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Critical Success Factors in Project Management: An Exploratory Study of an Energy Company in Brazil

By Paulo Cesar Felix Osorio, Osvaldo L G Quelhas, Luis Perez Zotes,
Eduardo Shimoda & Sérgio França

Fluminense Federal University, Brazil

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Keywords: *project management. project success. project-critical success factors.*

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Critical Success Factors in Project Management: An Exploratory Study of an Energy Company in Brazil

Paulo Cesar Felix Osorio^α, Osvaldo L G Quelhas^σ, Luis Perez Zotes^ρ, Eduardo Shimoda^ω
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Abstract- In a competitive business environment, the use of project management can allow organizations to strategically structure themselves to achieve their business goals and needs. In this way, organizations can invest in more effective project management that is aimed at achieving better performance, maximizing the possibility of success, and minimizing the chance of failure. Within this context, organizations must know which critical factors are most responsible for the success of a project to manage these factors in the best possible manner. The aim of this paper is to understand the relationship among critical success factors (CSF) in project management and the outcome of projects, from a contingency perspective. The field research developed in a company in the energy sector was done in two phases: document analysis and survey research with questionnaire applied to key stakeholders and 133 completed questionnaires were obtained. One result of the research indicates the CSF "Support from upper management" and "Scope clearly defined and detailed" as the most significant impact on the success of project management.

Keywords: *project management, project success, project-critical success factors.*

I. INTRODUCTION

According to authors such as Cleland and Ireland (2007), formal project management has existed for over 50 years; however, the history of management practices dates back to antiquity, as confirmed by large construction projects of the past such as the Great Pyramids and numerous canals, bridges, cathedrals, and other infrastructure projects.

According to Shenhar and Dvir (2010), in a competitive business environment, projects play an important role in organizations' strategic management. Projects are vectors for change and for the implementation of strategies and innovations that can bring competitive advantages to companies.

To authors such as Kerzner (2006) and Meredith and Mantel (2003), the last few decades have been marked by an increased use of project management as a way for organizations to structure themselves to achieve their goals. The recessions of 1979-83 and 1989-93 contributed to companies' recognition of the benefits of using project management.

According to Pinto and Slevin (1987), the process of managing a project is a constant challenge to its manager – the project manager – from the very beginning. A project's complexity requires its manager to have the ability to address a variety of issues with human, financial, and technical dimensions, to name a few, as well as their interactions. As a result, project managers must respond to difficult tasks, and their jobs are often characterized by overwork and a frantic pace.

As observed by authors such as Kerzner (2006), Munns and Bjeirmi (1996), and Oliveira (2002), the results of an organization's strategic planning guide it to undertake projects that can contribute to its strategic goals. Therefore, organizations seek to invest in more consistent project management that is aimed at improved performance, a maximized possibility of success, and a minimized chance of failure.

Oliveira (2002) defines strategic planning as the process of elaborating and implementing decisions on an organization's future course. Investing time and resources in the elaboration of a strategic plan can guide organizations to accomplish their strategic goals.

Kezner (2006) suggests that an organization's goals may not be achieved if attention is not paid to critical aspects such as project complexity, requests for changes in scope, organizational restructuring, project risks, technological changes, and financial planning, to name a few.

To Barcaui and Quelhas (2004), all of these factors place project management in a strategic position within organizations because the efficient implementation of projects may be the path by which organizations can reach their strategic goals and obtain the best possible results.

In this context, the objective of this paper is to understand the correlation between the critical success factors cited in academic papers and its impact on the success of project management.

To meet this goal, the concept of success is analyzed, and the critical factors are then defined and identified through the application of a questionnaire to specialists from an energy company.

Author ^α ^σ ^ρ ^ω [¥] : Fluminense Federal University.
e-mail: paulo_cesar_osorio@yahoo.com.br

The researched was developed in an important energy company in the period among October and December 2012.

II. BRAZIL'S ENERGY MARKET

To describe Brazil's energy market, data from the Brazilian National Petroleum, Natural Gas and Biofuel Agency (Agência Nacional de Petróleo, Gás Natural e Biocombustíveis - ANP), the Energy Research Company (Empresa de Pesquisa Energética - EPE), Petrobras, the International Energy Agency (Agência Internacional de Energia - IEA), and the Energy

Information Administration (EIA) were used. These data reflect the current status of the energy industry in Brazil.

According to Amaral (2013), petroleum is the primary energy source both in the world and in Brazil's energy matrix. Although petroleum consumption in Brazil is greater than the world's average, the Brazilian energy matrix is quite clean, with little participation of coal (5% in 2009) and a significant presence of renewables such as hydroelectricity and sugar cane derivatives.

Figure 1 presents the Brazilian energy matrix, which provides a better understanding of the trends that shaped the sector over the last few decades.

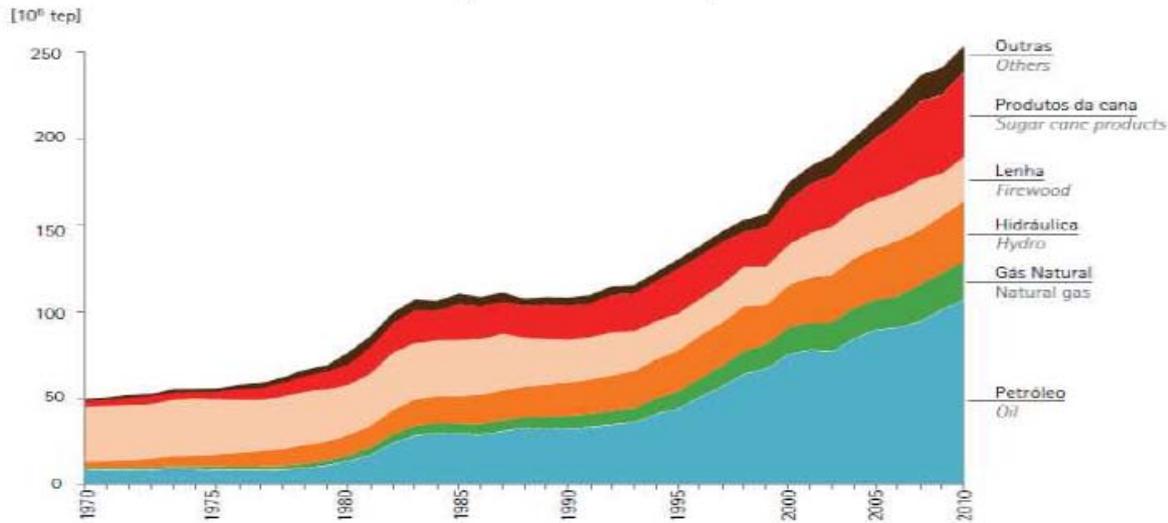


Figure 1 : Primary Energy Production in Brazil – 1970 – 2010 (million TOE)

Source: Empresa de Pesquisa Energética (2011).

According to the EIA report (Energy Information Administration, 2013), among all countries, Brazil is the eighth largest consumer of energy in the world and the third largest in the Americas, behind the United States and Canada. Brazil's total consumption of primary energy has increased by more than one-third in the last decade as a result of strong economic growth and the development of a new middle class.

Statistics show that Brazil is the world's 10th largest energy producer. Moreover, Brazil has made great progress in increasing its total energy production, especially petroleum and ethanol. Increasing internal petroleum production has been a long-term goal of the Brazilian government, and the recent discovery of large offshore reservoirs, namely pre-salt oil, could turn Brazil into one of the world's largest petroleum producers (EIA, 2013).

Because of the pre-salt oil discoveries in Santos Bay, Brazil is emerging as a new leader in the petroleum sector. Over the last three decades, Petrobras - the national petroleum company - has made a series of significant discoveries at sea, beginning with Campos Bay, and in the process has become a world leader in

deep-water technologies. The exploitation of deep-water oil fields by Petrobras and its partners will be complex and expensive, but it has the potential to turn Brazil into a significant petroleum exporter as well as an important producer of natural gas (International Energy Agency, 2013).

Figure 2 shows Brazil's energy demand, which has closely followed its gross national product (GNP) over the last two decades. Since 1990, the demand for energy has doubled, reaching almost 270 million tons equivalent of petroleum (Mtoe) in 2011.

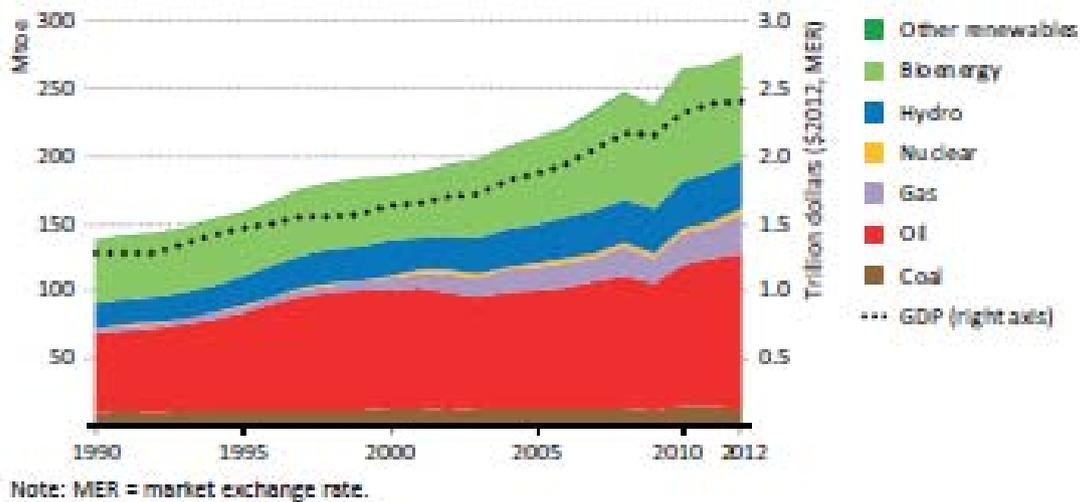


Figure 2: Brazil's primary energy demand and GNP growth

Source: International Energy Agency (2013).

The pace of growth, both in economic activity and in the demand for energy, has increased since the turn of the century: from 2000-2011, the average annual GNP growth was 1% higher than in the previous decade, i.e., 3.5% instead of 2.5%.

Petroleum and renewable energy (most importantly, bioenergy and hydroelectric energy) have remained dominant in the primary energy mix. The only significant change over the last two decades has been an increase in demand for natural gas, which increased its participation in the primary energy mix from 2% in 1990 to over 10% today (IEA, 2013).

III. SUCCESS IN PROJECTS

According to several authors, including Baccarini (1999), Belassi and Tukel (1996), De Wit (1988), Kerzner (2006), Pinto and Slevin (1988), and Shenrar and Dvir (2010), one theme within project management that is frequently discussed but seldom agreed upon concerns the notion of project success.

According to Kenny (2003), when judging a project's success within an organization, one cannot limit the analysis to the efficiency of the project management processes employed but must also take into account the project's effectiveness in contributing to the organization's strategic objectives.

To Jugdev and Müller (2005), project management is established to optimize projects' efficiency and effectiveness. Efficiency refers to maximizing production to a given input level, and effectiveness means achieving the project's goals and objectives. Both are goal-oriented practices that are related to achieving success.

To Dweiri and Kablan (2006), effectiveness is measured or evaluated as a function of the degree to which project goals are achieved, while efficiency is

measured as a function of meeting the project's deadline, budget, and quality criteria.

Patah (2010) argues that project success is related to two components, efficiency and effectiveness. The success of any project is determined by how well the project contributes to the achievement of the organization's strategic objectives (effectiveness) and how well the project has been carried out (efficiency). In an organizational environment, projects are ways to implement strategies. Therefore, a project's objectives must be directly connected to the organization's strategic objectives.

Shenrar and Dvir (2010) reinforce the concept of project success linked to efficiency and effectiveness. Meeting deadline and budget goals indicates that a project has been efficiently managed. However, most projects are part of their organizations' strategic management and must be evaluated based on their contributions to the business' results (effectiveness).

Based on their study, Shenrar and Dvir (2010) suggest that a project's success can be defined by five metrics:

- The first dimension, project efficiency, represents a short-term metric that is concerned with whether the project was completed according to plan.
- The second dimension, client impact, represents the main stakeholders and should clearly show how the project improved the client's business.
- The third dimension, impact on team, assesses the team's satisfaction and the indirect investment that the organization made in the team members, including further qualifications and the development of professional and managerial skills.
- The fourth dimension, commercial and direct success, is related to the project's commercial success and its contribution to the organization's final results.

- The fifth dimension, preparing for the future, reflects how well the project helped the organization prepare its infrastructure for the future, and how the project created new opportunities.

IV. EFFICIENCY AND EFFECTIVENESS IN PROJECTS

According to Patah (2010) in an organizational environment, projects are the way to implement strategies. Therefore, project objectives should be directly linked to strategic objectives. The effectiveness in any project is determined by how well the project contributes to the achievement of the strategic objectives of the organization and efficiency is determined by how well the project was conducted.

According to Shenrar, Poli and Lechler (2000 apud SHENRAR; Dvir, 2010), efficiency represents projects which are operationally managed focused on

doing the scope and meet goals on time and budget, while effectiveness represents projects which are strategically managed focused on getting results for business and grow the marketplace.

According to Shenrar and Dvir (2010) the goals of time and budget indicate that the project was managed efficiently. However, most of the projects are part of the strategic management of their organizations and should be evaluated based on their contributions to business outcomes (effectiveness).

To Dweiri and Kablan (2006) effectiveness is measured or evaluated based on the degree of achievement of the project objectives and efficiency based on the achievement of time, cost and quality criteria of the project. The table below presents a summary of the concept of effectiveness and efficiency for managing projects cited in the literature.

Table 1 : Definition of effectiveness and efficiency for managing projects cited in the research literature.

	Effectiveness	Efficiency
Patah (2010)	The effectiveness in any project is determined by how well the project contributes to the achievement of the strategic objectives of the organization	The efficiency is determined by how well the project was conducted.
Jugdev e Müller (2005)	The effectiveness means achieving goals and objectives; and both are guided by practical purposes related to obtaining successful.	The efficiency means maximizing output for a given input level.
Shenrar, Poli e Lechler (2000) apud Shenrar e Dvir (2010)	The effectiveness is strategically managed projects focused on getting results for the business and grow in the marketplace.	The efficiency is operationally managed projects focused on performing the scope and meet time and budget goals.
Shenrar e Dvir (2010)	Projects should be evaluated based on their contributions to business results.	The meeting targets for time and budget indicate that the project was managed efficiently.
Dweiri e Kablan (2006)	The effectiveness is measured or evaluated based on the degree of achievement of project objectives.	Efficiency is measured through the achievement of time, cost and quality criteria of the project.

Source: The author (2014).

In this paper Effectiveness is determined by how the project contributes to the achievement of business results and Efficiency is measured as a function of performing the scope and meeting targets of time, cost and quality criteria of the project.

V. CRITICAL SUCCESS FACTORS IN PROJECTS

Baccarini (1999), Pinto and Mantel (1990), Pinto and Prescott (1988), Pinto and Slevin (1988), Shenhar et al. (2001), understand that the process of managing projects involving the implementation of successful projects in organizations, represents topic of interest to researchers and project managers.

Much has been written to help project managers in their efforts to manage and guide a variety of organizational projects with greater efficiency and effectiveness. Empirical and conceptual approaches have been applied to the study of the management of the project and as a result, different process models

were presented and CSF contributed significantly to the success of the project.

According to Meredith and Mantel (2003), Pinto and Slevin (1987) the factors considered critical for the success of a project are different for different types of projects and industries, while emphasizing that these factors have an important influence on the success of the project and the organization.

Dvir et al. (1988) suggest that the CSF projects are not universal for all projects. Different projects have different sets of CSF, suggesting the need for more contingent approach to the theory and practice of project management.

Cooke-Davies (2002) examined 136 projects carried out between 1994 and 2000, at 23 major European private companies. The development of CSF is related to answers the following questions:

- What factors lead to success in project management?

- What factors lead to successful projects?
- What factors lead to consistently successful projects?

The first question, "What factors lead to success in project management?" leads the CSF that once applied by organizations, bring benefits that outweigh project management and impact the entire organization, taking a more strategic connotation (effectiveness) (COOKE-DAVIES, 2002).

The second and third questions, "What factors lead to successful projects?" And "What factors lead to

consistently successful projects?" leading to the CSF related to a well done project management (efficiency) (Cooke-Davies, 2002).

Fortune and White (2006) conducted an extensive literature review of 63 publications focusing on CSF. As a result of their work provided a list containing twenty-seven critical factors. The following table presents the CSF identified across 63 publications in descending order of frequency.

Table 2 : Critical Success Factors identified across 63 publications

Critical Factor	Count of citations	
Support from senior management	39	9,8%
Clear realistic objectives	31	7,8 %
Detailed plan kept up to date	29	7,3%
Good communication/ feedback	27	6,8%
User/client involvement	24	6,0%
Skilled/ suitably qualified/ sufficient staff/team	20	5,0%
Effective change management	19	4,8%
Competent Project manager	19	4,8%
Strong business case/ sound basis for Project	16	4,0%
Sufficient /well allocated resources	16	4,0%
Good leadership	15	3,8%
Proven/ familiar technology	14	3,5%
Realistic schedule	14	3,5%
Risks addressed/ assessed/ managed	13	3,3%
Project sponsor/ Champion	12	3,0%
Effective monitoring/ control	12	3,0%
Adequate budget	11	2,8%
Organizational adaptation/ culture/ structure	10	2,5%
Good performance by suppliers/ contractors/ consultants	10	2,5%
Planned close down/ review/ acceptance of possible failure	9	2,3%
Training provision	7	1,7%
Political stability	6	1,5%
Correct choice/ past experience of project management methodology/ tools	6	1,5%
Environmental influences	6	1,5%
Past experience (learning from)	5	1,3%
Project size (large)/ level of complexity/ number of people involved (too many)/ duration (over 3 years)	4	1,0%
Different viewpoints (appreciating)	3	0,8%

Source: Fortune and White, (2006).

However, despite growing lists of CSF, projects recognized by success are still rare. According Zwikael and Globerson (2006) CSF are general and do not contain sufficiently specific knowledge to support better decision making by the project manager.

For Dvir et al. (1988), Meredith and Mantel (2003), Pinto and Prescott (1988), Pinto and Slevin (1987), Shenhar et al. (2001), Shenhar and Dvir (2010), factors considered critical for the success of a project are distinguished for different types of projects and industries.

VI. RESEARCH METHOD

Based on the literature review of 63 publications focused on CSFs by Fortune and White (2006), the 27

most cited CSFs were incorporated into this study's questionnaire, and their descriptions were duly adjusted to allow conceptual unity and better understanding without losing comprehensiveness and meaning in the process.

In this study we chose to structure research in two phases. The first phase was a literature search, covering project management, critical success factors in project management and evaluation of project success. The field research was developed in a company in the energy sector with a survey research questionnaire applied to the project managers involved in major projects of the company. The last phase was the analysis and discussion of results.

In the first stage a critical analysis of the company project portfolio was carried out. We considered indicators drawn from the company database, among which may be mentioned budget, duration and scope maturity.

The questionnaire aimed to identify, among some critical success factors of projects mentioned by the literature, the impact that each one has on company

projects. From this result it was possible to identify the correlation between the CSF with a focus on effectiveness and efficiency of projects.

In Table 3, the CSF identified in the reviewed literature are presented in groups that are organized according to the concepts of effectiveness and efficiency discussed in previous section.

Table 3 : Critical success factors identified in the literature review

Component	Variable
Effectiveness	Support from upper management
	Clear and realistic goals
	Detailed and up-to-date Project Plan
	Efficient communication channels and system
	Involvement and commitment of stakeholders
	Effective control of changes
	Availability of information on the history of previous projects
	Adequate organizational structure
	Effective process for hiring suppliers
	Qualified project team and management
	Adequate project management tools and methodology
Efficiency	Project size and complexity
	Experienced and competent project team
	Experienced and competent project manager
	Clearly defined and detailed scope
	Sufficient and well-allocated resources
	Realistic timeline
	Effective risk management
	Effective project monitoring and control
Realistic budget	

Source: The author (2014).

For each CSF, one objective assertion is presented to each respondent for him or her to classify how this factor applies to the success of his or her company project.

As assessed by the respondents, in this study, success refers to how well the project contributed to the achievement of the organization's strategic objectives (effectiveness) and how well the project was carried out (efficiency).

Next, a questionnaire with answers that could be analyzed using a Likert-type scale was composed (Likert, 1932). Additionally, an alternative for abstention (I do not know/I would rather not choose) was provided.

This classification through a Likert-type scale contains five alternatives that indicate the level of importance attributed to the assertion regarding the particular CSF. This scale varies from 1, not at all important, to 5, very important.

The specialists were selected by convenience sampling, i.e., a non-random sample whose elements

are conveniently picked according to a given criterion. Non-random convenience samples seek to generate samples that adequately represent the population from which they have been extracted. The population consists of project managers at energy company in Brazil.

In choosing project management specialists, the premise of sending the questionnaire to the managers of approximately 900 projects that compose the company's project portfolio was adopted.

For the choice of the number of specialists to be interviewed, Richardson's recommendation was adopted: the number of specialists in project management who were identified as having the described profile in the organization being studied was 320, and the sample was set to 133 specialists, i.e., 41.5% of the total (Richardson, 1999).

Regarding respondents' experience as project managers, 57.8% claimed to have over 8 years of experience, 15.8% between 5 and 8 years, 16.5% between 3 and 5 years, 7.5% between 1 and 3 years,

and 2.3% up to 1 year. All of the respondents claimed to have a college degree, and 78.9% said they had some specialization or MBA, while 21.1% claimed to have a Master's or Doctoral degree. In the sample, 72.2% are certified as a Project Management Professional (PMP) by the Project Management Institute (PMI).

In developing a questionnaire, two aspects are considered very important: its validity and its reliability.

According to Richardson (1999), validity can be considered as the degree to which the scores from a test relate to some criterion that is external to the test.

Hayes (1995) defined reliability as the degree to which the measured result reflects the true result, i.e., the degree to which a measurement is free from the variance of random errors.

Cronbach's alpha coefficient was used in this study to investigate the reliability of the questionnaires used herein.

In 1951, Lee J. Cronbach described the alpha coefficient (Cronbach, 1951). This test represents an estimate of questionnaire reliability that has been applied in many studies. Given that all of the items in the

questionnaire used the same measurement scale, the α coefficient, restricted to the [0,1] interval, was calculated from the variance of the individual items and the covariances between items through the following equation:

$$\alpha = \frac{k}{k-1} \left[\frac{S_t^2 - \sum_{i=1}^k S_i^2}{S_t^2} \right]$$

where k is the number of items in the questionnaire, S_i^2 is the variance of the i-th item, and S_t^2 is the questionnaire's total variance.

According to Streiner (2003), the value of Cronbach's alpha should be between 0.7 and 0.9. If it is below 0.7, the internal consistency of the scale being used is considered low, and if it is above 0.9, redundancy or duplication is considered to be present. Cronbach's alpha values between 0.8 and 0.9 are preferred.

Table 4 shows the results of the internal consistency analysis for the items belonging to each of the dimensions used.

Table 4: Reliability analysis for the internal consistency of questionnaire items

	Effectiveness	Efficiency
Cronbach's α Coefficient	0.80	0.83

Source: The author (2014).

The internal consistency of the answers obtained from applying the questionnaire in the company being studied reveals that the questionnaire displayed high reliability in the context in which it was applied.

The Cronbach's alpha values found for the dimensions investigated meet Streiner's requirement that the values of the alpha coefficient should be between 0.80 and 0.90 (Streiner, 2003).

Thus, suitable levels of relevance and robustness confirm the reliability of the results obtained for the company being studied.

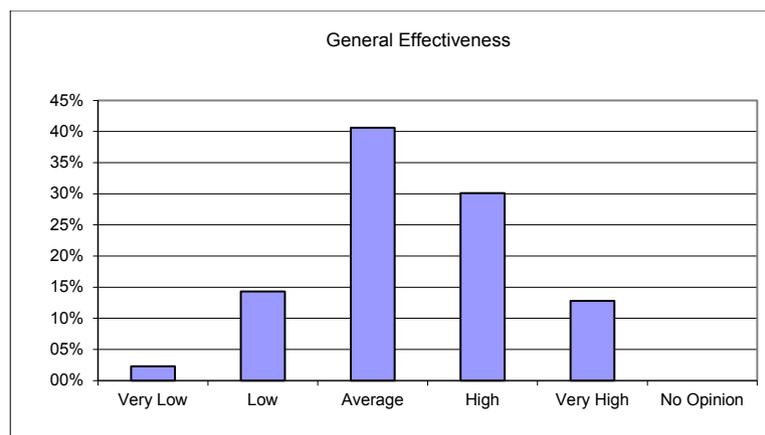
VII. ANALYSIS OF RESULTS

a) Effectiveness

The study required the respondents to roughly classify the EFFECTIVENESS of project management within the company in which they work using the aforementioned Likert-type scale for their assessments.

Figure 3 shows the respondents' perceptions regarding how well their projects contributed to the achievement of the organization's strategic objectives.

Figure 3: General Effectiveness



Source: The author (2014)

The results show that, for 85% of the respondents, the projects developed by the company had an average to very high contribution to the achievement of the organization's strategic objectives.

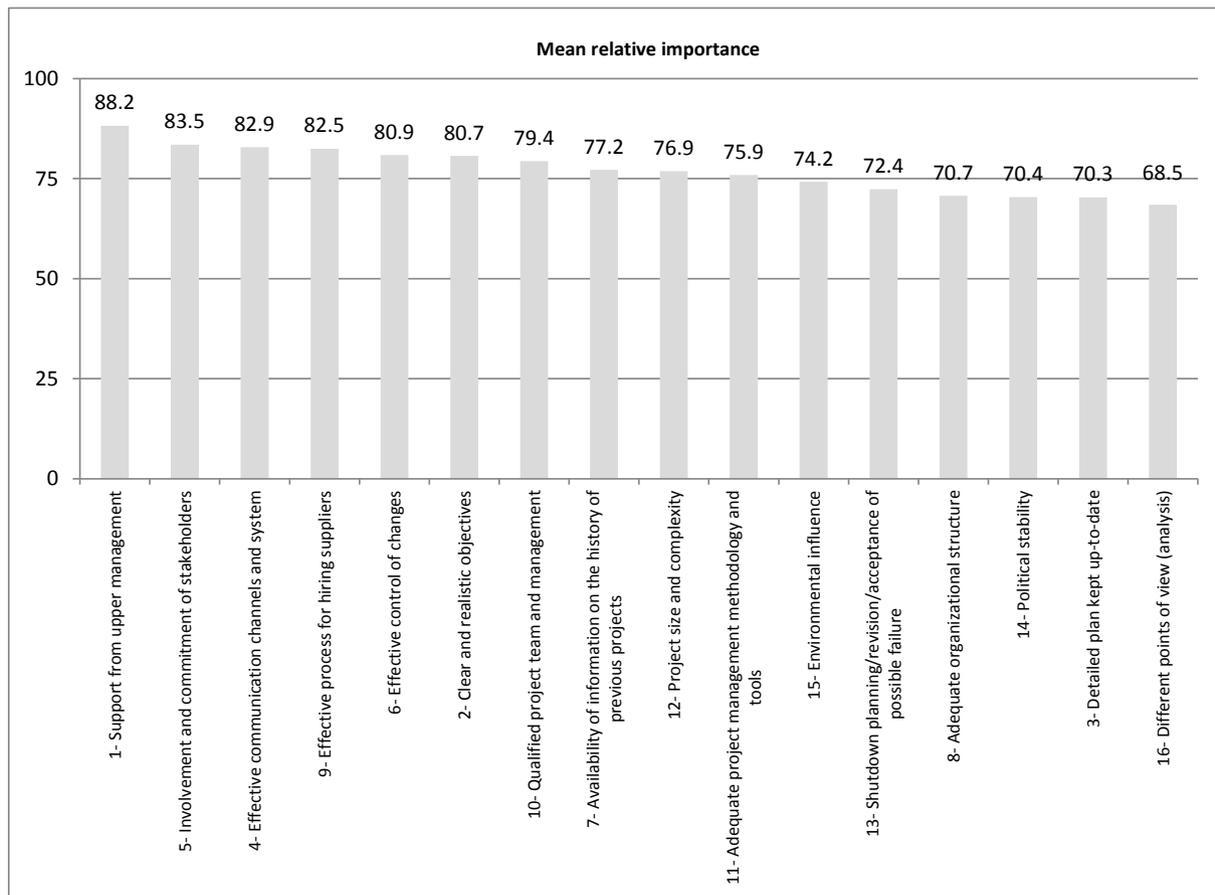
A similar method was applied to identify the Critical Success Factors for the EFFECTIVENESS dimension using a five-point Likert-type scale where the alternatives indicate the level of importance attributed to the assertion on a scale that varies from 1, indicating no importance, to 5, indicating great importance.

Considering that the mean importance value can range from 1 to 5, the values of these two statistical parameters were equalized by interpolation to values between 0 and 100.

The standard errors were presented in association with the mean values, indicating a significance level of 5%.

Figure 4 shows the mean relative importance of the CSF for effectiveness, in decreasing order, obtained from the correlation and from the mean importance declared by the respondents.

Figure 4 : Mean relative importance of the CSFs for effectiveness, in decreasing order, obtained from the correlation and mean importance declared



Source: The author (2014).

The respondents' perceptions were in alignment with the organizational structure of the company being studied and with the projects being developed, which displayed a high level of complexity. Of the CSF, **Support from upper management** in carrying out the business plan and management was seen as value-aggregating by the project managers. Moreover, given the complexity of these projects, it was important to obtain **Involvement and commitment of stakeholders**, whose expectations and needs help define **Clear and realistic objectives** for the **Effective control of changes**. Additionally, due to the strategy of hiring and using Engineering-Procurement-Construction (EPC)

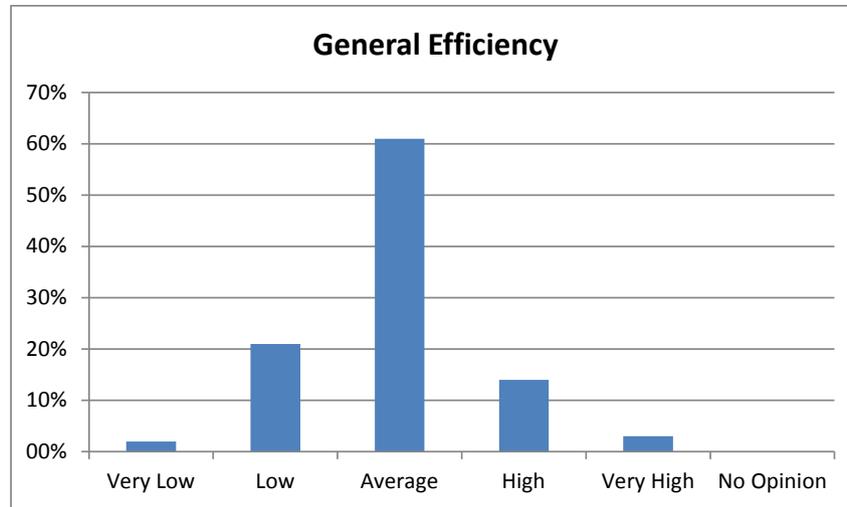
specialists, having a **Transparent and well-defined hiring process** was perceived as critical because it involves the participation of several suppliers, which reinforces the importance of establishing **Effective communication channels**.

b) *Efficiency*

The questionnaire requested the respondents to generally classify the **EFFICIENCY** of project management within their company using the aforementioned Likert-type scale for their assessments.

Figure 5 shows the respondents' perceptions regarding how well their projects were carried out.

Figure 5 : General efficiency



Source: The author (2014).

The results reveal that, for 61% of the respondents, efficiency in the carrying out of their projects was considered average, while 21% of the respondents considered it to be low, and 14% considered it to be high.

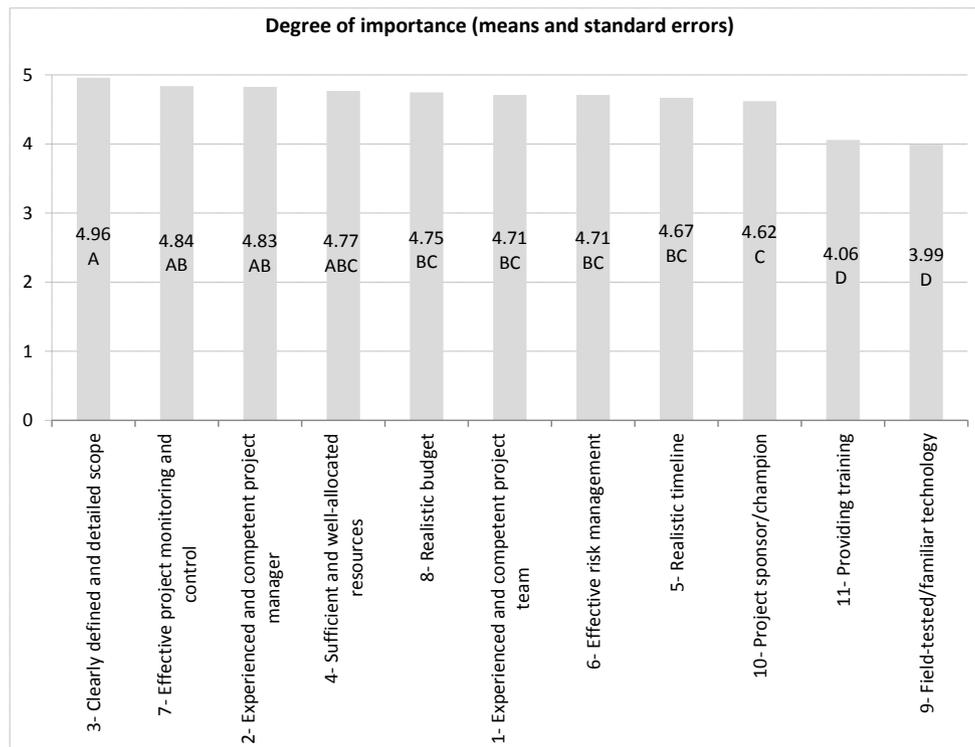
A similar method was used to identify the Critical Success Factors for the EFFICIENCY dimension using a five-point Likert-type scale to indicate the level of importance attributed to each statement on a scale that varies from 1, indicating no importance at all, to 5, indicating great importance.

Considering that the mean importance value can vary between 1 and 5, the values for these two statistical parameters have been equalized, by interpolation, to values between 0 and 100.

Standard errors have been presented along with the associated mean values, indicating a significance level of 5%.

Figure 6 shows the mean relative importance of the CSFs for efficiency, in decreasing order, obtained from the correlation and the mean importance declared by the respondents.

Figure 6 : Mean importance of CSFs for efficiency, in decreasing order



Source: The author (2014).

The respondents' perceptions were in alignment with the high degree of complexity of the projects they executed, where having a **Clearly defined and detailed scope** was the basis for efficient project planning. The complexity of the projects further justified the perception of importance of **Project monitoring and control** and having an **Experienced and competent manager** leading the project, at whose disposal were **Sufficient and well-allocated resources** that allowed him or her to stay within a **Realistic budget**.

VIII. CONCLUSION AND RECOMMENDATION FOR FUTURE WORKS

The following research question was addressed: What are the critical success factors that are responsible for achieving efficiency and effectiveness in project management according to project managers in one of Brazil's energy companies?

This study's central question was answered by identifying the Critical Success Factors that were most often mentioned in theoretical studies and their relationship to effectiveness and efficiency in project management and by classifying these Critical Success Factors in order of importance from the opinions of project management specialists.

Although this study was conducted within a single company, the company is part of a productive chain that corresponds to approximately 10% of the country's GNP. In international terms, the company has a presence in 27 countries. Moreover, its project portfolio includes approximately 900 projects with budgets in excess of US\$ 10 million each, and its business plan for the period from 2013-2017 foresees investments on the order of US\$ 230 billion.

As for the project managers who answered the questionnaire, approximately 74% have held this role for over five years in the company being studied, which indicates a favorable level of maturity regarding the level of knowledge of project management. Moreover, 72.2% of the respondents claimed to be PMP-certified, which confirms that the professionals have the technical skills to act as project managers.

To establish a measurement criterion for Critical Success Factors, the perceptions of project managers regarding these factors in relation to effectiveness and efficiency attributes were surveyed using a questionnaire based on the theoretical framework.

Finally, the questionnaire's quality and reliability were assessed using Cronbach's alpha coefficient.

This study sought to identify and determine the relevance of the Critical Success Factors that are most often mentioned in theoretical studies along with their relationship to effectiveness and efficiency in project management and their classification, in order of importance, based on the opinions of an energy company's project management specialists.

Based on the results of this work, this article presents three original contributions that may help to advance knowledge regarding the topic studied herein.

The first contribution is to gather the Critical Success Factors most often cited in 63 studies in the international literature into a single study.

The second contribution made by this study is to relate the Critical Success Factors found in the literature to the effectiveness and efficiency of project management. In addition, this study provides the correlation of these Critical Success Factors with EFFECTIVENESS and EFFICIENCY attributes in the opinions of an energy company's project management specialists.

The third significant contribution of this study is the identification of the Critical Success Factors that are really significant in explaining the success of project management in the opinions of the specialists, and the assessment of the correlation that each of these CSFs has with the two attributes studied herein: EFFECTIVENESS and EFFICIENCY.

For the EFFECTIVENESS attribute, the results indicate that, in the respondents' opinion, the following Critical Success Factors have greater importance to a project's general effectiveness: **Support from upper management, Involvement and commitment of stakeholders, Efficient communication systems, Effective process for hiring suppliers, Effective control of changes, and Clear and realistic objectives.**

For the EFFICIENCY attribute, the results indicate that, in the respondents' opinion, the following Critical Success Factors have greater influence on a project's general efficiency: **Clearly defined and detailed scope, Project monitoring and control, Competent and experienced project manager, Sufficient and well-allocated resources, and Realistic budget.**

This study was limited to analyzing, in the context of project management, only the effectiveness and efficiency attributes, along with their respective Critical Success Factors in order of importance and the correlations between the variables.

It should be noted that the Critical Success Factors analyzed herein may be insufficient to guarantee a project's success given the complex scenario in which a project may be inserted, but, as noted in this study, these CSFs have been considered the most relevant by scholars and project managers.

Based on the results from the present study, the following suggestions can be provided for future studies:

- a) Broaden the study to a larger number of companies in the energy sector to compare the management of these organizations;
- b) Regarding a project's lifecycle, prioritize and analyze the Critical Success Factors at each project phase;

c) It is also recommended that company maturity level be studied in more detail to identify whether the level of maturity has any influence on the prioritization and correlation of Critical Success Factors and general effectiveness and efficiency in project management.

These suggestions would complement this study because the concept of success in project management and knowledge of the critical factors that are responsible for achieving efficiency and effectiveness in project management may benefit organizations and people.

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