IT Project Management Critical Success Factors

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Abstract. IT Project Management Critical Success Factors (CSFs) are the areas of an Information Technology (IT) project that are essential to its success, and that must be identified and followed throughout the life cycle of the project. The identification, definition and communication of CSFs help to ensure that the project manager and team maintain the focus on what is important while avoiding spending resources on other less important areas. Although each IT project is unique and therefore has a unique set of CFSs, in this article, we propose a framework based on a literature review, whose results provide researchers and project managers with a comprehensive understanding of current CSFs of IT projects.

Keywords: IT project · IT project management · IT project managers · Critical success factors

1 Introduction

Information Systems (IS) are critical to the proper functioning and development of virtually any human organization. By involving people, processes, Information Technology (IT), and other resources and organizational structures that facilitate the acquisition, storage, processing and availability of information in an organization, IS demands constant attention in order to properly fulfil its role and keep pace with the evolution of business needs [1]. As in other areas, organizational initiatives aimed at improving IT are typically configured as projects, which are fundamental to structuring the activities and resources required. IT projects are collective, collaborative, complex, creative, and knowledge-intensive efforts that involve people participating in different activities [2], coordinated to achieve a certain purpose.

According to ISO 21500 [3], a project consists of a single set of processes that encompass coordinated and controlled activities, which are executed in order to achieve the defined objectives, according to previously defined start and end dates. In this sense, a project is a temporary effort made to create one or several products, services or other results [4]. There are several types of IT projects executed to meet the different needs of organizations, and their nature may differ according to the nature of the organization and the scope of its action. Schwalbe [5] considers as examples of IT

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projects, activities that range from the simple replacement of computers in a company's finished department, or updating an organization's technological infrastructure to provide wireless network access, to projects for the development of new applications to increase sales force productivity or customer relationship management. Cadle & Yeates [6] classifies IT projects into eight categories: development of IT applications; implementation of IT application packages; improvement of IT systems; consulting and business analysis; migration of IT systems; implementation of infrastructure; outsourcing (and insourcing) projects; and disaster recovery.

According to ISO 21500 [3], "project management is the application of methods, tools, techniques and competencies to a project". Project management is carried out through processes and includes the integration of the various phases of the project life cycle. The processes selected to execute a project must be aligned according to a systemic vision, and each phase of the project life cycle must have specific deliverables and results, which should be regularly reviewed during the project life cycle to meet the requirements of the sponsor, customers, and other stakeholders.

Although IT projects are "famous" for their high failure rates, with the consequent overrun of costs and deadlines, there has been an improvement in the success of the projects [7], with organizations investing more in management good practices [8]. Due to this high rate of failures, researchers have acknowledged the need to investigate project management practices to identify critical success factors (CSFs) that contribute to the project final results [9].

In the context of this study, CSFs are the activities or areas essential for an IT project to achieve its objectives (e.g. production of deliverables, in software development projects), i.e., to be successful. CSFs management can anticipate problems like a lack of top management support, poor communication, or lack of resources [10]. CSFs highlight what the project needs to be successful, which helps to keep the project manager and team members focused. As far as IT projects are concerned, it is possible to see the suitability of CSFs in different areas such as the adoption of ITIL [11], agile software development [12] or continuous practices in DevOps context [13]. Although various studies exist regarding CSFs in IT Projects, there is no, to the best of our knowledge, a categorized summary to be effectively used by researchers and practitioners. This work presents the results of an effort to identify and organize current IT project management CSFs, so they can support research and be easily used in practice. From a theoretical, point of view, it provides a state-of-the-art framework on CSFs in IT project management.

The rest of the paper is structured as follows. Section two presents related work. Then in section three, it is presented the research method. In section four, the results obtained are presented and discussed. Finally, section five presents some final considerations and directions for future work.

2 Related Work

CSFs are the few variables that the manager must prioritize in order to achieve his goals. Effective and efficient management of CSFs is the basic requirement for project success. They must be systematically and quantitatively assessed, anticipating possible

effects, in order to choose appropriate methods to deal with them [14]. The CSFs in the area of project management has been the target of many studies in the past, such as the Slevin & Pinto study [15], and are explored in the next sections.

2.1 CSFs in IT Project Management

IT projects have characteristics that make them different and more likely to fail than other projects, posing greater challenges to management [16]. The essence of this difficulty is the way information technologies are so closely linked to their organisational context, as opposed to, for example, construction projects. As a result, issues of organisational effectiveness and user involvement are more complex and more prominent in IT projects, which places too much emphasis on requirements-setting and customer involvement tasks than in other types of projects [17]. So, it is natural that there are specific CSFs for the management of IT projects and even for the different types of projects within IT projects.

Although there are some studies on IT/IS, like Rockart's [18], during the eighties, it is from the nineties onwards that the research around CSFs in the IT area and specifically in the field of IT project management starts. One of these studies that shows one of the facets that is different in IT projects is the study of Summer [19], in which there is clear concern about the relationship between the culture of the organization and the system to be implemented.

In the late nineties, many studies of CSFs emerged in the context of the implementation of ERP systems [20–22]. From the year 2000, the study of CSFs began to focus on another type of IT projects, the software development projects [23, 24]. From 2010 the focus shifted to the paradigm of agile software development [12, 25, 26]. It should be noted that many studies have been found on CSFs associated with software development projects [25, 27, 28].

In conclusion, the types of studies on CSFs in IT project management found are mainly of two types: literature review studies [27, 29, 30], which seek to identify which CSFs are most important; and surveys [28, 31–33], which seek to find out which CSFs are most important to the success of the project according to the participants in the study, which generally include IT project managers and other top managers in the organizations. In the results section, a summary is made of the CSFs, from the last five years, found in the review of literature carried out.

2.2 Categories of CSFs in IT Project Management

As the list of CSFs identified over the years is extensive it becomes important to classify them into categories so that it is easier for researchers and IT project managers to know what areas they are aimed at, for example, whether they are more focused on the internal team developing the project or factors associated with the client.

In the work of Belazi and Tukel [34] a first proposal is made to classify CSFs into categories, which the authors designated as a new framework for determining critical success/failure factors in projects. In this framework, the following categories were proposed: project; project manager and team members; organization; and external

environment. Although this work was not focused on IT projects, the same served as inspiration for future CSF research in IT projects and software development.

In Adzmi's work [29] it is suggested the use of three categories, namely: project management competence; organization competence and project management methodologies, methods, tools and techniques. Ahimbisibwe [30], in his work on critical success factors for software development projects, suggests the use of five categories: organizational factors; team factors: customer factors; and project factors. These same factors are used in Garousi's work [28]. Nasir [35] proposes in his work the use of different categories from the previous authors, namely: people; process and technical.

In Cao's work [25] study of critical success factors in agile software projects, the following categories are used: organizational; people; process; and technical. These same categories were later used in Stankovic et al. [36]. Finally, in Warren's work [17] on CSFs Projects, IT Projects, and Enterprise Resource Planning Projects, the following categories are identified: organizational; process; social; technological.

There is, therefore, no consensus among the different authors in the literature as to the categories of CSFs. Thus, based on the previous works and considering the focus of our work, we propose a new classification, focused on the project, which allows having a more comprehensive perspective.

The proposed categories are: team factors related to the project team, which include factors related to the project manager and team members; process factors, which include all CSFs related to the way the project is managed, such as scope or risk management; organizational factors, which include all CSFs that depends on the organization, such as assuring top management support; and stakeholder relative factors, that refer to stakeholders external to the team. Some of these categories had already been identified in the literature but were not used with this classification scheme.

3 Method

The method used to conduct this research was a Literature Review, consisting of a methodologically rigorous review of search results [37]. Figure 1 presents the steps of the used search process.

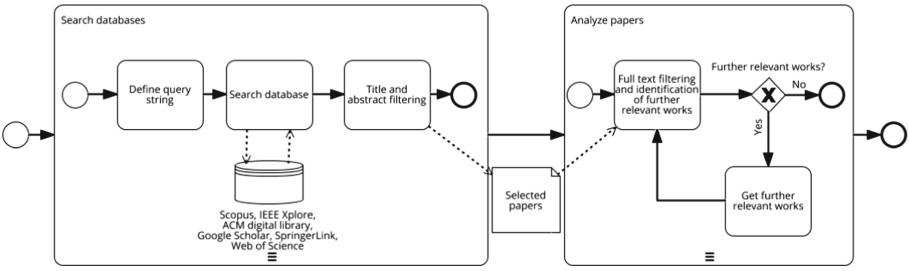

Fig. 1. Literature review search process.

The research question of this work is "*What are the current IT project management CSFs?*". The first step of the process was to define the research questions and the search terms to use. The following query string was used ("Critical Success Factors" OR "CSF") and ("IT Projects" or "Information Technology Projects"), with the initial year set for 2015. It was decided to focus the literature review on the last five years since the IT arena is always evolving, and the main objective was to identify the current CSFs.

Following the process defined in Kitcheman et al. [37], we searched the databases of articles that had in their title or abstract the terms identified above, having been discovered in SCOPUS 25 articles, in IEEE Xplorer 39 articles, ACM digital library nine articles, Google Scholar 39 articles (by title), Springer Link 34 articles, and Web of Science six articles. After integrating the results from the different searches, inspecting the titles and abstracts and removing the duplicates, a list of 22 papers was obtained.

The second step of the procedure consisted of reading each paper for compiling a list of CSFs. Every time a new relevant work was found in the full-text filtering, it was analysed in a snowball approach. This SLR process resulted in a final list of ten relevant papers.

4 Results

From the literature review, 25 unique CFSs were identified, as presented in Table 1.

In the work of Adzmi et al. [29], focused on the Malaysian public sector, the following success factors were identified: involvement of functional department in planning; involvement of the client in planning; authority of project managers; monitoring and feedback; client consultation; communication; monitoring and feedback; experience of the project manager; planning effort; team member experience; team member commitment; customer involvement; priorities of the project by team leader; training; project manager appropriate assignment; project manager involved in the planning stage; communication among project manager and organizations; project mission; support of top management; project schedule/plans; client agreement; a well-defined scope; all resource were defined; usage of WBS; usage of Gantt Chart; usage of CPM; usage of project management software; technical tasks; troubleshooting; and level and effectiveness planning. The factors were classified into five categories: project management; project manager; organization competence; and method and techniques.

In the work of Correa et al. [31], an empirical work conducted in small and medium enterprises of the IT sector in Bogota, 11 success factors were identified: project scope definition; planning; monitoring and control; manager empowerment; team skills; stakeholder management; effective communication; project management methodology; risk management; change control; and support from senior directors.

In a survey conducted in Pakistan by Fayaz et al. [32] to assess which identified CSFs had an effect on project success, were identified 15 CSFs: management support; effective communication; training; effective monitoring and control; leadership; clear goals; requirement specification; risk management; budget support; users involvement; project progress schedule; team capability; right team; project duration; and teamwork.

Table 1. IT project management critical success factors identified in the literature.

	Critical success factors/Papers	Adzmi et al. 2018	Correa et al. 2018	Fayaza et al. 2017	Gheni et al. 2017	Gumay et al. 2020	Saleem et al. 2019	Sarif et al. 2018	Vadhanasin et al. 2016	Wachnik 2017	Warren 2016	Total
Organizational	Top Management Support	x	x	x		x		x			x	**6**
	Organization culture (change management)								x		x	2
	Clear and realistic project goals			x	x	x	x	x			x	**6**
Stakeholders	Customer involvement	x	x	x	x	x		x			x	**7**
	Customer training			x						x	x	3
	Paying attention to customer needs		x		x	x			x			4
	Procurement management							x			x	2
	Communication and feedback (external stakeholders)	x	x	x		x	x		x			**6**
Process	Adequate use of resources (resource management)	x					x	x		x		4
	Appropriate use of methodologies and tools	x	x		x	x	x		x	x	x	**8**
	Clear and complete requirements specification	x		x		x	x	x		x		**6**
	Project complexity (duration, complexity, number of people involved, size)			x							x	2
	Project monitoring and controlling		x	x	x		x				x	5
	Project planning		x					x			x	3
	Quality management	x					x		x			3
	Realistic budgets (cost management)	x		x	x		x			x	x	**6**
	Risk management	x	x	x	x		x				x	**6**
	Realistic schedules (schedule management)			x			x			x	x	4
	Project changes (scope management)	x	x	x		x	x	x	x	x		**8**
Team	Project manager leadership	x	x	x		x		x	x		x	**7**
	Project manager capability (skills, expertise)		x		x	x	x				x	5
	Team commitment and motivation	x	x	x	x	x				x		**6**
	Team communication and collaboration	x					x					2
	Team composition (right people, multi-disciplinary)	x		x								2
	Team experience (skills, expertise, lessons learned)	x	x	x	x	x		x			x	**7**

Gheni et al. [33] also conducted an online survey among developers and IT managers to assess the CSFs for IT projects. In their study, they identify nine CSFs: committed and motivated team; internal communication; use of tools and infrastructures; goal and objectives; skilled project managers; skilled teams; risk analysis; project monitoring; and good estimation. According to the authors, the most important CSFs is to have a committed and motivated team.

Gumay et al. [38] conducted a survey in a Telco company in Indonesia and applied the analytical hierarchy process to identify CSFs. In their study they identified eight CSFs: top-level management and organizational culture; capability and leadership of the project manager; requirement management; project management and methodology; clear project objective; customer involvement and effective communication; capability and motivation of a team; and tools and infrastructures used. The three most important CSF were customer involvement and effective communication, capability and leadership of the project manager and project management and methodology.

In the work of Saleem et al. [27] were identified 14 CSFs: scope management; performance management; knowledge management; human resource management; feasibility; resource management; communication management; quality management; process management; complete requirements; stakeholders management; schedule management; budget management; and risk management.

Sarif et al. [39] conducted a survey among IT officers and staff of Malaysian government institutions involved in IT projects using nine CSFs, order by the importance attributed to them by the authors in their study: good user participation/involvement; good requirements and specifications; good of skills; complete requirements; good management and performance from vendor/contractor; good of project planning; realistic expectations; good of resources; good of executive support (top management).

Vadhanasin et al. [40] interviewed IT experts (executives and IT managers) from 12 leading Thai firms to discuss success factors and the measurement of IT project success. In their study they identified five CSFs: streamline of process and tools; emphasis on quality; scope control; change management; and platform for communication.

Wachnik [41] studied the importance of CSFs in 127 IT projects of five different types: standard implementation, upgrade, re-implementation, roll-out and implementation of a standard system with an add-on, analysing them using structural equation modelling. This study resulted in nine CSFs: effective process of establishing functional requirements for the implemented system; effective IT project management; credible estimation and agreement with the supplier regarding project parameters; competence and engagement of the client project group; choice and use of an IT implementation method; motivation of the client project group; added value brought by the supplier into the implemented system; information asymmetry between the supplier and the client; sharing knowledge about functionalities and technology of the implemented system.

Finally, in the study conducted by Warren [17], a literature review on CSFs in IT and ERP projects, were identified the following CSFs associated to IT Projects: user/client involvement; clear realistic objectives; support from senior management; skilled/suitably qualified/sufficient staff/team; proven/familiar technology; organisational adaptation/culture/structure; realistic schedule; project size (large)/level of

complexity (high)/number of people involved (too many)/duration (over three years); sufficient/well allocated resources; good performance by suppliers/contractors/consultants; strong detailed plan kept up-to-date; correct choice/past experience of project management; methodology/tools; differing viewpoints (appreciating); competent project manager; effective monitoring/control; environmental influences; good communication/feedback; training provision; adequate budget; good leadership; strong business case/sound basis for project; effective change management; political stability; past experience (learning from); and risks addressed/assessed/managed. The author of this study proposed a classification of the CSFs with the following categories: organisational; process; social; and technological.

5 Discussion and Conclusion

After the enumeration of the CSFs identified in the literature review, they were analysed in terms of similarity, i.e., it was verified if they represented the same concept, aiming at obtaining a unique set of factors. The factors were then ranked considering the number of references and classified according to the categories of factors previously mentioned in the related work section.

Figure 2 presents the framework that includes the most referenced factors. Each framework's factor has at least five references. Although this measure does not represent an absolute and definitive way for identifying the most important factors since it lacks statistical grounding, several authors use it to measure the importance [30, 35, 42]. In our study, using it was important since the focus of this paper is on the critical success factors (which are a subset of success factors, which cannot fail).

The obtained framework provides useful information for researchers, so they can focus their work in the areas of factors that are critical for the success of projects. It is also useful for practitioners, mainly IT project managers, in the sense that they can use it to identify significant contributors for project's success and to manage factors in their daily practice (for instance, by following factors with dashboards and associating each factor with Key Performance Indicators (KPIs) to monitor the evolution across the project lifecycle).

A limitation of this work is related to the selected measure for identifying the more relevant factors. The decision was to consider the 50% more referenced factors (corresponding to factors with five or more references). Future work should expand this perspective.

Each project is unique, thus having a unique set o CSFs. Project managers can use the framework (Fig. 2) as a checklist, for identifying the factors that are relevant in their own projects and to assure that they are duly considered. As further work, we propose the development of IT tools to support the management of CSFs in practice, integrating it with success management processes [43–45].



Fig. 2. Framework of current IT project management CSFs.

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