

Gustavo Vieira

Success Criteria Adherence in Information Systems Projects. A Case Study on Brazilian Companies

Master's Thesis

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**SUCCESS CRITERIA ADHERENCE IN INFORMATION SYSTEMS
PROJECTS: CASE STUDY ON BRAZILIAN COMPANIES.**

CONTENT

CONTENT	2
ABSTRACT	3
1 INTRODUCTION.....	4
1.1 WORK JUSTIFICATION	4
2 LITERATURE REVIEW.....	7
2.1 PROJECT SUCCESS CRITERIA	7
3 METHODOLOGY.....	19
3.1 RESEARCH TYPOLOGY	19
3.2 METHODOLOGICAL PROCEDURES.....	20
4 RESULTS PRESENTATION.....	23
4.1 RESPONDENTS SAMPLE PROFILE.....	23
4.2 CATEGORY OF ANALYSIS	24
4.4 SUGGESTED PRACTICES FOR EVALUATING SUCCESS IN IS PROJECTS	27
5 FINAL CONSIDERATIONS.....	30
REFERENCES	35

ABSTRACT

This paper objective is to raise practices and success criteria considered to be at the literature vanguard regarding success in information system (IS) projects performance. Besides, this work also aims to evaluate success criteria adherence from a sample of large Brazilian companies of various economic segments. To support this study were interviewed senior project management professionals with background in IS project, totaling seventeen different companies surveyed. From the results collected in this research, it was possible to infer that, in general, companies adopt formal practices to measure their IS projects results. However, most companies still analyze their projects from the unique point of view of their implementation, based on the so-called triple constraint concept, represented by cost, time and requirements (scope) indicators. Measurement concepts considered more advanced, especially those related to the expansion of the success analysis on more general aspects of the organization, such as the impacts brought by the projects to the enterprise processes, as well as on the strategic goals, however, are not yet majorities. Finally, there was a more restricted set of practices with even less occurrences, but which indicates that, at least in part, Brazilian companies adopt the most avant-garde concepts in their fullness. Based on these findings, this study stratified the practices presented in three distinct sets, presenting as a suggestion that companies adopt as a way to obtain better result at least the first two.

Keywords: Information Systems (IS); Project Performance Indicators; Project Management; Projects; Project Success.

1 INTRODUCTION

Projects are not seen only as elements that enable disciplined technical changes implementation, but also as a means to improve business. In this sense, organizations should keep in mind that success or failure in these actions may be directly related to their strategic performance (ANDERSEN; JESSEN, 2002; RAUNIAR; RAWSKI, 2012; BERSANETTI; CARVALHO, 2014).

Project failures, however, bring financial losses to companies. According to The Chaos Manifesto report, only in 2013 were invested about US \$ 750 billion in projects involving Information Systems (IS) around the world, resulting in US \$ 200 billion losses, representing 26.7% of the total amount invested (THE STANDARD GROUP, 2013). Data from 2014, on the other hand, show that only 16.2% of IS projects were completed within the expected time frames and costs, and that, on average, presented these indicators deviation of 222% and 189%, respectively. In addition, completed projects deliver, on average, only 61% of the originally expected outcomes (THE STANDISH GROUP, 2014).

By involved numbers, it can be said that the theme is representative of companies, especially considering that, according to Hilletofht *et al.* (2009), the current level of competitiveness among companies requires an ever-increasing variety of products and solutions, making companies find themselves in frequent process of change.

1.1 WORK JUSTIFICATION

A common feature of contemporary organizations is the large volume of transactions involved in their business processes, and the need for constant changes within organizational structures and processes. In this sense, Mabert and Venkataram (1998); Hult *et al.* (2004) consider Information Technology (IT) fundamental to the company operational effectiveness, since it is one of the elements that enables business processes establishment and operationalization, both by supporting information sharing, and by coordinating competitive initiatives (FROHLICH, 2002; WU *et al.*, 2006). For Hékis *et al.* (2013), information systems (IS) usage provides advantages deriving from these processes optimization, as well as better information quality for

decision making. Thus, the IS adoption enhances the value aggregation, and increases organizational efficiency.

To Hilletofht *et al.* (2009), companies are demanding an ever-increasing variety of products and solutions to achieve and maintain competitiveness, being in frequent change processes. Changes, according to Hornstein (2015), imply in projects implementation to promote these changes in organizations. This fact was also pointed by Griffith-Cooper and King (2007), and also by Serra and Kunc (2015), explaining that business community itself recognizes projects a structured way of implementing organizational changes. Thus, projects can be considered an effective instrument to make changes in the business context, creating innovation conditions (HILLETOFT *et al.*, 2009; PMBOK, 2017).

However, project success definition is ambiguous and difficult to measure, since a project may have been completed during its design and execution without, in many times, bring the expected benefits to the organization (McLEAN, 2003). In this sense, despite the growing importance of projects in the business environment, as stated by Marques Junior *et al.* (2011), most do not meet their goals, which means that do not achieve the desired success.

In this sense, the main objective of this work is to evaluate the adherence of success measurement criteria in Information Systems (IS) projects in a sample of large companies of various business sectors, but which represent a significant and relevant share of the Brazilian economy.

This paper main objective is formed by the following secondary objectives: a) identify in the available literature, effective measurements criteria for IS projects success; b) check, within the surveyed companies, IS projects success criteria applied on, and; c) propose a set of indicators to measure IS projects success, both based on the literature, within the researched field.

This work also considered some assumptions, based on the IS projects main success categories analysis, identified from the bibliographic review: i) the adoption of cutting-edge practices, when considered specific sectors, as the financial, and/or its controlling

capital origin, its size or activity sector, or the implemented IS project type or size; ii) relevant firms, according to the sample surveyed, whether they use formalized processes and mechanisms, and internal knowledge available to measure performance, applied to IS projects initiatives; iii) success measures extend over the entire project life cycle, covering all phases of product development and delivery; iv) existence of a single and definitive concept of IS projects success accepted by all stakeholders involved in this project context.

For this, this work was conducted based on exploratory and descriptive research aspects, using both the elements contained in the bibliography to delimit the research field, as well as information obtained from national companies to support statements, characterizing it as a case study (LAKATOS; MARCONI, 2010).

This paper is organized in six sections. Firstly, in this, work context is presented, including the research problem, as well as research justification. After, in section two, it is stated a literature review about criteria for success applied to IS projects. The third section describes methodology used in the study. The fourth section presents the data analysis and discussion, based on project management professionals research. Finally, section five presents final considerations about this work results, and suggestions for new research. The bibliographic references used are also included in this last section.

2 LITERATURE REVIEW

2.1 PROJECT SUCCESS CRITERIA

Research carried out by The Standish Group (2013), focusing on Information System (IS) projects, revealed that between the years of 2009 and 2013 about 20% of the total projects started in that period faced failures, becoming completely unfeasible. When success concept was extrapolated to other factors, such as customer and project sponsor satisfaction, business value creation, and strategic goals adherence, the failure rate is even higher, reaching astonishing 1.2% of those projects being concluded with success. More recent figures, from the same institute, confirm this trend.

However, the success definition itself may vary according to the criteria considered in the analysis. Such low rates can be justified based on what Turner and Serrador (2014) argue, that effective project success must consider not only the triple constraint metrics, but also broader metrics that measure project impacts over the organization.

Marques Junior (2011) commented that, despite the growing importance of projects in organizations, the discussion about success is still open, based on the fact that the majority of IS projects does not meet its goals, not achieving the desired success.

Not infrequently, according to Turner and Zolin (2012), projects completed on time and within the expected cost left investors unhappy because they failed to deliver the expected benefits. In the same way, many initiatives with substantial delays and cost overruns were considered a success.

In this sense, there seems to be a dilemma regarding the evaluation of success in IS projects. If, on the one hand, it is claimed that losses and failures are considerable, on the other hand, there does not seem to be a common understanding of what success is, or how to effectively measure it (PRABHAKAR, 2009; THE STAND GROUP, 2014)

Davis (2014), in retrospect of success studies in Project Management, mentions that in the 1970s, discussions on this subject

felt on operational issues, such as techniques and tools usages to control project results, and customers importance in this matter. From the 1980s and 1990s, the need to expand the success analysis over broader perspectives than the efficiency metrics, represented by the triple constraint, which according to the PMBOK (2017), raised the need to control cost, scope and time in a synergistic and integrated way, since changes in one of these dimensions cause impacts in the other two. From the 2000s, studies have pointed to the expansion of Stakeholder influence on success, as well as a greater focus on Critical Success Factors, and the differentiation of success analyzes from different industries point of view. Researches are currently attempting to relate success to the product life cycle.

2.1.1 PROJECT SUCCESS PROCESS EVALUATION FORMALIZATION

The clear definition of goals and objectives at the beginning of a project is considered an essential condition for this project to achieve good performance, as long it can be adherent to organizational general objectives (PINTO; SLEVIN, 1987).

However, according to Barclay and Osei-Bryson (2010), the vast perception about the performance definition itself presents great difficulty in measuring IS projects success (or failure). In this sense, unclear and incomplete objectives contribute even more to the failure perception.

For McLeod *et al.* (2012), understanding a project's success or failure is still an incomplete and fragmented issue. However, it can be said that success concept has been expanded to encompass an ever wider range of objectives, as well as perspectives from different stakeholders. In addition, authors argue that the success concept is relative, varying in each project, according to the type, industry and context, making the discussion much more complex than the duality of success or failure evaluation.

Therefore, the definition of clear criteria for project acceptance is needed to avoid situations in which the project presents a certain success level, but final results do not add value to the business itself.

In addition, from the project planning initial phase, scope must be validated with main stakeholders, so that be clear to all involved people what is included and what is outside this project scope boundaries (PMBOK; 2017).

Thus, according to Mir and Pinnington (2014), organizations should invest in their projects performance measurement structures as a way to ensure that their time, effort and financial resources are better allocated, increasing these ventures success likelihood. According to authors, a formal project success measurement system, which guarantees a clear and correct project efficiency measurement, also tends to positively impact the project team, contributing to this team motivation and engagement, which contributes to proposed goals achievement.

Chih and Zwikael (2015) argue that the presence of results measurement structured process can be considered a prerequisite to achieving success in projects. For authors, the creation of mechanisms to define and calculate targets should occurs on initial stages of the project, regardless of the project management approach adopted. In this sense, authors point out that the more traditional view tends to focus more on aspects related to the project efficiency measurement, such time, costs and specifications, sometimes leaving aside aspects related to organizational benefits generated by these projects. However, authors suggest a recent tendency to place greater emphasis on multidimensional and value-related aspects, thus broadening the focus of analysis and interest on the topic.

Badewi (2016) considers that success must presuppose clear metrics existence, besides a proactive management of the person or area in charge of this project. The author also argues that project success can be analyzed under multiple aspects, considering both the management point of view of the organization, the financial perspective, and the inestment return, from the project efficiency point of view, and return to the organization, as well as impacts of the project results to the other stakeholders, in addition to future potential gains.

2.1.2 THE IMPORTANCE OF INITIAL ESTIMATES FOR PROJECTS SUCCESS EVALUATION

One of the challenges observed in the current management context concerns both the preparation of the project initial budget for costs, schedule with deadlines, and required resources. For Doherty *et al.* (2012), from the organization perspective, a project only achieves success if it is able to deliver benefits that exceed incurred costs. Authors suggest that companies adopting a clear perspective of seeking benefits from business change and transformation, rather than achieving them only through IS delivery solutions, seeking to obtain superior results, consider a holistic perspective of the whole process, not just the solution deployed itself.

In this sense, according to the PMBOK (2017), the project success should be measured against the last baseline approved by the Project Manager and appropriate Stakeholders, such as the project sponsor, and the senior management team, considering aspects related to the scope, costs, time, quality, resources and risks.

For Serra and Kunc (2015), special attention should be paid to the business plan and metrics to financial returns defined at the beginning of this project. Such metrics are important both in the project approval and also in their closure, making them relevant for the project success perception.

Badewi (2016) also cites the importance of a business plan definition, prior to the project start, as well as constant results monitoring and reporting, as one of the key factors for successful project investments.

2.1.3 CRITERIA FOR SUCCESS EVALUATION APPLIED TO STUDIED PROJECT TYPE AND CONTEXT

According to Wit (1988), the project progress, costs and quality measurements are essential for this project management to control, and should be considered prerequisites for the project success as a whole, but not enough to ensure their ultimate success.

Baccarini (1999) proposes that the success analysis be given under the project effectiveness point of view, that is, in relation to the proposed objectives achievement degree, taking as basis a project

hierarchical view, from different levels. Initially, according to the author, one must evaluate success from the project general objective point of view, relating it to the organization strategic goals; in the sequence, one must analyze the success from the point of view of the effects brought to the users from its use. Next, it is suggested to evaluate tangible results obtained from the deliveries to processes measurement, finalizing with the analysis of necessary resources usage during this project implementation, in concept near to the project efficiency, measured by the triple restriction.

Regarding the financial benefits generated from the implementation of information systems perspective, it is assumed that part of the obtained gains are intangible, hindering their measurement and financial evaluation through the traditional approach, using metrics such as payback, discounted cash flow, internal return rate, and net present value. Balancing quantitative and qualitative metrics, since aligned with the organization's strategic objectives, tends to be a more efficient way to make such evaluation. In this way, it is suggested to customize the goals and objectives according to each level, or decision layer, covering both short and long term objectives (ROSEMAN; WIESE, 1999; SEDERA *et al.*, 2001; STEWART; MOHAMED, 2001).

Fairchild (2002) adds that the project success evaluation should also consider a set of indicators, whether qualitative or quantitative, that are related to the organization strategic objectives.

Muller and Turner (2007) argue that the success perception can be variable and personal, that is, what is success for one may not be for another. Thus, it is important that organizations do not adopt subjective criteria. So, it is necessary to study standards and conditions for certain criteria use, in favor of others, pondering each available criterion importance, according to the project type, industry, and project managers profiles.

Ogunlana *et al.* (2010) stated that the triple restriction continues to be widely accepted and used. However, new metrics are being increasingly accepted in the industry, reflecting the current business context. Authors cite, for example, new organizational functions incorporated in the results elaboration and monitoring, increasing in importance given to users demands, as well as the regulatory

environment reflection on these metrics. In this way, authors argue not only for a criteria expansion, but also for the fact that there are different initiatives according to each project, reflecting the differences in context and stakeholder demands, and also points of view involved.

McLeod *et al.* (2012) summarize several criteria proposed in the literature from three perspectives: i) success in the project, based on the triple constraint; ii) success in the product as measured by product use, customer satisfaction and benefits, and; iii) success for organization, evaluated by the benefits generated to the business and strategic goals.

For Cecez-Kecmanovic *et al.* (2014), the project success evaluation for IS presupposes calculating the benefits generated from tangible and non-tangible factors, arising from the automation that the project brings, or functionality involved in the process. However, the project's results evaluation, and consequently the success or failure definition, does not always take into account a sufficient time to stabilize the project solution, so that the organization may have not be adapted to the new reality, thus not obtaining the maximum value from this deployment. In this way, given the continuous reconfiguration of the relationships between the agents involved in the process, the performance measured for a project can vary according to the measurement period.

Mir and Pinnington (2014) point out, however, that projects differ in size and complexity, as well as they can be influenced by the economic context, which makes that success criteria vary in each situation, making it unlikely to define a single set metrics to assess project success.

Hornstein (2015), in turn, comments that project success concept is still based on the perspective of mid-management analysis, emphasizing aspects related to controls, activities, execution and deliveries. The author suggests that there is a greater recognition of the multidimensional aspect of the projects, expanding the traditional metrics, so that the impacts caused by the organizational changes can be captured in the evaluation process, thus considering the whole project life cycle, including previously ignored steps, such as support in creating a learning environment, and support for users in

understanding the new generated system, as well as in overcoming resistance to change and transform processes, as required.

Saw and Kunc (2015) indicate the existence of two ways of evaluating and measuring the results obtained by the projects: i) one based on aspects related to initiatives efficiency, measured basically through the triple constraint - costs, deadlines and requirements; ii) and another that considers the benefits delivered to the business from the project execution. Authors point out that there are different levels of adoption of metrics and practices for monitoring and measuring results in projects, varying according to the organization, context, or country under study, which suggests that there is no optimal combination to fit all cases and situations.

2.1.4 PROJECT SUCCESS AND STAKEHOLDERS

Jha and Iyer (2006) evaluated the impact of top management and project manager support and dedication bring to project success. Authors highlight the existence of a positive relationship between top management involvement and time and technical requirements achievement, as well as between the existence of a dedicated project manager and the project deadlines fulfillment. It is important to emphasize, however, that results obtained by authors are directly related to the project efficiency analysis, measured by the triple constraint, and not to their effectiveness, as measured by broader business metrics (BERSANETTI; CARVALHO, 2014; TURNER; SERRADOR, 2014).

Turner and Zolin (2012) argue that the project success perception for key stakeholders goes beyond the traditional indicators of time, cost and requirements (scope), also extending to the impacts brought to the operation, such as adding new capabilities, and achieving business objectives.

Monteiro de Carvalho (2013) affirms that a common understanding about the project success criteria is essential. According to the author, there are often semantic differences between the terms used by different stakeholders, such as information technology, business teams and Senior Management, and the Project Manager is

responsible for building a common understanding and to avoid conflicts that may arise (AMTOFT, 1994; FRANK CERVONE, 2014).

Still regarding the importance of the communication process between stakeholders, Mirza *et al.* (2014) argue that the same is of great importance to the project success, citing as example the processes of definition and agreement of the project deliveries, in addition to the constant renegotiations throughout the project, which authors say be critical to IS projects success. This fact is corroborated by Keil *et al.* (2013), stating that the efficient communication process is essential for the correct identification of issues that arise during the project progress, especially those related to the scope management.

Davis (2014) emphasizes the need for a direct and frequent involvement of the project main stakeholders, especially the project manager, customers, sponsor, users, and project team, considered more important, highlighting more once, the relevance of the communication process in order to ensure the same understanding among them.

For Silva *et al.* (2015), normally there is a consensus on project success when evaluated stakeholders' perceptions on the same hierarchical level. However, when different hierarchical levels are compared, the success perception tends to present divergences. According to the research, main reasons for distinct perceptions are related to the lack of alignment between different hierarchical levels stakeholders, especially between managers, users and analysts.

2.1.5 PRODUCT PROJECT SUCCESS AND PROJECT MANAGEMENT SUCCESS

Delone and McLean (2003) warn that a project's success definition, especially in IS, is difficult to determine because a project can succeed on its implementation, but the system created may not have generated benefits for the organization.

The same fact is noted by Thomas and Fernández (2008), highlighting the project management success possibility, and yet such success not be reflected in the impacted business, presupposing the partial success, or a success below its optimal or maximum level, also

considering the fact that this evaluation is not a common practice among companies.

Prabhakar (2009) complements, questioning exactly if the search for a desired level of performance by the product delivered by the project should not be considered as the most important metric to be pursued, instead of privileging indicators such time, cost and requirements (scope). Or, put in another way, what is the relative importance of meeting the project deadlines and costs, compared to the final delivered product poor performance?

Badewi (2016) points out that the project product critical success factors, and success in project management, are distinct from each other.

2.1.7 SHORT AND LONG TERM SUCCESS METRICS

According to Turner and Zolin (2012), a comprehensive model for measure project success should consider not only the expected outcomes for each major stakeholder point of view, but also its short and long-term impacts. Authors complement that the project manager, as well as his / her team, must continuously monitor the results in order to evaluate if they are heading in the expected direction, in order to soon correct or maximize them.

Table 1 presents a summary of the main concepts, which would be project success categories of analysis, as well as the literature support to validate such dimensions.

Table 1 – Project Success Criteria Analysis Categories

#	Category of Analysis	References
1	To calculate success through formal and agreed upon mechanisms.	Pinto; Slevin (1987); Barclay; Osei-Bryson (2010); Fortune <i>et al.</i> (2011); PMBOK (2017); Mir; Pinnington (2014); Chih; Zwikael (2015); Badewi (2016)

2	Evaluate project success against initial estimates, such financial feasibility calculations and baselines of cost, time and requirements.	De Wit (1988); Wateridge (1995); Munns; Bjeirmi (1996); Shrnhur <i>et al.</i> (1997); Dvir <i>et al.</i> (2003); Atkinson <i>et al.</i> (2006); Jiang <i>et al.</i> (2009); Doherty <i>et al.</i> (2012); PMBOK (2017); Turner; Serrador (2014); Serra; Kunc (2015)
3	Consider the criteria of time, cost, technical requirements and specifications, known as a triple constraint, and efficiency criteria for success evaluation.	De Wit (1988); Wateridge (1995; 1998); Shrnhur <i>et al.</i> (1997); Atkinson (1999); Cooke-Davis (2002); Milis; Mercken (2004); Papke-Shields <i>et al.</i> (2010); Ogunlana <i>et al.</i> (2010); McLeod <i>et al.</i> (2012); Morioka <i>et al.</i> (2012); Bersanetti; Carvalho (2014); Davis (2014); Turner; Serrador (2014); Chih; Zwikaël (2015); Serra; Kunc (2015); Badewi (2016)
4	Calculate the project success from the point of view of the various stakeholders, reflecting the differences in context, perceptions and interests involved.	Wateridge (1995); Munns e Bjeirmi (1996); Shrnhur <i>et al.</i> (1997); Dvir <i>et al.</i> (2003); Jha; Iyer (2006); Muller; Turner (2007); Ogunlana <i>et al.</i> (2010); McLeod <i>et al.</i> (2012); Turner; Zolin (2012); Monteiro de Carvalho (2013); Frank Cervone (2014); Davis (2014); Hornstein (2015); Silva <i>et al.</i> (2015)

5	Consider multidimensional success criteria (besides the triple constraint), with the possible use of qualitative metrics, adapted to the type and context of the projects in question	Wateridge (1995); Saarinen (1996); Shrnhur <i>et al.</i> (1997); Atkinson (1999); Cooke-Davis (2002); Fairchild (2002); Banker (2004); Morioka <i>et al.</i> (2012); McLeod <i>et al.</i> (2012); Cecez-Kecmanovic <i>et al.</i> (2014); Mir; Pinnington (2014); Turner; Serrador (2014); Chih; Zwikaël (2015); Hornstein (2015)
6	Distinguish success of project product from success in project management.	De Wit (1988); Munns; Bjeirmi (1996); Saarinen (1996); Baccarini (1999); Andersen; Jessen (2002); Cooke-Davis (2002); Delone; McLean (2003); Banker (2004); Thomas; Fernández (2008); Prabhakar (2009); McLeod <i>et al.</i> (2012); Rauniar; Rawski (2012); Bersanetti; Carvalho (2014); Serra; Kunc (2015); Badewi (2016)
7	Consider project management as a phase of the product lifecycle, discerning the evaluations by phase.	Munns; Bjeirmi (1996); Baccarini (1999); Davis (2014); Hornstein (2015)
8	To consider in the success analysis the result of the organizational changes delivered from the project.	McLeod <i>et al.</i> (2012); Hornstein (2015); Serra; Kunc (2015)
9	Customize project goals and objectives according to each level, or decision layer.	Baccarini (1999); Rosemann; Wiese (1999); Sedera <i>et al.</i> (2001); Stewart; Mohamed (2001); Mir; Pinnington (2014)

10	Distinguish success metrics between short and long-term metrics.	Munns; Bjeirmi (1996); Shrnhur <i>et al.</i> (1997); Cooke-Davis (2002); Milis; Mercken (2004); Turner; Zolin (2012); Cecez-Kecmanovic <i>et al.</i> (2014)
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Source: Author (2017)

Based on Table 1, it can be seen that there is great diversity about the criteria adopted to measure success in projects by authors. However, an identified aspect is that such criteria go beyond the traditional triple constraint (cost, time and scope), and increasingly approach organizational objectives, considering, for that, several actors perception and evaluation, such as the project team, the manager, as well as the other stakeholders.

3 METHODOLOGY

Initially the research classification was made, according to the criteria defined by Lakatos and Marconi (2010). Methodological procedures for conducting field research are described below.

3.1 RESEARCH TYPOLOGY

In order to be an effective research, which means that adopted procedures lead the researcher to the expected results, it is necessary to classify this research according based on its nature, approach, objectives, and technical procedures, besides clearly define its objectives (LAKATOS; MARCONI, 2010).

In this sense, this research can be classified as an applied case study. This work uses technical procedures described in the literature, but applied in practical situations.

The choice for the case study is based on the problem nature, as well as on the data organization, justifying such choice based on the following points: (1) the alignment of a stabilized methodology for defining criteria success in IS projects, and consequent measurement of the effectiveness of such projects, becomes relevant subject, being the literature scarce for the Brazilian sector; (2) the content of the proposed set of metrics is based on field research (interviews, questionnaires and direct observation); 3) for the development of the research, it is important that data be organized chronologically facilitating the determination of cause-and-effect links. Therefore, based on these elements, the case study becomes an appropriate method (McCUTCHEON; MEREDITH, 1993; EISENHART, 1989; YIN, 2004).

The nature of this research also implies the use of applied knowledge to solve problems related to concrete situations, based in a qualitative approach, in which the focus lies on the organizational context understanding, not on numerical data, seen that the objective is to describe the events, and does not list them (LAKATOS; MARCONI, 2010).

In addition, this work presents characteristics of an exploratory research because it involves the review of available literature, which can be systematically applied to information system (IS) projects, in order to identify which criteria are effective to measure success.

3.2 METHODOLOGICAL PROCEDURES

The present work was initially based on an exploratory and descriptive research, using as much bibliographical surveys about success criteria in IS projects, as for the analysis and detailing of such characteristics from actual examples. It is important to emphasize that this research type does not require the use of statistical methods and techniques, constituting the environment as the direct source for data collection, and the researcher as its instrument (LAKATOS; MARCONI, 2010).

Firstly, it was searched CAPES journals databases, considering the subjects related to the proposed theme. Since the theme of project management is broad, recent articles with less than five years of their publication, focused on IT environment, more specifically on IS projects, were selected. It is important to note, however, that older articles were included due to their high incidence in the directed searches, or the completeness and adherence of their contents to the proposed theme.

The most widely used bases for the search of bibliographical references were Science Direct, Emerald and Google Scholar, using as an advanced search criterion mainly, but not exhaustively, the combination of the following terms: “Information Technology”, “Information Systems”; “Project Management”; “Project Benefits”; “Project Success”; “Project Value”; “Performance Measurement”; “Key Performance Indicators”.

The sample of surveyed companies considered both national and international capital, but since classified as large, which, according to the National Bank for Economic and Social Development BNDES (2016), are characterized by having annual gross operationg revenue above R\$ 90 million. Another important characteristic as a criterion for companies selection was the relevant and frequent realization of IS projects inside these companies.

In this sense, no additional or specific considerations were made regarding the annual amount of investment in IS projects, as well as the nature of the projects involved, leaving such factors as an opportunity for future, more specific and targeted studies.

Regarding the interviewees' definition, it is important to consider what Huber and Power (1985) argue about the complexity of the strategy and the difficulty in analyzing the topic empirically. According to authors, those who are responsible for the information, also called "units of analysis", must be people with a great knowledge in the subject, which requires time and resources to obtain a sample large enough for the researched. Therefore, it is important that the process of gathering and interpreting information be accurate in order to obtain the necessary information in the shortest time possible. In this sense, it is equally important that the researcher knows the subject in order to facilitate the process of data collection, interviews, direct observation, documentary analysis, among other relevant aspects, supporting the choice of the best research methods.

As data collection procedures, a sample of potential professionals was initially identified for interviews. Approximately thirty people were considered, targeting project managers, seniority equivalent to a range of five to fifteen years of practice in the market. In the next step, individual contact was made with each of the potential respondents, in order to present the research project, its objectives, the content of the questions, as well as the procedures to be performed in the data collection process.

This contact ranged from sending an explanatory email, to more than one personal meeting for data collection, and could be considered as a sensitive point to the research, since the interaction between the researcher and the interviewees varied in each case, according to the availability presented by the second.

For the collection of the answers, an online research tool called SURVEY MONKEY was used, with the aim of ensuring that the data could be collected, organized and analyzed in a practical and structured way, giving homogeneity to results.

In all, twenty-four questions were considered, three of which were related to the identification of the sample, and twenty-one were related to the problem categories of analysis, according to a bibliographic survey. These questions had as objective to evaluate

internal aspects of Project Management in each company, such as the maturity degree of the companies in relation to best practices, aiming only to guide the researcher about the practices adopted by each of these companies, not being characterized as definitive answers to the researched topic. In order to guide the answers, and also facilitate the analysis, the questions were based on binary, "YES or NO" response, with fields open for comments. A twenty-fifth open-content question was inserted at the end of the questionnaire, allowing interviewees to record their own perceptions about the topic involved.

Additional considerations, collected from the direct contact with the interviewees, or through material sharing such as worksheets, presentations and other artifacts used by the interviewees in the project management activities, were included as additional information, supporting the answers to the questions elaborated.

After collecting answers, additional information was requested from the interviewees, as a way of clarifying or detailing some questions or answers. The objective of this additional step was to ensure a better understanding of respondents' answers about the success and failure of IS projects, such as the metrics used by each organization to determine the results of the projects.

Finally, it is emphasized that, for reasons of confidentiality, the names of the respondents and their companies, as well as the details of these operations, will be kept confidential and not disclosed throughout this study.

4 RESULTS PRESENTATION

Initially is presented the respondent sample profile. In the sequence, results are presented for each questions, related to the thirteen analysis categories surveyed.

4.1 RESPONDENTS SAMPLE PROFILE

4.1.1 TOTAL CUMULATIVE EXPERIENCE IN INFORMATION SYSTEM PROJECT MANAGEMENT ACTIVITY?

As previously reported, in the Methodology session, thirty professionals from the Project Management area in IS were selected, with different experiences among them.

The final sample had seventeen respondents, with average experience between five and fifteen years (Table 1). This result was considered positive since it indicates that interviewees, in their majority, present on their profile a good level of knowledge and maturity in the functions related to the area.

4.1.2 POSITION OR CURRENT ROLE IN MANAGING PROJECTS OF INFORMATION SYSTEMS ACTIVITIES IN YOUR COMPANY?

Another considered aspect in the survey was the position held by interviewees. It is believed that professionals with more experience can act in positions with some leadership level in Project Management, an important assumption in obtaining more complete and comprehensive answers on the subject, given the load of responsibility and, above all, involvement in strategic issues in the organization.

Of the seventeen respondents, all hold some leadership positions in projects. Most of the interviewees (70%) act as manager or project leader, with the remaining 30% holding functional leadership roles, or executives dedicated to Project Management, according to Table 2.

4.1.3 ACTIVITY SECTOR OF YOUR CURRENT COMPANY?

Finally, it was analyzed the economic activity sector of the companies in which the respondents act. This information is considered important for the subsequent analysis of successful IS project practices by type

of industry or economic segment, since one of the objectives of the work is precisely to verify if there is any specific trend by sector.

Results obtained by the research pointed to a greater concentration on four type of industries: Information Technology, Food and Beverages, and Pharmaceuticals (Table 3). In relation to the first one, with four citations, even for its vocation for projects, it is expected a more avant-garde trend to the best practices in Project Management.

The Food and Beverage industry appears with three respondents, and is characterized by a high volume industry and dynamic markets, where both the need and the speed of changes are a constant.

In relation to the pharmaceutical industry, also with three companies, there is a sector marked by great public regulation, which, according to the interviewees themselves, demands structured and well organized processes and controls.

Fourth, with two occurrences, is the Energy industry. This industry is represented by companies originating in the sugar and alcohol sector that, due to the economic context and market opportunities, have expanded their activities to other sectors, such as electricity generation and fuel distribution. Although its origins have remitted to the family agroindustry, on the other hand there is a recent effort to modernize its organizational structures, including with the support of investing groups of origin

4.2 CATEGORY OF ANALYSIS

From the sample surveyed, it was verified that in practice, companies have adopted a set of practices for measurement and definition of success that are relevant, based on what determines specific literature to this topic.

Among ten practices for success evaluation and definition considered in this study, denominated here as categories of analysis, was noticed the majority adherence to only five of these practices, as shown in Table 2 below.

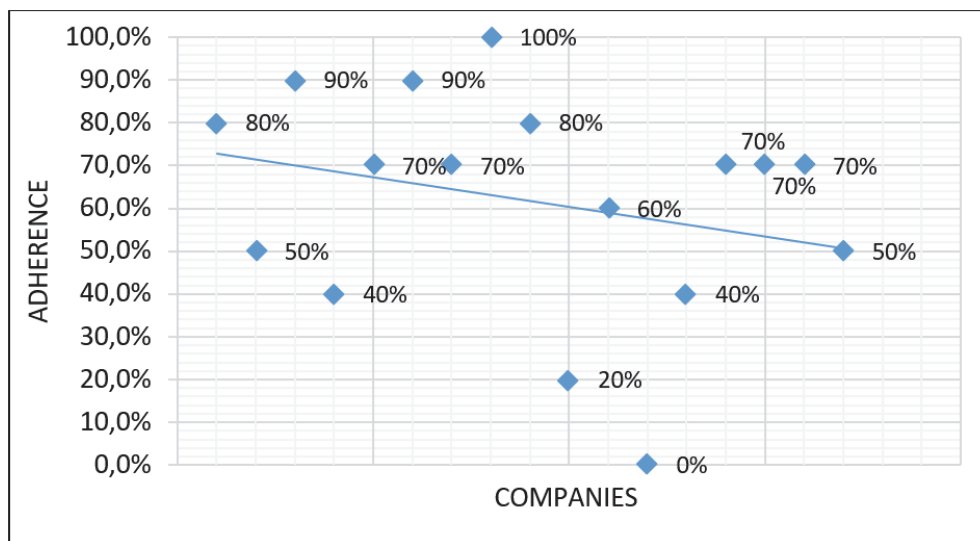
Table 2 – Main Categories of Analysis

#	Categories of Analysis	Results	%
1	Calculate success through formal and agreed-upon mechanisms	YES - 14 responses	82,4%
2	Assess project success against initial estimates, such as financial feasibility calculations and baselines of cost, time and requirements	YES - 15 responses	88,2%
3	Consider the criteria of term, cost and technical requirements and specifications, known as triple constraint and efficiency criteria for evaluation of success	YES - 15 responses	88,2%
6	Consider in the analysis of success the result of organizational changes arising from the project	YES - 9 responses	52,9%
7	Calculate the project success from the point of view of the various stakeholders, reflecting the differences in context, perceptions and interests involved	YES - 13 responses	76,5%

Source: Author (2017)

It is important to emphasize, as previously mentioned in the Methodology session, that this study was based on a qualitative research, and it is not an objective to analyze the results from the statistical point of view.

Graphic 1 – Adherence to criteria by company



Source: Author (2017)

Based on the results, project management indicators, also known as triple constraint, are still highly relevant for IS projects results evaluation. Considering De Wit's (1988) statement that this set of indicators may be considered essential, but not sufficient for success, it is possible to consider that a significant portion, if not a majority of the companies, still adopt practices that, according to Davis (2014), are from the 1980s to the 1990s on this subject.

It should be noted that there are still restrictions on the expansion of the success analysis to broader indicators than those known as triple constraint. The exception was the incorporation of the concept of organizational changes as an indicator of success, as portrayed in question number 13, where a small positive margin of acceptance was computed, with only 52.9% of adherence among the participants.

Important aspects, considered as cutting edge in the literature, such as the use of multidimensional criteria, whether they are represented by quantitative or qualitative indicators, see question number 8, were not mentioned in a majority way by the respondents.

This behavior is related to the still predominant view that relates the success in IS projects to the management concept, restricting, therefore, the analysis only on the period, or phase of the solution implantation, in detriment to a more complete or holistic approach, in order to consider both the impacts brought to the company, and the

extension of the analysis over a longer period of time, so as to allow the capture of the effects brought about by the project in the long term.

4.4 SUGGESTED PRACTICES FOR EVALUATING SUCCESS IN IS PROJECTS

Based on the results obtained by this study, it is suggested the group of indicators stratification into three distinct levels, considering the adherence level and the correlation between them, according to Table 3 below.

The first group is represented by the six most recurrent practices, adopted in a majority way by the companies surveyed, precisely because they represent practices considered fundamental, having as main characteristics the existence of a evaluation formal process and the project implementation efficiency analysis from estimates previously prepared, and validated among the key stakeholders.

Issues related to the adoption of multidimensional criteria, as well as the expansion of the analysis of success in IS projects, besides the management of its implementation phase, are considered as a second level. This stage has as a characteristic to represent a prerequisite to the adoption of other more complex and innovative practices, such as the application of the period of analysis, criteria weightings by distinct layers, among other points.

Then, other categories are grouped in the third level, given the greater complexity involved, both in the metrics definition and monitoring, and in the measurement itself. Despite the low observation, the existence of these practices demonstrated that their adoption is not only possible, but is not translated into mere exceptions. It is expected that as more firms consolidate the focus of analysis on the practices here categorized as level 2, more space is open for new approaches to successful evaluation in IS projects to arise, thus increasing the number of companies framed around practices classified as level 3.

Table 3 – Suggested Relevance for Categories of Analysis

#	Categories of Analysis	Relevance
1	Calculate success through formal and agreed-upon mechanisms	Level 1
2	Assess project success against initial estimates, such as financial feasibility calculations and baselines of cost, time and requirements	Level 1
3	Consider the criteria of term, cost and technical requirements and specifications, known as triple constraint and efficiency criteria for evaluation of success	Level 1
4	Calculate the success of the project from the point of view of the various stakeholders, reflecting the differences in context, perceptions and interests involved	Level 1
5	Consider multidimensional success criteria (besides the triple constraint), with the possible use of qualitative metrics, adapted to the type and context of the projects in question	Level 2
6	Distinguish success of project product from success in project management	Level 2
7	Consider project management as a phase of the product lifecycle, discerning the evaluations by phase	Level 2
8	Consider in the analysis of success the result of organizational changes arising from the project	Level 1
9	Customize project goals and objectives according to each level, or decision layer	Level 3
10	Distinguish success metrics between short- and long-term metrics	Level 3

Source: Author (2017)

In this way, it is proposed to consider, from the entire survey, that a company adopts, as a process of IS projects results measurement, the categories of analysis framed in levels I and II, in order to guarantee not only the presence of a formal and structured process, but also a broader focus of analysis, with the main objective of ensuring that there is a distinction between the evaluation of the implementation process, measured through its management and through the indicators of the triple constraint, the evaluation of the product delivered by the project and its impacts on the various processes and affected stakeholders, extending this analysis including different phases or periods, ensuring greater completeness to the evaluation itself. This is in line with Turner and Serrador (2014), who assert that effective project success must consider not only the metrics of the triple constraint but also broader indicators that measure project impacts on the organization.

5 FINAL CONSIDERATIONS

The IS projects success measurement is not only conditional on the application of techniques or management tools, or the presence of organizational structures dedicated to the subject, nor the presence of certified professionals in standardized methods. Nor is it limited to meeting deadline, cost, and pre-established requirements, even during the planning stages. In order to evaluate the success itself, it is needed go further, considering the positive and negative impacts brought to the company, extending the analysis about the impacted processes, besides the company's own business, considering different points of view, from different areas and people, including a time horizon sufficient to guarantee the maturation of all the effects brought by the project to the organization (DE WIT, 1988; MUNNS; BJEIRMI, 1996; SHENHAR *et al.*, 1997; BACCARINI, 1999; DVIR *et al.*, 2003; MCLEOD *et al.*, 2012; HORNSTEIN, 2015; SERRA; KUNC, 2015; BADEWI, 2016).

All the complexity involved in the various options and combinations of metrics, indicators and possible procedures must be considered, in order to make the process objective and functional, and to minimize the perception that success in IS projects is a variable concept and personal (MULLER; TURNER, 2007).

The aim of this research was to evaluate the adherence of a companies sample that were a reference in their market niches, whether by size or market reputation, to a series of concepts and practices considered modern or cutting edge on the IS projects success evaluation and definition.

Initially, a bibliographical survey was done on the subject, where a series of management practices of projects categorized in ten points, also called categories of analysis, were raised. A sample of seventeen companies, all of them with a relative experience in the subject, were selected for data collection. The research process itself presented variations regarding the form and the degree of involvement and contact between researcher and researcher, but sufficient to guarantee uniformity and standardization in the data collection process.

Based on the data collected, it was possible to note the companies' adherence to at least one successful measurement practice. This

grip, however, was not uniform. In some cases it was observed a great adherence to the practices raised. However, in some other cases, adherence was low, even with an occurrence equal to zero.

Given the limitation of the sample, which covered nine distinct economic sectors, but many with only one participant, it was not possible to extend the adherence analysis to different sectors. Even in cases where there was more than one representative per segment of the economy, as in the case of the information technology industries, with four respondents, the pharmaceutical and food and beverage companies with three each, and the energy with two representatives, noticed a clear tendency of greater or lesser adherence.

In this sense, other characteristics seem to influence the adoption of practices considered more modern and avant-garde, but again, it was not possible to detect which factors exert more influence. Despite this, evidence was suggested in order to encourage future work in this direction. Aspects such as the origin of capital, size of company, economic segment, levels of competition in its sector, as well as aspects related to organizational culture, and the very nature of IS projects, among others, were cited in some way as justification for the presence, or absence, of certain practices.

Therefore, from the sample surveyed, it can not be affirmed that there is any tendency regarding the adoption of avant-garde practices, when considering aspects related to companies context, such as their controlling capital origin, their activity size or sector, or by the type or size of the implanted IS project, a presupposition considered as one of the secondary objectives of this work.

But if on the one hand it was not possible to establish a segmented adherence analysis, the individualized analysis by companies alone provided a number of important considerations, and that even in isolation, they contributed to a better understanding of the categories of analysis.

In this way, as mentioned above, sufficient evidence can be considered to support the assumption that companies consistently use and adopt formal processes and mechanisms for measuring performance, knowledge, agreed upon and accepted internally, and common use to all initiatives related to IS projects, and is not an informal or incipient or growing practice.

On the other hand, it is interesting to note the existence of an isolated case of total nonobservance of the practices analyzed here. Despite representing a low value in statistical terms, representing only 5.88% of the sample, the case brought interesting elements to the analysis, since it was a telecommunications company, generally linked to modern management practices, and linked to the a large Brazilian business group, also renowned for its reputation in both marketing and management terms. However, because it is a newly formed company, in a segment different from the one that originated the main business of its controller, it gives it, according to the respondent, an experimental character regarding the management of the projects, being managed as a startup, with low presence of formal corporate management processes.

In this sense, this singular case is interesting, since it goes contrary to Atkinson's (1999) statements, that project management professionals seem more willing to adopt new methodologies, tools, knowledge and skills in project management, in detriment to new ones ways of measuring results in projects. What it was obtained in this case is precisely a greater prioritization of project results in detriment to the adoption of management processes, based on the agile precepts of development and project management, which, according to Comfort and Amaral (2008), are strongly based on the search for simplicity, flexibility and in interactions and constant addition of value from fast deliveries.

On the other hand, when analyzing the results of the research as a whole, there seems to be a clear tendency, at least in larger companies, to expand the traditional view of project measurement beyond the triple constraint, which meets the affirmations of Morioka *et al.* (2012), that the definition of success in projects, especially in projects involving information systems, is beyond the evaluation of the classic triad of indicators, incorporating new dimensions of analysis, in parallel with the progress in studies about the level of maturity in organizations.

Another assumption of this work was to evaluate if the measurement of success in IS projects would extend to the whole life cycle of the project, considering both the implementation phase of the solution and the use itself.

Since the evaluation of success demands a more extensive view of the process itself, it is necessary that the analysis extends beyond the stage of implementation of the envisaged technological solution, in order to ensure that the anticipated benefits arising from the automation of the processes, being tangibles or not, happened (MUNNS; BJEIRMI, 1996; PMI, 2017; DOHERTY *et al.*, 2012; CECEZ-KECMANOVIC *et al.*, 2014; DAVIS, 2014; HORNSTEIN, 2015).

In this context, three questions were asked, with the results close to the sample median, ranging from 47 to 52% of respondents, that is, in the intermediate range of the total companies surveyed, demonstrating that if the subject is not yet recurrent, these practices are already consolidated for a significant number of companies. This item was considered crucial for companies that want to advance their performance evaluation processes beyond the classic vision of efficiency in the implementation of IS.

The role of stakeholders in the definition and acceptance of success in IS projects was also considered a prerequisite of the study, as it sought to assess whether they were actually involved in the discussion and definition of the indicators, or processes be defined internally, requiring only this approval (MUNNS; BJEIRMI, 1996; SHENHAR *et al.*, 1997; ATKINSON, 1999; DVIR, 2003; JIANG *et al.*, 2009; OGUNLANA *et al.*, 2010; MCLEOD, 2012; TURNER; ZOLIN, 2012; LAPPE; SPANGE, 2013; PMI, 2013, DAVIS, 2014; SILVA *et al.*, 2015)..

Two questions were raised about the subject, the first one in order to verify if stakeholders were actually involved in the process of evaluating the success of the IS projects, and the second, more specific, about the role played in defining the metrics of evaluation.

For the first case, there was a majority participation of the interested parties in the proceeding. Even in the case of companies that responded negatively to the presence of formal mechanisms for evaluating success in projects, it was noted the existence of interactive processes between professionals and areas involved in the initiatives with the objective of aligning and equalizing the understandings about the subject.

The second question indicates that in most cases the participation of the interested parties begins in the very discussion of metrics and

indicators of success to be adopted by the project. Considering the fact that there are distinct criteria per project, it highlights the importance of stakeholders as a factor in project success, suggesting that, at least in a considerable number of companies, there is at least one discussion involving the various points view of the topic.

In this way, it can be considered that, given the representativeness of the sample, both in absolute terms and in terms of comprehensiveness, that the evaluation of successes in IS projects is a consolidated theme in companies, extending beyond simple evaluation of costs, deadlines and requirements. However, it is also noted that the process is not yet formalized, with a series of peculiarities and situations of exception, which in turn give the process a still transient character, or in consolidation, not infrequently with cases in which the same company it is possible to note the existence of practices considered as the most avant-garde, accompanied by others configured as an exception, linked to individualized practices, usually associated with an interested party of great ascendancy and influence on the process.

As future developments, this study suggests two paths. The first is to deepen the practical understanding of the distinction between the success of the project product from success in project management in companies. What would lead a company to cross the border of the traditional triple constraint as a factor in the success of its information systems projects, to consider different elements, such as impact on processes, and business in general? A second suggestion would be to develop an in-depth study on the segmentation of practices by different companies, considering criteria such as size, origin of capital and economic sector, among others. Such an analysis, in principle, could contribute to a better understanding of the facts that would contribute, or, on the contrary, make it difficult to expand and extend the analysis of success in projects to the most avant-garde practices.

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