccessful, it is considered that:

- **Potential value \approx perceived value $>$ performed value:** one of the most common cases described in literature – when potential and perceived values are near, despite the expected value by the set of system benefits was not reached, generating a bad management of ICT resources or even by the contingencies that may have occurred during the implementation of ERP.
- **Potential value $<$ perceived value $>$ performed value:** in this case, the organization expects the system a total number of benefits to be fulfilled higher than those available. The potential value will be inferior to the perceived value at the implementation of ERP, so does the performed value, and the total number



of benefits achieved can be closer to the potential value, however the necessities or the objectives of the corporation when implementing the ERP system will not be completed.

Hence, the evaluation of the value of the ERP systems to enterprises must consider, besides other analysis techniques here shown, how to interpret the data collected. Errors originated from the interpretation of evaluators in regards to the value of ERP system may result in unsuccessful cases in adopting technology.

4. ANALYSIS OF PERSPECTIVES AND PROPOSAL OF CONCEPTUAL STRUCTURE TO EVALUATE THE VALUE GENERATED BY ERP SYSTEMS

After the description of different perspectives of evaluation of the value of ERP systems, this research presents, on Image 4, the proposal of a conceptual structure that combines the definitions of value used by some authors regarding IS and ICT, as discussed previously. The proposal encompasses since a wider evaluative scope, aimed to indexes of corporation global performance to a more limited

analysis, focused on internal performance indexes, or the work of those directly affected by the adoption and implementation of ERP, such as the improvement of processes in general.

There is also the differentiation of the value that is fully performed by the ERP system to the company, and the one perceived or potential value of the system. The definitions for potential, perceived, or performed can be extended to all analytical theories, therefore they are in the bottom of Image 4. They can be either to the assessment of the value generated by the ERP systems in a wider dimension, as defined by Jain (2008), or in a narrower sense, as for example, the organizational level.

An ERP system that is underused by the members of an enterprise will be aggregating an inferior value to its potential, but in the case the IS have little influence to the competitive strategy or to the corporate strategy, this underutilization will not be considered as a failure by the organization, which may impact in the way this issue is perceived. In a general sense, ERP can continue to aggregate a lower value than its potential one.

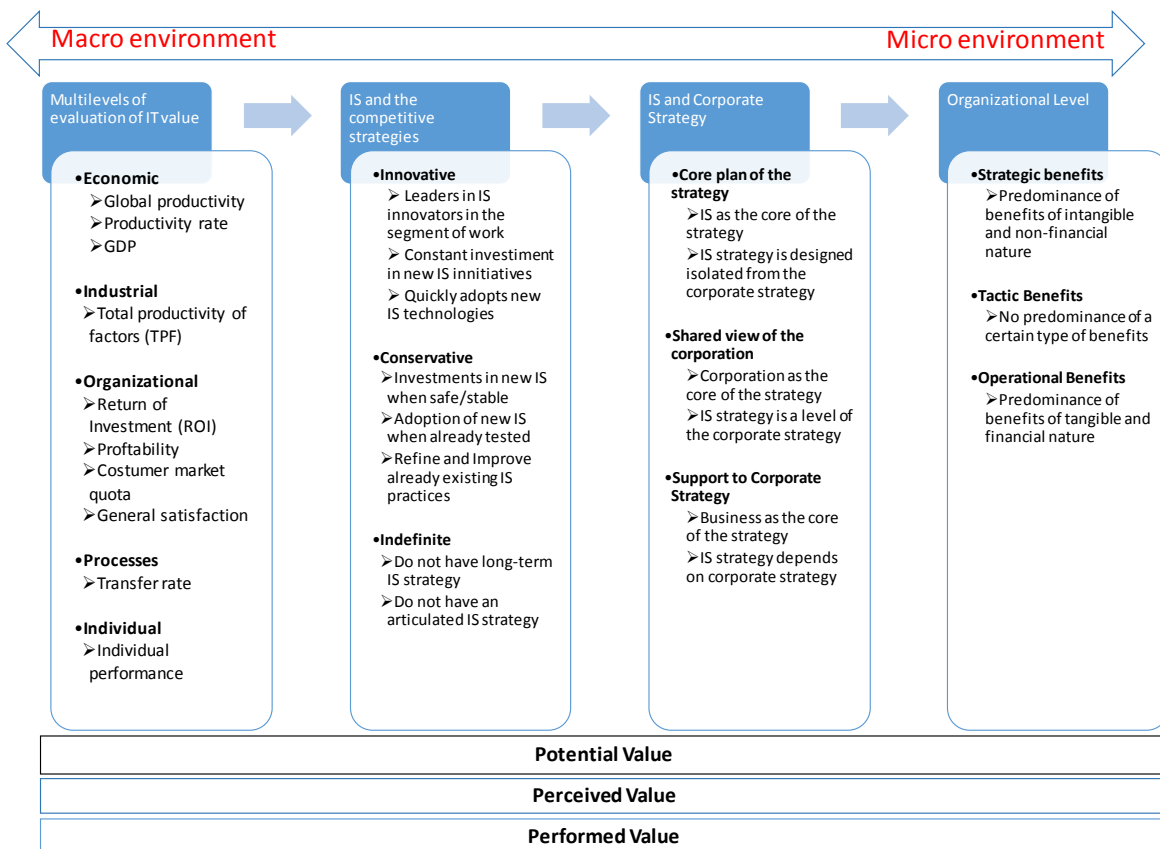


Image 4 – Contributions to the analysis of the aggregated value by ERP systems.

Source: Designed from Chen *et al.* (2010), Irani *et al.* (2002), Jain (2008) and Sanchez *et al.* (2009)



The generation of value of ERP systems can vary according to the importance they have to the company analyzed. In this sense, the division created by the role of IS in corporate strategy defines the first plan of value management, both in these systems and in ICT in general. The studies demonstrated that there are different levels of evaluation of the value of ERP systems proposed in literature, based in evaluations that are focused in micro-environment or in macro-environment of the organization. The focus on the technology and its relationship with corporate strategy are other important factors to limit the investment to be one by companies in ERP systems, which also limits the benefits expected to be generated from the ICT area to the corporation as a whole.

On the other side, the different perspectives of evaluation of the value ERP systems can aggregate to companies are conditioned to the perception that will be generated by this technology. The value perceived will be the result of the format of the assessment used to rate the return of investment, and the corporate importance the system has to the whole company. If the company decides to measure the returns of investment generated by the ERP is not the most adequate, or if the costs to its adoption are measured inadequately, the real value used will not be correctly recognized.

The definition of ERP systems has in itself the idea of enterprise integration, which means to affirm that its performance will affect the organization as a whole, despite some authors prefer to focus on only in some areas or levels of the company when evaluating the value these systems aggregate.

The complexity of evaluation of the value of these systems can be explained by the lack of understanding of enterprises regarding their coverage inside the organizational levels. Thus the model here proposed, unifying the different levels of assessment of the value of ERP systems can help in the management of their value when permitting a culture of understanding of the possible benefits created in each corporate level, as well as improvements that can occur in the inserted macro and micro environments of the company.

By the proposed model, it is necessary to highlight that corporations can adopt an assessment model that is more specific and focused, such as those presented in the context of the multiple levels of IT evaluation, as if they are aware of the necessity of corporate alignment, in special under the IS context and competitive strategies, and in corporate strategies. However, it is important to also mention that companies must have previous understanding of the benefits into the organizational context. The recommendation is that enterprises have a full awareness of the impact ERP systems can present, considering the coverage of the model presented.

5. CONCLUSIONS

The main contribution from this study is the proposal for a conceptual structure to assess the value of ERP systems, with the intention to improve the evaluation of value generated by these systems. The conceptual structure proposed brings in itself the integration of the main perspectives dealt in order to demonstrate how the evaluation of the value of ERP systems can be vast, considering at the same time the different perspectives of assessment. Using these different perspectives amplifies the coverage of evaluation, moving it from focusing only in the improvements in the operational areas of the companies.

In this sense, the evaluation is directly conditioned to the perspective of value that the organization has towards these systems, as represented in Image 4. Evaluations that focus exclusively in one of the perspectives can be incomplete and will not be able to assess the aggregated value as a whole. Evaluations that combine more than one, or that use various other perspectives will be able to reduce the challenges found in the evaluation of ERP systems, with a narrow focus on the financial indicators, on operational results, and on failures in over sighting, among others.

As observed in Image 4, one of the first perspectives is the level of evaluation of ICT value, in which the assessment can be under a more restrictive perspective, focused in a certain section of the company or in the performance of the final user, or in a broader sense, evaluating the impact that ERP system has upon the market value of the company, for example. In both cases, the characteristics of the organization and the expected results by the adoption of the ERP system will influence the potential value, at the same time the system can offer more tools and capacities to improve the company, and in the perceived value, when considering that companies characterized by having a hierarchical structure or a higher complexity may require more functionalities from these systems, finding a higher potential value from its usage.

In the same way, to consider the corporate strategy the ERP system has to the organization can facilitate the assessment of its value. For companies with an innovative strategy, or that IS belongs to the core plan of corporate strategy, uncertain investments or those with a long-term return of investment are acceptable, which implies in an evaluation that takes these characteristics into account. In companies that have a more conservative strategy, or those in which IS are seen as a support to corporate strategy, they are characterized by using a safer and stable approach to the investments in the area, which lead them to delay the promotion of value from these systems, and requiring a differentiated evaluation.



In a general sense, the perspectives of value from ERP systems are complemented by the use of the evaluation according to its potential, perceived and performed value. The aggregated value by these systems can be seen in a set of benefits with a significant variation of their nature, according to the perspective of evaluation adopted. If all benefits generated are evaluated, this will depend only from the perspective of assessment used by the corporation. When using various perspectives of evaluation, the bias found in each perspective will be reduced or eliminated, improving the assessment.

As a conclusion, there is the importance to assess the value generated by the ERP systems, in which are more frequent in business environment, demanding growing investments. It is fundamental that companies really understand how to evaluate their benefits, and consequently, to find strategies and/or tools to amplify them.

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