

Critical Success Factors in IT Projects: An Exploratory Survey

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ABSTRACT: Considering that the Critical Success Factors (CSF) are key points which define the success or failure of a particular project because, if well defined, they guide the efforts of the management process. This article aims to determine, group and prioritize the critical success factors (CSF) in Information Technology (IT) project management to the light of the Brazilian experience. As research methodology we realized a literature review to search for references of success and failures in IT projects. The primary studies occurred in scientific data basis and their results were grouped in an exploratory survey with quantitative approach. The survey was answered by 77 specialists in Information Technology and stakeholders. The results evidence the importance of the following factors: project planning and control, as well as human resources management and the relevance of supporters' endorsement to the project

KEYWORDS: Critical Success Factors, project management, Information technology, information system, planning, survey

I. INTRODUCTION

Nowadays, the fast changes in technological and business aspects generate an increasingly competitive global scenario which demands innovation and quality. It provokes the need for the promotion of strategic changes and the achievement of better results of business goals, since everything needs to happen in a short term and using the less financial resources as possible.

The results published by the International Company Standish Group were one of the motivational factors for this research. The group started researching the success and failure of software projects in 1990. Ever since, they have published a report called "Chaos Report", every two years, which aims to evaluate the maturity in the development of IT solutions [28]. Every time this report is released, it contains recent statistics about many different aspects of software projects. The first report, which contains data of 1994, indicated that only 16% of all software projects were well succeeded, 31% were considered failures and 53% were considered as "challenges". The term "challenge" is used to indicate a project which is on delay about the cost or does not contain the original set of required resources (reduced scope or quality).

Well succeeded projects are defined as projects finished within the established deadline, according to the budget and containing substantially all the necessary resources and functions originally specified. Only 16% of the projects were well succeeded in 1994 (Standish Group – Chaos Report 2003).

Even after 20 years, considering the results published in 2013 by The Standish Group International with the report "Chaos Manifesto" [29], which presents results of projects during the years of 2004 and 2012, show that the fail in project management was 18%, with a relative evolution in the success tax, which skipped from 29% to 39%. Although, if we consider the tax of projects with problems, we may conclude that the tax of succeeded projects is still very small (Standish Group – Chaos Manifesto 2013).

Project management has a key importance to the success of a project, contributing to the achievement of the enterprise goals, because it tries to predict better costs, follow deadlines, have more committed teams, minimize risks and reduce

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efforts. Project management is the use of knowledge, abilities and techniques to the execution of projects in an efficient and effective way. It is related to a strategic competence to organizations, allowing them to unite the project results to the business goals and, therefore, compete better in their markets [22].

The biggest challenge of the project manager is to find the best way to balance the key variables to the project, like cost, deadline, reduction of risks, communication, management of the team and its possible conflicts, as well as to be able to manage the changes of requirements and scope or even resources during the execution of the project.

So, this article aims to determine, group and prioritize the critical success factors (CSF) in Information Technology (IT) project management to the light of the Brazilian experience. We expect to present data which can contribute to the success of IT project management by guiding the main critical success factors which, if well defined and planned, may direct the efforts of the management process. According to Rockart [24], the Critical Success Factors are defined as key areas which favorable results are absolutely necessary for managers to achieve their goals. To Milosevic and Pantanakul [17] in a perspective of project management, the CSF are characteristics, conditions or variables that can have a significant impact on a project success when properly sustained, maintained and managed. Therefore, this article is structured according to the following sections: the state of art, methodology, results and underlying analysis, conclusions and results and references.

II. THE STATE OF ART

IT PROJECT MANAGEMENT

Information Technology has being pointed as a very important factor to the fast evolution of organizations, because it optimizes their competitive strategies and enriches their organizational process. According to Rodrigues [25] in an environment characterized by changes, Information Technology (IT) takes a vital role to the improvement of competitiveness of organizations.

The effectiveness of project management is characterized by many factors that are deeply connected to the stages of development. According to the PMBOK [22] project management is the application of knowledge, abilities, tools and techniques to the project activities, aiming to fulfill their requirements.

Prado [23] says that one can define success in management when the project:

1. Achieves the established goal in relation to the scope suggested and the client satisfaction, within the limitations of deadline, costs and quality;
2. Achieves the stakeholders' expectations (supporters and people who are interested or engaged to the project).

The ISO 10006 – Guidelines to Project Management Quality – project is a “unique process, which consists in a group of coordinated and controlled activities with a date to start and finish, taken in order to achieve a goal according to specific requirements, including limitations of time, cost and resources”.

According to the PMBOK [22], “a project is a temporary effort which aims to create a product, service or exclusive result. Projects and operation are different, specially because projects are temporary and exclusive, while operations or processes are continuous and repetitive”.

Information technology project management has some peculiarities in relation to other projects, because they need project managers with more abilities in technical and interpersonal leadership, considering the intangibility of many of the products delivered (software), identification of requirements, project progress, estimate time, methodology, technology, tools, etc [2].

Critical Success Factors – CSF

Developed by Rockart [24], the critical success factors are an empirical method based on interviews, which provide structured techniques that may be used by interviewers to identify the management priorities.

After, the results are compared to verify the intersections. They may be used to plan and build management information systems; in a top-down system of deployment: industry, enterprise, department, individuals. Most of the managers use the CSF concept, even implicitly. However, once explicit, the allocation of resources can be correctly defined.

According to Wideman [33], Critical Success Factors are measurable, listed in order of importance. When these factors are present in the project environment they are the main conductors to project. When well defined, the critical success factors are a reference to the activities guided to the organization missions.

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The Research Method Survey

The research method survey may be described as a way to obtain data or specific information, actions, opinions of a certain group of people – a target population – through a research tool, usually a questionnaire [21], aiming to produce quantitative description of a population [12]. According to Freitas [13] a survey research is classified according to its purposes (explanatory, exploratory, descriptive) and according to the time (longitudinal and cross-sectional).

As we aim to provide perspectives for future studies, this an exploratory survey research, which intends to look for new concepts to be measured or identified which concepts are appropriate to be measured in a certain situation and, yet, how they should be measured. In this method, new possibilities of study in the target population may arise [13].

III. METHODOLOGY

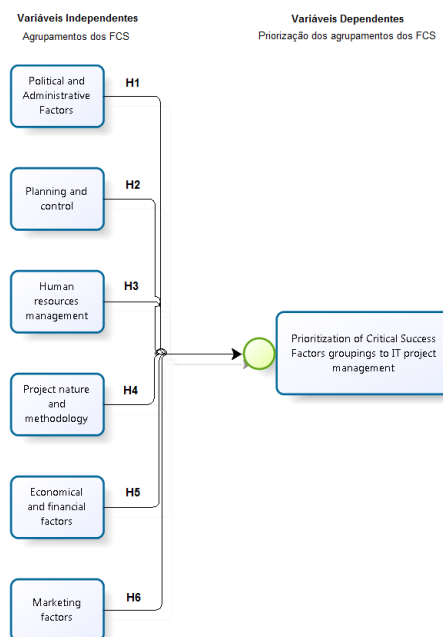
TYPES OF RESEARCH

This quantitative research involved the application of a questionnaire (survey). According to Freitas [13], the survey studies are realized to allow descriptions about a specific population. To do so, we used an electronic tool for data collection with Information Technology specialists in Brazilian public companies, trying to prioritize, in degree of importance, the groupings of Critical Success Factors.

Conceptual Model

Based on the study goals, the concepts and information from the literature review, as well as the knowledge obtained from the exploratory phase of the research, we elaborated the basic conceptual model of this research. It is composed by a set of variables related to the groupings of Critical Success Factors. The chart below (Picture 1) shows the conceptual model of the research, which constitutes a guide to illustrate the important concepts about the problem to be explored by the survey.

Picture 01 - It is the conceptual model where the surveyed clusters are presented for the implementation of the survey aimed at prioritizing the critical success factors.



DATA COLLECTION AND SAMPLE

The methodological aspect of this research is described as exploratory study with the application of an electronic questionnaire (survey) to a quantitative approach, aiming to provide subsidy to data analysis, presentation and prioritization of CSF for IT project management.

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We researched on specialized articles with pre-established criteria by key-words in data basis so we could define the references of facilitators and barriers in IT project management. These items were grouped to the application of a research, aiming to prioritize them. The research was applied with 102 (one hundred two) IT specialists and clients. The research was divided in two phases:

Search for references of facilitators and barriers to IT Project management, on scientific data basis;

Data basis used in this research:

- 1) ACM Digital Library - <http://portal.acm.org>
- 2) ScienceDirect – Elsevier - <http://www.elsevier.com>
- 3) IEEE Xplore - <http://www.ieee.org/web/publications/xplore/>
- 4) Emerald - <http://www.emeraldinsight.com>
- 5) Google Scholar - <http://scholar.google.com.br/>
- 6) ISI Web of Science - <http://www.isiknowledge.com>
- 7) Wiley InterScience - <http://www.interscience.wiley.com>

a) To develop the research we defined the following key-words:

- 1) IT project management;
- 2) facilitators in IT project management;
- 3) barriers in it project management;
- 4) IT critical success factors (CSF)

Initially we foresaw the possibility to change these key words if the results presented many studies with no relation to the research subject, or the lack of related works. Considering the fast technological change in IT, we used as exclusion criteria articles published before 2008.

b) CSF grouping

After searching the data basis, we read the articles chosen and selected the main occurrences of facilitators and barriers in IT project management. These items were grouped in six areas, which are described below:

- 1) Political and Administrative Factors;
- 2) Planning and Control;
- 3) Human Resources Management;
- 4) Project Nature and Methodology;
- 5) Economical and Financial Factors;
- 6) Marketing.

c) Application of the electronic questionnaire (survey)

Trying to provide statistics analyse of the data to prioritize the CSF, having as a target population people involved in IT project management (specialists, IT team, IT project managers, stakeholders, IT professors), categorized by education level, experience time, operational or management roles and the federation unit where they work.

The people who answered could use a rating scale based on the 5-point importance scale, with the following alternatives and values: 1) Very irrelevant 2) Somehow relevant 3) Relevant 4) Very relevant; 5) Totally relevant.

d) Statistical data analysis

The data collected in the research was submitted to statistical analysis.

To base and support this research we used the following computational tools: Google Forms; Google Sheets, Google Drive, Microsoft Excel e Analysis software for statistical application “R”.

To develop the questionnaire which systematizes and apply the research we used the free tool “Google Forms”. The data collected was tabulated with “Google Sheets”, stored on “Google Drive” and exported to the electronic spreadsheet “Microsoft Excel” to generate supporting graphics.

This survey research was sent to 102 (one hundred two) people, from which we obtained 77 (seventy-seven) valid answers of specialists, IT project manager, IT team, stakeholders and IT professors

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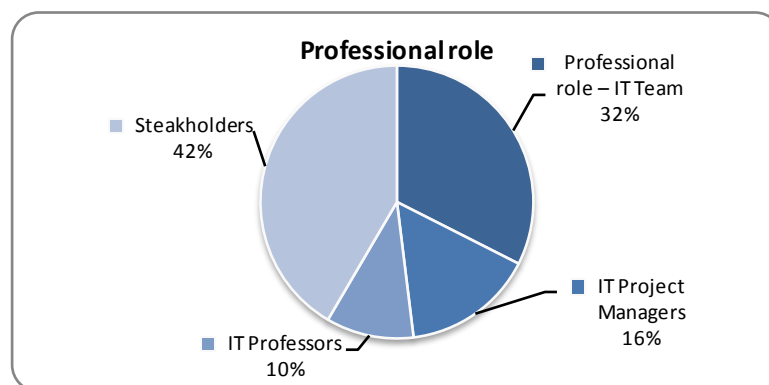
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IV. UNDERLYING RESULTS AND ANALYSIS

Aiming to analyze and comprehend better the scenario of the research, the survey responses were tabulated and categorized by: professional role; education level; time of experience in IT; federation unit where they work. After categorizing the respondents' profiles, we calculated the average attributed to each grouping, which allowed to classify and provide the graphical analysis of the results.

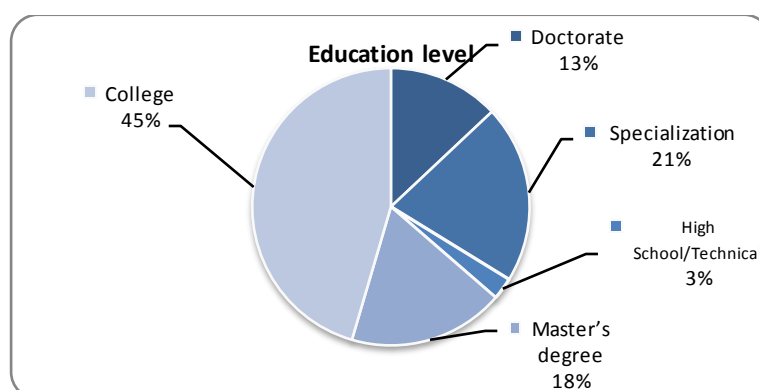
The graphics with the results are presented below: The Picture 02 shows the statistical result with the percentage of the 77 specialists which responded to the survey. Most of the responses were given by stakeholders which, according to Freeman [13] may be defined as "any group or individual which can affect or is affected by the achievement of the organization goals". The second bigger group of respondents is the IT teams with IT analysts or solution developers. The IT project managers compose the third bigger group of respondents and, in the fourth place, IT professors.

Picture 02 – Respondents by professional role - shows the statistical result with the percentage of the 77 specialists which responded to the survey.



Picture 03 presents the education level of the IT specialists who responded to the survey. The group is composed by two IT techniques; 35 college students (employers, interns and fellows in IT enterprises); 16 specialists; 14 masters and 10 doctors, which qualifies the researched environment validating definitively the answers presented.

Picture 03 – Respondents by education level - presents the education level of the IT specialists who responded to the survey



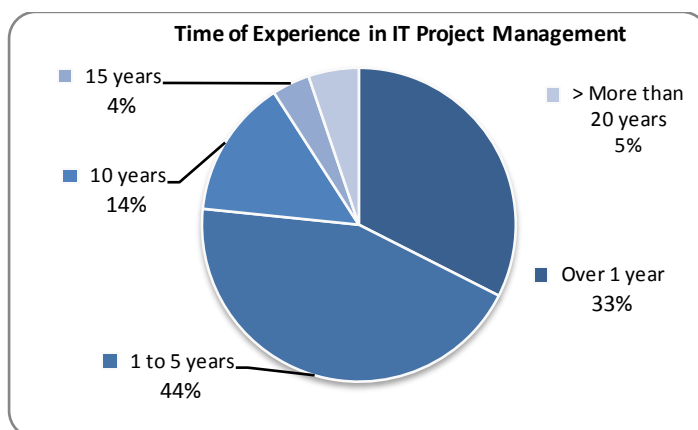
To proof the degree of experience of the respondents presented on Picture 4, we asked about the time of experience in IT. The result is that 18 of the respondents have experience of more than five years, 34 between 1 and 5 years, and 25 more than 1 year of experience.

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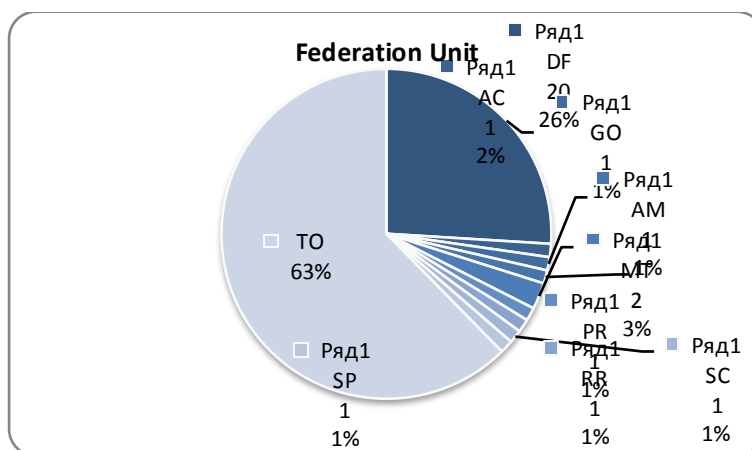
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Picture 04 – Time of experience in Information Technology projects - It is presented to search with a time of experience in computer science



On Picture 5 we present a statistical analysis of the federation unit where the respondents' work. From that we may see that 63% of them work in Tocantins, 26% in Distrito Federal and other 11% who work in São Paulo, Santa Catarina, Roraima, Paraná, Mato Grosso, Amazonas, Goiás e Acre.

Picture 05: Respondents by federation unit - It is presented a statistical analysis of the federation unit where the respondents' work



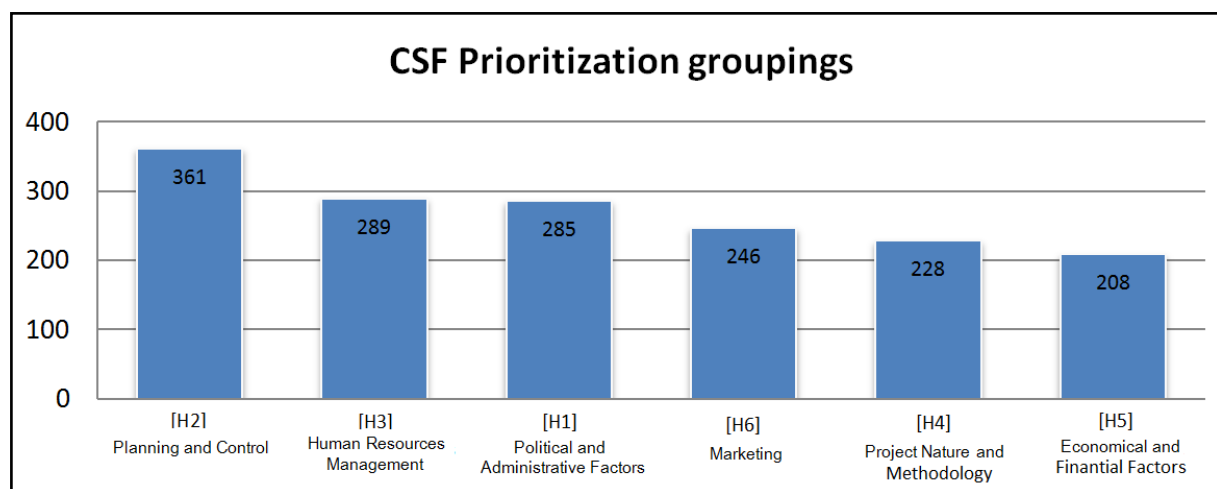
On Picture 06 we presented the answers with CSF prioritization groupings.

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Picture 06 - CSF Prioritization for IT project management - It presents the final results of the research with the ranking and prioritization of critical success factors for IT project



To realize this quantitative exploratory analysis we tried to highlight the most relevant opinions about the CSF and also about the strategic value of the project in the organization, according to specialists and stakeholders' experiences. The results show the key importance of project planning and control, as well as human resources management, as well as the fundamental relevance of political administrative factors, characterized by the endorsement of supporters and strategic alignment of the project to the business, following the marketing tendencies and technological innovations.

V. CONCLUSIONS AND LIMITATIONS

This article aimed to identify the main Critical Success Factors (CSF) to Information Technology Project Management. As a research methodology we realized a literature review to look for successful and failed references in IT project management. The primary studies occurred in scientific data basis. After that, the data was grouped by related areas and we applied a survey, answered by 77 specialists in Information Technology and stakeholders. The results revealed the importance of the following factors: project planning and control, human resources management and the key relevance of the project supporters' endorsement.

The identification of the main facilitators and barriers for IT projects guarantees a wider vision of the process during the project management in this area. It allows to prioritize actions and to implement the most appropriate decisions, to guarantee success in the implementation of IT projects.

We understand that the enterprises may look for a clear definition about its planning management and business strategy. To establish importance among the main IT project factors enables to conclude which is the adherence between the contributions and the critical success variables during management, suiting possible aspects to increase the chance of success.

RESULTS ANALYSIS

With the aim to classify and check the average of responses to this research, we realized a variance data test and after an average test using the comparison method Scott-Knott [8]. This analysis revealed that three groups received similar evaluations of priority, specifically: Human resources, political-administrative factors and marketing.

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Picture 07 –Average test using comparison test Scott-Knott – R program – it present a variance data test and after an average test using the comparison method Scott-Knott

AVERAGE TEST SCOTT-KNOTT			
Groups		Treatments	Means
1	a	Planning and Control	4.722222
2	b	Human Resources	3.708333
3	b	Political-administrative factors	3.666667
4	b	Marketing	3.333333
5	c	Project Nature and Methodology	2.944444
6	c	Economical-financial Factors	2.680556

RECOMMENDATIONS AND FUTURE WORKS:

After statistic data analysis, presented by variance and average test, we recommend, for future works, to do interviews aiming to improve the results of this study. Another recommendation for future works would be the extension of the questionnaire to other federation units or sectorization to specific regions of the countries and categorization of enterprises as public and private.

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