

Influence of the Best Practices of Project Management in the Information Quality's Performance: an Exploratory Study in Brazil

Thatiane de Oliveira Rosa^{1,2}, Selma Regina Martins Oliveira³

P.G. Student, Department of Computational Modeling Systems, Federal University of Tocantins – UFT, Palmas,
Tocantins, Brazil¹

Professor, Department of Information and Communication, Federal Institute of Education, Science and Technology of
Tocantins – IFTO, Paraíso do Tocantins, Tocantins, Brazil²

Associate Professor, Department of Computational Modeling Systems, Federal University of Tocantins – UFT, Palmas,
Tocantins, Brazil³

ABSTRACT: Despite decades of research and the growing adoption of methodologies and automated tools for the management and implementation of IT projects, most of them still fail. In face of this motivation, there is research conducted in order to identify best management practices to be adopted to increase the rates of successful projects. It is important to highlight that, along with the best management practices, it is necessary manage the quality of information to allow projects to succeed. Quality of information is indispensable resource for project management, considering that it allows understand the problem, supports decision-making and describes the adopted solution. In face of this scenario, the goal of this paper is verify the effects generated by best management practices in performance of information quality in IT projects. Therefore, this study explores a bias under discussed in the literature on the relationship between the best management practices and the quality of information, allowing researchers in the area check how one affects the other. It is important to highlight that the research of this problem is limited to Brazil.

KEYWORDS: Information technology projects, Best practices of project management, Information quality.

I. INTRODUCTION

In recent decades, because of global market instability, rapid changes in trade, greater complexity of operations and the need to maximize the integration of internal and external activities was imperative that organizations evolve their management models, which are currently supported by information technology - IT ([1]; [2]). In this context, IT emerges as a competitive factor and key differentiator, when it is well applied and used strategically in line with the business need, assists in setting and achieving goals and objectives of the organization, in the other words, can increase the efficiency and quality of the products and services, reduce costs and optimize resources ([2]; [3]).

However, although currently the IT be an extremely important resource for organizations, scientific research published in project management area, shows that most IT projects are characterized by fail or be delivered with high error rates ([4]; [5]; [6]). Thus, in order to minimize the occurrence of the factors that generate the failure of projects, many studies are conducted to identify the best practices to be applied to develop successful IT projects ([7]; [8]). Coupled with good management practices, another determining factor for project success is the quality of information, this is justified because the low quality of information can generate a number of risks for the project and consequently for the organization ([9]). However, a lack of a technical and scientific researches that analyzes the influence of good project management practices in information quality is perceived, yet the few existing studies indicate that the quality of information is a relevant factor for IT projects ([10]).

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

Thus, from the presented context, this work aims to evaluate the main impacts of best management practices at information quality performance in IT projects, in restrictions conditions. To this end, the paper is systematized according to the following sections: Related Work, Methodology; Results and Underlying Analysis; Conclusions and Limitations.

II. RELATED WORK

Information Technology Management:

Recently, IT has become unquestionably a competitive advantage for organizations, because it lets you optimize information management processes, collaboration and communication, among others ([11]). Though of the cited benefits, many organizations do not perceive or does not enjoy them, which creates dissatisfaction with the investments made in IT ([12]; [13]). To justify such dissatisfaction, [14] and [15] state that many IT projects are not completed, others are completed, but lack adequate strategic planning, or the results generated by the project are not measured appropriately.

In this perspective, it is clear that is extremely important to realize the IT projects management, so that organizations can actually enjoy of the competitive advantages required through the adoption of information technology. In that sense, it appears to be important to understand what the project management is and the benefits offered. Thus, according to theoretical clippings, one can understand that project management must start from the understanding of the requirements and definition of the project's objectives and goals, which are achieved through planning, execution and control actions, tools, skills and knowledge. Since the correct management of IT projects increases the probability of obtaining successful use in IT organizations and consequently the market organizations ([16]; [17]; [18]).

Understanding the importance of managing IT projects for organizations, the following section discusses about the failures and challenges of IT project management, and best practices that can be adopted for an IT project has a higher probability of success.

Best Practices in IT Project Management:

Despite decades of research, the increasing adoption of methodologies and automated tools for the management and implementation of IT projects, most of these keeps failing ([6]). This can be seen when analyzing a survey published by the Standish Group [5], which shows that only 16.2% of IT projects are successful, thus 83.8% fail because they are concluded with some kind of change (overflow in budget and / or schedule, or do not provide the planned solution), or are canceled during execution.

Thus, researchers of project management area seek to identify what the causes for the high rate of IT projects fail, in order to define strategies, methodologies, practices and tools that can contribute to increase project's success. Therefore, identifying such factors comes up the challenge to neutralize them so that the project success rates increase. In this sense, they apply best practices that assist in managing successful projects.

In this context, [19] and [20], supplemented by [7] define best practices as ideal ways to perform a particular job in order to reach high performance, thus, they are proven processes that allow to realize measurable improvements in efficiency and effectiveness of a project.

Therefore, in order to achieve the objective of this study is necessary to identify what are the best practices for managing IT projects, so one conducted an analysis of several studies published in recent decades. After performing this analysis 322 best practices were identified in the searches made by [3], [4], [6], [7] and [8], among other authors. At the end of the study, the practices were subjected to statistical technique of cluster analysis, and obtained eight groups of best practices, which are presented in section III and IV of this article.

After presenting the importance of best practices in a project, the next section explains the importance of information in the project management process.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

Information Quality Importance of IT Projects:

As mentioned, currently the adoption of IT presents itself as a competitive differential for organizations, according to published studies, the main changes in organizations in recent decades have been generated, influenced and encouraged, directly or indirectly, by technological change, which is characterized by the strong relationship between information and computing ([21]; [22]). From this development, the information passed to be generated, processed and transmitted at high speed, allowing managers to make informed decisions on historical, concrete and consistent facts, not just in estimates ([21]).

In this context, information is presented as indispensable raw material for the project management, because it is fundamental to understand the problem to be solved, is utilized as a basis for decision making during of the entire project, as well as to describe the solution adopted for the treaty problem ([23]; [24]). Therefore, if the information is misinterpreted, bad decisions are made and the solution developed for the problem is inconsistent, which in turn can lead to losses of different aspects ([21]). On the other hand, it is important to understand that having information and interpret them is not enough, but it is indispensable that the manipulated information is a quality information.

Therefore, in an attempt to organize the analysis of information quality [21] and [25], based on the study of [26] and other authors, indicate that there are 2 dominant perspectives: based on the product and based on the user (consumer). A perspective based on the product emphasizes the information as an object (or thing), and the prospect based on user, analyzes the relationship between user and information.

Furthermore, there is a wide range of criteria that are adopted to evaluate the quality of information in both perspectives, however there is a single set and pattern of these criteria. Therefore, considering that there are different classifications of information quality criteria, and none of that are considered standard, this work will follow the classification performed by [27]. That among the studies analyzed in this research is the one with highest number of citations (more than two thousand and four hundred, according to Google Scholar) and can be considered a well accepted ranking by the academic community.

Thus, according to [27], the criteria of quality of information are classified into four categories, each consisting of dimensions of information quality, termed as intrinsic (accuracy, reliability, objectivity and reputation); contextual (added value, relevance, timeliness, completeness and proper amount); representational (interpretability, easy to understand, consistent representation and concise representation); and accessibility (affordability and secure access).

III. METHODOLOGY

Framework of the conceptual model and hypothesis:

As already explained, have access to quality information is essential to develop successful projects, because this is the information it uses are of low quality, these induce taken bad decisions, which in turn directly affects the final quality of the project . On the other hand, if quality information is taken and correctly interpreted, the probability of taking the correct decisions and to obtain a successful design is increased. In this perspective, for evaluating quality of the information properly, researchers define criteria to analyze it, such as credibility, easy of understanding, value, accessibility, among many others. In addition, it can be inferred that access to quality information can be directly influenced by the practices adopted to manage the project. Therefore, in the light of the theoretical cutouts, the independent variables, and dependent pocket were identified, illustrated in Figure 1, as well as hypothesized.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

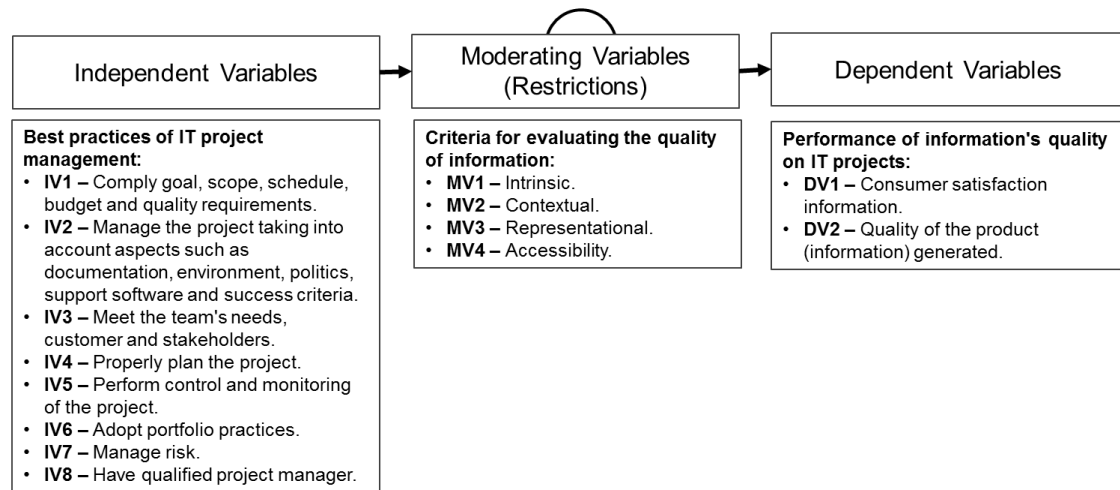


Fig.1. Conceptual Model Search. Source: Prepared by the author.

Independent variables (IV): correspond the best IT project management practices, which were identified by an analysis of the literature, addressing research published in recent decades. Thus, at the end it identified 322 best project management practices, and these were subjected to statistical technique of cluster analysis, to be summarized. From this, it obtained eight groups of best practices, identified as: (IV1) Comply goal, scope, schedule, budget and quality requirements; (IV2) Manage the project taking into account aspects such as documentation, environment, politics, support software and success criteria; (IV3) Meet the team's needs, customer and stakeholders; (IV4) Properly plan the project; (IV5) Perform control and monitoring of the project; (IV6) Adopt portfolio practices; (IV7) Manage risk; and (IV8) Have qualified project manager.

Dependent variables (DV): correspond to the quality of information performance, taking into account aspects above: the consumer satisfaction information (DV1) and the quality of the product (information) generated (DV2). These aspects were considered, based on the concepts presented in Section II, when the criteria and perspectives of analysis of information quality were showed.

Moderator variables (MV): are represented by the criteria for evaluating the quality of information. Considering the constraints that affect the relationship between the best management practices and the quality of information on the performance of IT projects. Importantly, the quality of information criteria representing the moderator variables follow the classification given in Wang and Strong [27] research.

Before the context presented is relevant to explore the relationship between the best project management practices (independent variables) on the performance of information quality (dependent variables), and this relationship influenced the criteria for assessing the quality of information (moderator variables). Thus, the following hypothesis was developed: Best management practices influence positively or negatively the performance of information's quality on IT projects.

Therefore, so that you can better understand how the data were collected and processed, the next section covers such procedures.

Sample Collection and Data

This section presents the procedures for collection and sample of the survey data. In that sense, it is noteworthy that the survey was conducted in the light of the literature and consultation with experts. Theoretical clippings were extracted independent, dependent and moderator variables. Therefore, the search execution process is divided into 2 phases and 9 steps, as shown in Figure 2.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

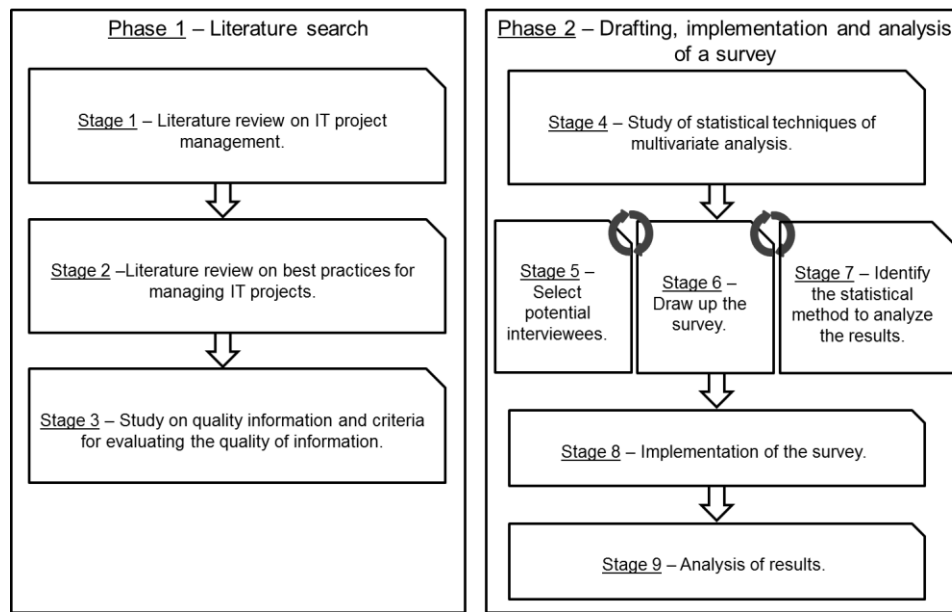


Fig.2.Flow follow the steps and stages of research. Source: Prepared by the author.

Thus, Phase 1 is related to understanding the problem and deepening of the theme, through a literature search in order to understand the key concepts of managing IT projects (Stage 1); best project management practices (Step 2); quality information and criteria for evaluating the quality of information (Step 3). During this phase, over 100 articles were consulted, which are extracted from scientific research bases as ACM, Emerald, Google Scholar, IEEE and Science Direct.

The Phase 2 has the main objective to develop and apply a survey with experts with knowledge of the research object, which are selected by technical and scientific criteria. Thus, the selection was carried out mainly using the Lattes Platform ([28]), where it was possible to analyze the curriculum of experts considering the academic training, length of experience and professional involvement related to IT projects management and quality information areas, wherein were selected 205 experts, of which 22.24% answered the questionnaire.

Thus, the data were extracted from 205 Brazilian experts through an array of trial, and the responses analyzed in order to identify the impact of best management practices on the quality of information IT projects to this end have been executed six steps. Thus, in Step 4 was conducted a study of statistical techniques of multivariate analysis, to reduce and group the 322 best project management practices identified during the literature search. Steps 5, 6 and 7 were carried out simultaneously, and had, respectively, the following objectives: select potential interviewees, draw up the survey on the basis of studies, and identify the statistical method to analyze the results generated by the application the survey.

Step 8 occurred during the implementation of the survey and finally in Step 9 responses were analyzed based on the statistical method selected (at Step 7).

IV. RESULTS AND UNDERLYING ANALYSIS

In this section the results and underlying analysis are presented. After identifying 322 best IT project management practices from the literature, it was started the clustering process. This procedure appears to be relevant since, in the

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

context of this work, best practices correspond to the independent variables, then summarizes them without loss of information is essential to obtain consistent final results.

Therefore, to perform the grouping in question has been adopted the method known as hierarchical agglomerative Ward, which was selected from a range of tests performed either with this method as with the K-means method. In all test cases the Ward showed better results, achieving group more consistently the best practices analyzed. In addition to the experiments with Ward and K-means methods, tests were also performed with different types of formatting the description of best practices and were also carried out tests to generate different amounts of groups, at the end, it obtained better results when practices were organized into 8 groups.

Before the generation of groups, it became necessary to characterize them. Thereby terms, clouds were generated in order to show the strongest in each group. Thus, based on the descriptions of the practices contained in each group, and with the help of clouds terms, the 8 groups of best project management practices were characterized as follows:

- Group 1: from the generated groups is one that has the largest number of best practice, that is, 151, and is also made up of various practices, as evidenced in his cloud of terms. For these reasons, it is the group that covers more areas within project management, such as: purpose and scope, schedule and budget as well as requirements and quality. Thus the description formulated for this group was "Comply goal, scope, schedule, budget and quality requirements";
- Group 2: the most obvious word in your cloud project's terms, while the others have similar emphasis, therefore this group was characterized as "Manage the project taking into account aspects such as: documentation, environment, politics, support software and success criteria". Importantly, this is the second largest group practices, consisting of 56;
- Group 3: group composed of 26 best practices, and is one of the most well characterized since its component practices are quite similar. Thus, such a group was characterized as "Meeting the team's needs, customer and stakeholders";
- Group 4: it's also a very well characterized group, thus, has very similar practices, so this group was named as "Properly plan the project." In addition, this group comprises 29 best practices;
- Group 5: This group consists heavily best practices related to the control and monitoring during project implementation, and therefore was named "Perform control and monitoring of the project". Furthermore, it is one of the groups with fewer best practices, that is, 13;
- Group 6: is the group with the lowest number of practices, that is, 10, and these are closely related to portfolio management, with that the group was characterized as "Adopt portfolio practices";
- Group 7: This is a group that has more similar practices, all of which are related to managing risks during project execution, so it was named "Manage risk". It is noteworthy that this group is made up of 19 best practice;
- Group 8: consists of 18 best practices and is also one of the groups that have very similar practices, all related to the importance of having a well prepared and qualified project manager, it was characterized as "Have qualified project manager."

After understand how indirect variables (best project management practices) of the conceptual model were grouped, went up to assess the influence of best practices on information quality performance on projects, and this relationship affected by the assessment criteria quality of information.

So once collected the data from the specialists, the next step was the development of the analysis of the results using the statistical technique Spearman correlation, which was chosen to allow describing the relationship between two ordinal characteristics, which is the case this work.

Thus, ownership of the results identified in the previous section went to the analysis of the collected answers, using the Spearman correlation. Thus, it sought to identify the correction between x and y . x being represented by the degree of impact of the independent variables (Best project management practices) on the dependent variables (information quality performance) y represented by the degree of influence of moderator variables (evaluation criteria of information quality) on variables dependents. What goes against the aim of the research is: to assess the main impacts of best

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

management practices (independent variables) on the quality of information performance (dependent variable) in IT projects in conditions of restriction (moderator variables).

Therefore, in general, the following steps were performed to verify the correction between x and y:

Step 1: Organization matrix of information that represent the variable x correlation, as well as defining the ranking position of each of the values;

Step 2: Organization matrix of information representing the variable y of correlation, as well as defining the ranking position of each of the values;

Step 3: Obtaining a table with the correlation values from the calculation of Spearman correction coefficient between each of the x and y values.

From this, there was the analysis of the responses and calculate the Spearman correlation coefficient for each established relationship between independent variables and dependent variables, and between the dependent variables and moderator variables. The calculation results are presented in Figure 3.

At first, they present the results related to the aspect "Satisfaction of information consumers", which corresponds to the first dependent variable. Thus, the Side (a) of Figure 3 shows the correlation coefficients identified between satisfaction of information consumers with all the best practices deemed groups, and under the influence of the criteria for assessing the quality of information.

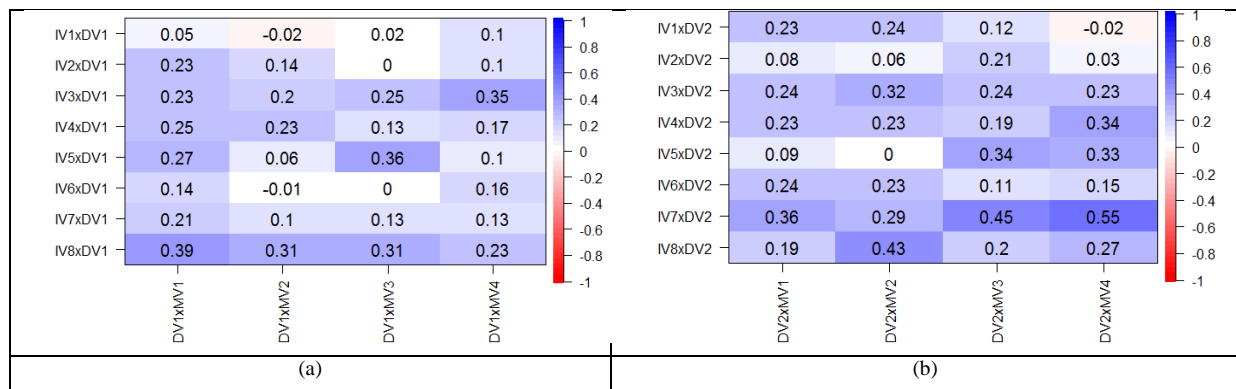


Fig.3. Correlation coefficients between the independent and dependent variables influenced by moderator variables. (a) Matrix with indications of positive correction, zero and negative aspect of consumer satisfaction information. (b) Matrix with indications of positive correction, zero and negative aspect of the quality of the product (information) generated. Source: Prepared by the author.

Therefore, one can infer that, in general, the best management practices have a positive relationship, however weak, to the satisfaction of consumers of information, when influenced by the evaluation criteria of information quality. This conclusion is supported the review of the correlation coefficients, which mostly have values above 0.0, and the maximum coefficient was 0.39 (Owning project manager qualified influences the satisfaction of consumers of information, when the information submitted is accurate and objective, and has credibility and reputation (IV8xDV1 correlated with DV1xMV1)). This indicates that despite the best practices exert a positive influence on satisfaction of information consumers, this influence is considered small.

With regard to the results related to the aspect "Product quality (information) generated", which corresponds to the second dependent variable, they are exposed on side (b) of Figure 3. From the analysis presented coefficients is possible to understand that in order, overall, as in the previous case, the best management practices have a positive relationship, however weak, with the quality of information as a product, when influenced by the criteria for assessing the quality of information. However, despite the correlation still be weak, the presented ratios are slightly higher when compared to those found in relation to consumer satisfaction information. In this case, the maximum coefficient was 0.55, which indicates that the practice of managing project risks influence the quality of information (product) when it is available (IV7xDV2 correlated with DV2xMV4). This coefficient indicates a median positive relationship.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

Therefore, when analyzing all correlation coefficients found (Figure 3), it can be inferred that the best management practices have a positive relationship with the quality of information of performance in IT projects, considering the influence exerted by the evaluation criteria for quality of information. On the other hand, despite the existing ratio is positive it is considered weak, and in a few cases median, null or even negative.

V. CONCLUSIONS AND LIMITATIONS

Overall, the aim of this study was to assess the impacts of best management practices in information quality performance in IT projects in restrictions conditions. Therefore, this research shows is relevant because conducted a study of a bias little explored in IT project management field, that is, the relationship between the best management practices and the quality of information. For it to be possible to achieve the proposed objective, a literature search was initially performed in order to explore the importance of IT project management, identify best practices for achieving successful projects (322 have been identified), substantiate the importance of information quality during the execution of projects, and to understand how information quality can be assessed.

From the understanding and organization of these concepts became possible to develop a survey instrument consistent and objective to investigate the proposed problem. Thus, 205 experts were contacted, of which 22.24% answered a judgment matrix. From this, it calculated the Spearman correlation coefficient in order to quantify the relationship between the best project management practices and performance of information quality under the influence of the evaluation criteria of the information.

Therefore, from the found coefficients, one can say that there is a positive relationship, however low, among the best project management practices and the quality of information, namely, the adoption of best management practices influence on increasing the quality of information on IT projects. So it is desirable to adopt best practices which contribute to the generation of quality information during the execution of projects and consequent collaborate to increase the probability of success during implementation.

It is noteworthy that despite having been carried out a comprehensive study of art as well as practice of study based on the experience of experts and statistical techniques, this research is subject to criticism, since all the variables involved are qualitative therefore involve a high degree of subjectivity, which gives opening to uncertainty and questioning the results. Given this context, it is recommended that this research be reproduced and replicated expanding the sample of experts, for greater certainty in the results. As well as implementation of other statistical techniques in order to confirm the results.

REFERENCES

1. Guimarães, L. C., Mello, K. A. B., Andrade, C. C. P., Figueiredo, F. A., Mota, C. M. M., "Projeto de Tecnologia da Informação: Caracterização da Gestão de Projetos de TI no Estado de Pernambuco", XXVIII Encontro Nacional de Engenharia de Produção (ENEGEP), 2008.
2. Pinto, S. A. O., "Gerenciamento de projetos: análise dos fatores de risco que influenciam o sucesso de projetos de sistemas de informação", São Paulo: Faculdade de Economia, Administração e Contabilidade, University of São Paulo, 2002, Master's Dissertation in Administração.
3. Ferreira, M., Tereso, A., Ribeiro, P., Fernandes, G., Loureiro, I., "Project Management Practices in Private Portuguese Organizations", *Procedia Technology*, Vol. 9, pp. 608-617, 2013.
4. Marques, A., Varajão, J., Sousa, J., Peres, E., "Project Management Success I-C-E Model: A Work in Progress", *Procedia Technology*, Vol. 9, pp. 910-914, 2013.
5. Standish Group, "The Standish Group Report: Chaos", 2014.
6. Wateridge, J., "IT projects: a basis for success", *International Journal of Project Management*, Vol. 13, Issue 3, pp. 169-172, 1995.
7. Alias, Z., Ahmad@Baharum, Z., Idris, M. F. M., "Project Management Towards Best Practice", *Procedia - Social and Behavioral Sciences*, Vol. 68, pp. 108-120, 2012.
8. Papke-Shields, K. E., Beise, C., Quan, J., "Do project managers practice what they preach, and does it matter to project success?", *International Journal of Project Management*, Vol. 28, Issue 7, pp. 650-662, 2010.
9. Borek, A., Parlikad, A. K., Woodall, P., Tomasella, M., "A risk based model for quantifying the impact of information quality", *Computers in Industry*, Vol. 65, Issue 2, pp. 354-366, 2014.
10. Liebchen, G. A., Shepperd, M., "Data sets and data quality in software engineering", *Proceedings of the 4th international workshop on Predictor models in software engineering (PROMISE '08)*, pp. 39-44, 2008.
11. Basu, A., Muylle, S., "How to plan e-business initiatives in established companies", *MIT Sloan Management Review*, Vol. 49, Issue 1, pp. 28-36, 2007.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

12. Love, P. E.D., Irani, Z., "An exploratory study of information technology evaluation and benefits management practices of SMEs in the construction industry", *Information & Management*, Vol. 42, Issue 1, pp. 227-242, 2004.
13. Peña-Mora, F., Vadhavkar, S., Perkins, E., Weber, T., "Information Technology Planning Framework for Large-Scale Projects", *Journal of Computing in Civil Engineering*, Vol. 13, Issue 4, pp. 226-237, 1999.
14. Nitithamyong, P., Skibniewski, M. J., "Web-based construction project management systems: how to make them successful?", *Automation in Construction*, Vol. 13, Issue 4, pp. 491-506, 2004.
15. Stewart, R. A., Mohamed, S., "Evaluating the value IT adds to the process of project information management in construction", *Automation in Construction*, Vol. 12, Issue 4, pp. 407-417, 2003.
16. Project Management Institute – PMI. *PMBOK Guide, "A Guide to the Project Management Body of Knowledge"*, 5. Ed., Pennsylvania: Project Management Institute, 2013.
17. Stewart, R. A., "A framework for the life cycle management of information technology projects: project IT", *International Journal of Project Management*, Vol. 26, Issue 2, pp. 203-212, 2008.
18. Verzuh, E., "MBA Compacto: Gestão de Projetos", Campus: São Paulo, 2000.
19. Ramabadron, R., Dean, J. W. J., Evans, J.R., "Benchmarking and project management: a review and organizational model", *Benchmarking for Quality Management & Technology*, Vol. 4, Issue 1, pp. 47-58, 1997.
20. Zairi, M., "Measuring Performance for Business Results", Chapman & Hall, 1994.
21. Machado, O. A., "Qualidade da informação : uma abordagem orientada para o context", São Paulo: Escola Politécnica, University of São Paulo, 2013. Doctoral Thesis in Sistemas Digitais.
22. Sordi, J. O., "Administração da Informação: fundamentos e práticas para uma nova gestão do conhecimento", São Paulo: Saraiva, 2008.
23. Calazans, A. T. S., "Qualidade da informação conceitos e aplicações", *Transinformação*, Campinas, Vol. 20, Issue 1, pp. 29-45, 2008.
24. Porter, M.E., "Estratégia competitiva: técnicas para análise de indústrias e da concorrência", Rio de Janeiro: Campus, 1991.
25. Oleteo, R. R., "Percepção da qualidade da informação", *Ciência da Informação*, Brasília, Vol. 35, Issue 1, pp. 57-62, 2006.
26. Marchand, D., "Managing information quality", WORMELL, I. (Ed.) *Information quality: definitions and dimensions*, London: Taylor Graham, 1990. pp. 7-17 apud Machado, O. A., "Qualidade da informação: uma abordagem orientada para o context", São Paulo: Escola Politécnica, University of São Paulo, 2013, Doctoral Thesis in Sistemas Digitais.
27. Wang, R., Strong, D. M., "Beyond accuracy: What data quality means to data consumers", *Journal of Management Information Systems*, Vol. 12, Issue 4, pp. 5-34, 1996.
28. Plataforma Lattes, Currículo Lattes, 2015.