

KEYWORDS ■ project ■ management ■ success ■ software ■ construction

FAILURES IN SOFTWARE PROJECT MANAGEMENT

– are we alone?

A COMPARISON WITH CONSTRUCTION INDUSTRY

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ABSTRACT

Unfortunately software development projects have long been identified with budget complications, delays and failure concerning scope. For instance, the widely quoted CHAOS Reports of the Standish Group, whose first results were released in 1994, find that while this situation has improved, deviations from the plan continue to be present in a majority of projects. In this paper, we study the current state of success in software development projects, contrasting their results with those of civil engineering projects. The obtained results show the relative success that has been achieved in the industries studied in terms of meeting deadlines, budgets and scope. Although differences do exist, several similarities were found.

INTRODUCTION

Software projects are frequently criticized for their delays, budget overruns, low productivity and product quality. The Standish Group reports [17] [16] reflect this, having for a number of years identified some of what are considered to be chronic problems in this area.

In order to study whether these problems are unique to software projects, we carried out a survey applied to 40 software development project managers and to 40 project managers. This allowed us to compare the success of

software projects with the results obtained in a traditional engineering industry, in which project management practices are regarded as well-established.

In section 1, based on a literature review, the main concepts and common success aspects of project management are presented and discussed. In section 2 the research method is described. In section 3 the results are presented and discussed. Finally, in section 4 a global analysis is carried out and the results obtained are summarized.

1. Background

A project is a set of activities assigned to create a unique result, with a clear beginning and end date [15]. A project is broadly defined as “a unique process intended to achieve target outcomes” [19] [20]. Project stages may vary according to the project itself or with the activity sector concerned [10]. Nevertheless, in the majority of cases, a project life-cycle usually follows the stages [15]: starting; planning; execution/monitoring; and closure.

Project success and project management success have several definitions and various factors can influence them. According to Kerzner [13], the up-to-date definition of project success is one that assesses both primary and secondary factors. Primary factors include meeting deadlines, budget limits and the level of expected quality. The secondary factors consist, for instance, of the agreement and acceptance of the client to share his name as a reference.

Regardless of the activity sector, during the development of any project it is very difficult to accomplish all requirements, stay within budget limits and meet deadlines and client expectations. For a project to succeed it is necessary to manage all the activities, meet evolving requirements, cost, risk, time and many other aspects, in order to achieve the desired product or service.

Thus, project management plays a major role in planning, organization, task management and resource management, in order to achieve a pre-determined goal. It provides an organization with powerful tools that enhance their ability to plan, implement and monitor activities, people and resources [14].

To meet (or even surpass) the needs and expectations of stakeholders, project management applies knowledge, skills, tools and techniques to project activities [15]. The growing importance of project management and its increasing use by companies of all sectors has led to the emergence of working groups and several framework proposals which have contributed to maturation in this area. For instance, the PMBoK (*Project Management Body of Knowledge*), created in 1976 by the PMI (*Project Management Institute*), defines techniques, methods and processes for project management. These are now standard practices in the area of project management.

PMBoK defines nine knowledge areas: scope management; time management; cost management; quality management; human resources management; communications management; risk management; procurement management; and integration management. Each of these areas has its own characteristics and levels of complexity, and they are closely

interrelated. Although in different situations they may have different levels of importance, project managers must be aware of and master all of them [15].

Managing a software development project entails confronting complexity. Many software development projects are not fully or properly realized, and some of them are even cancelled [17]. It is widely accepted that one of the main causes for this failure is inefficient project management [8]. Thus, the success of software development projects depends upon the rigorous processes of project management [7].

The basic definition of success refers to the ability that a project has to achieve its goals [1]. In the literature, success factors for project management often refer to the traditional Atkinson [2] triangle elements (*cost, time and requirements*). Some authors add other factors to these.

For instance, Belout and Gauvreau [5] discuss the relevance of human factors in project success and its management (*depending on the life cycles and on the type of organization*), and great emphasis is given to them in several reviewed papers.

Carú et al. [6] show that the successful outcome of a project highly depends on the management of the relationships with the client during the project cycle. Another interesting perspective by Belassi and Tukel [4], shows that depending on the success factors that are being considered and prioritized, specific critical factors will appear as most important, indicating that they are highly interrelated with the considered success factors.

As shown in the literature, several aspects are underlined as being important to project success management. The technical and human aspects related to the project manager and the project team through the client's involvement, all seem to contribute to the overall success of a project. However, the traditional success factors continue to be mentioned as key elements, although a set of a broader and richer considerations are also highlighted by different authors.

2. Method

A survey was conducted with the aim of identifying the success obtained in software development and construction project management. The survey was undertaken from February 2008 to May 2009 and the general methodology involved a questionnaire that was sent to project managers of Portuguese companies. After three rounds, 80 usable questionnaires were received and the data collection process was concluded. A careful application of survey techniques was done, in particular those related to institutional permission and subject anonymity.

Questionnaire

A survey instrument was developed to obtain feedback from project managers. The proposed questionnaire was used in a previous survey [19] and it was pre-tested with a sample of six project managers to validate its content and readability and to improve some aspects of the questions. The necessary changes were made to the final questionnaire, which was edited in an online survey tool. The same questionnaire was used to get feedback from both groups of project managers.

Subjects

The subjects of this study were 40 software development project managers and 40 construction project managers. In the case of software development companies, the managers were selected from the group of 1000 Portuguese large companies [11]. In the case of construction companies, the sample consisted of project managers of 40 different construction companies selected from the list of the 750 medium and large companies provided by the Portuguese Instituto Nacional da Construção e Imobiliário – INCI (*National Institute of Building and Real Estate*). Casual and convenience sample methods were used respectively.

A briefing letter was sent by email to the project managers presenting the scope and goals of the study, including a link to a Web site, which permitted the completion of the questionnaire online. In order to ensure the same number of companies of each industry to enable the comparability of results, several reminders were sent to companies.

The choice of medium and large organizations seemed the most appropriate, since the complexity involved in bigger projects demands more efficient project management practices.

Characterization of the survey sample

The characteristics of the respondents are shown in **Table 1**.

The participant software project managers represent a broad range in terms of practice experience. In general, the majority of software project managers are male (75%), over 35 years old (67.5%), have been working in their current companies for more than 5 years (62.5%) and have more than 5 years experience in project management (50%). Regarding education, 92.5% of the participants have a university degree, 60% of them in the computer science field.

Concerning construction project managers, the majority are male (82.5%), less than 36 years old (52.5%), have been working in their current companies for less than 11 years (55%) and have more than 5 years of experience in project management (60%). 85% of the respondents have a university degree, 70% of them in the construction field.

Considering both groups together, the surveyed project managers are mainly male (*about 78%*), over 35 years old (57.5%), have been working in their current companies for more than 5 years (65%), and have more than 5 years of experience in project management (60%).

The project managers' characteristics indicate that the survey's results obtained represent a good picture of the current practice of project management in the studied industries.

TABLE 1. Characteristics of project managers

Characteristics	Number	%	Number	%
	Software		Construction	
Gender				
Male	30	75	33	82.5
Female	10	25	7	17.5
Age				
Less than 30 years	3	7.5	12	30
30 to below 35	10	25	9	22.5
36 to below 40	14	35	2	5
41 to below 45	7	17.5	5	12.5
Greater than 45	6	15	12	30
Time working in current company				
Less than 5 years	15	37.5	13	32.5
5 to less than 10 years	16	40	9	22.5
11 to less than 15 years	5	12.5	6	15
Greater than 15 years	4	10	10	25
Without answer	0	0	2	5
Experience in project management				
Less than 2 years	9	22.5	7	17.5
2 to less than 5 years	7	17.5	9	22.5
6 to less than 10 years	15	37.5	9	22.5
Greater than 10 years	9	22.5	15	37.5

3. Data analysis and results

To answer to the research question, the companies participating in the study were surveyed regarding the frequency of projects completed within scope, cost and deadlines. Thus, we followed the conventional view of the success of projects, which consists of three dimensions of the Atkinson triangle (1999).

With regard to software development projects, as can be seen in **Figure 1**, the study enabled us to verify that nearly 72 percent of projects were completed within cost and about 70 percent of projects meet their scope target. In regard to meeting deadlines, the percentage fell to 59 percent.

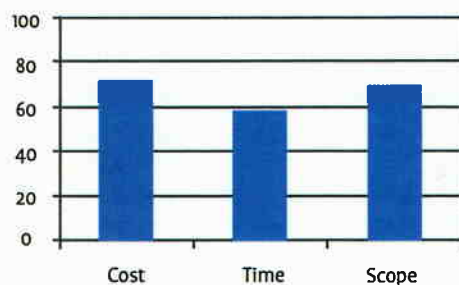


FIGURE 1. Success in software projects.

Although these problems were identified several decades ago and there has been much development of techniques and tools for project management in recent years, software development projects still continue to show success rates well below what is desirable and required, thus necessitating more rigorous and effective management in terms of the use of resources.

With regard to construction project success, as can be seen in **Figure 2**, 70 percent of projects ended within budget and 72 percent of completed projects met the deadlines. Regarding scope, there is an even higher rate of project success, with values of around 88 percent. Meeting deadlines in this industry is quite complex, due to uncontrollable factors such as meteorological conditions, that may require significant changes in the execution of the project in relation to the original plan.

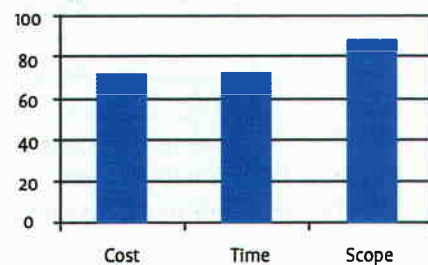


FIGURE 2. Success in construction projects.

Considering the results obtained in both industries, **Figure 3** shows that in the construction area results were slightly better.

In terms of compliance with the budget, although the software development industry results are slightly better than in construction, the results are very similar.

The major differences are in meeting deadlines and compliance with scope, with a clear advantage in the latter case to the construction industry. This can be explained by the fact that in the construction industry there is a clear separation of the project (*planning and design*) from those of *construction and implementation*, which reduces risk. In the case of the software development industry, the identification of requirements that oftentimes arise in the context of project execution significantly increases the risk in relation to the satisfaction of the project scope.

The lack of clear specifications and ambiguous definitions of the goals and requirements clearly influence the success of a project. Furthermore, any modification of these aspects during a project influences the success of the outcome. Independently of the initial requirements and the project size, the environment is always changing during a project cycle. This contributes to the expansion of project requirements and increases the efforts to complete the project. Moreover, delays and frequent interruptions during the development of a project may also contribute to an increased expense each time the work restarts [3], with its consequent chronogram delay.

Even though time, cost and environment project control are essential aspects for success, quality also has a relevant role to play. Efficient quality control has been shown to be the most important factor that separates a well-executed project from a failed or aborted one [12]. Taking this into account, it is important that a project fulfils the initial established requirements as well as the evolving client's needs. In general, too little involvement of the client in a project may create misleading expectations about the final outcome. Hence, it is important that the client is involved in the overall process.

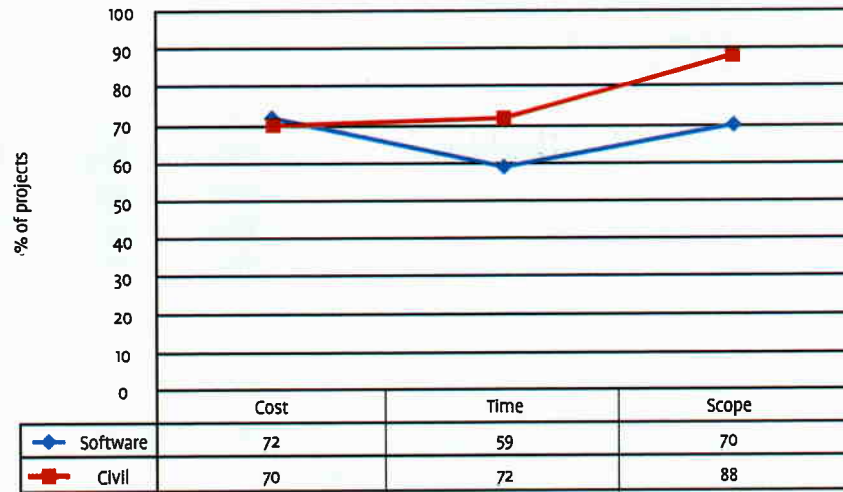


FIGURE 3. Comparison of project success levels in software and construction industries

4. Conclusion

The software development industry has not had a stellar reputation in recent years in terms of success in projects. This is mainly reflected in budgetary deviations, in non-compliance with budgets, non-compliance with scope, and worse, a high rate of abandonment of projects. Studies by the Standish Group have said this, from the initial studies in the 1990s [16] to the most recent ones [18].

In order to ascertain whether this was particular to software development, a comparison study was conducted with civil engineering, an area of more traditional project management.

The study enabled us to verify that, although the construction project results are more positive in scope and time compliance, the overall results are very similar.

Since construction projects tend to have higher budget than software projects, we can say that “no, (un)fortunately the software development industry is not alone in terms of success levels in project management”. These results are largely due to the fact that project management is a complex activity, which leads with a high degree of uncertainty.

It is necessary, therefore, to continue the research effort for more and better solutions for project management. Particularly in areas identified as requiring particular attention by various authors [19] [9], such as risk management and quality management.



João Varajão is currently professor of information systems and project management at the University of Minho and a visiting professor at the University of Porto Business School. He is also a researcher of the Algoritmi research center. Born and raised in Portugal, he attended the University of Minho, earning his Undergraduate (1995), Masters (1997) and Doctorate (2003) degrees in Technologies and Information Systems. In 2012, he received his Habilitation degree from the University of Trás-os-Montes e Alto Douro. His current main research interests are in Information Systems Management and Project Management. Before joining academia, he worked as an IT/IS consultant, project manager, information systems analyst and software developer, for private companies and public institutions. He has supervised more

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