Use and benefits of planning and scheduling techniques in Brazilian IT projects

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Abstract

The paper presents the results of a survey with 55 IT project managers in Brazil to identify if project managers know and utilize time planning management techniques to manage their projects and if these techniques can lead to project success in reaching the original schedule

Keywords: project management planning, schedule techniques, project success

Introduction

The 2014 World Cup, held in Brazil, will leave a sour taste for Brazilians. The stadiums for the event cost 42% more than the amount originally planned, and up until the last minute there were doubts to whether or not everything would be ready in time for the tournament. That deviation in cost totaled US$ 1.12 billion, a sum that the Government could have spent in sectors such as health, education, or infrastructure, but that went into a private event that has generated uncertain revenues for the country.

Project fund deviations like these are easier to be observed in the engineering and in public sector projects where the end product is tangible; however this is harder to spot in sectors such as information technology (IT), where project failures are mostly visible only within their parent companies. In such cases, it is possible to utilize data from research, which shows that IT projects still have a high failure rate. In Brazil, 44,6% of all IT projects fail completely or partially (in reaching time, scope, cost objectives, or customer satisfaction) (Prado and Andrade, 2012). This number could be as high as 61% worldwide (The Standish Group, 2013). If we take into consideration the Gartner prediction, according to which IT spending in Brazil in 2015 will be US$ 125,3 billion, this is an alarming rate of failure.

On that account, project management could assist in the delivery of IT projects while avoiding these failure scenarios. Ever since the formal conception of project management, different associations and standards have been created, but the failure rate remains high, which leads to the question, “do project managers in Brazil know and use project management techniques, and if so, are they effective?”

In order to be able to answer this question, a survey with a convenience sample was conducted on-line. The sample consisted of 77 project managers from different IT

companies, from small to large. Of the 77 surveys sent, 55 questionnaires were considered complete and fit for use. With a sample this size, it is not possible to generalize the results to encompass the entire population of Brazilian IT project managers, but the findings were, nonetheless, surprising, showing a low usage of more elaborate time planning and management techniques, and an extremely low usage and awareness of agile time management and planning techniques.

Literature review

Project Success

One of the reasons for applying project management methodologies is to increase the chances of project success, so it is important to define what success is. One of the first mentions of project success relates to the iron triangle (cost, quality, and time), which can be traced back to Oisen (1971). Since then, there have been many discussions on what project success should be. Some researchers recognize the importance of efficiency (meeting time, cost, or scope targets) while others also recognize the importance of efficacy, such as meeting customer and team satisfaction, preparing the company for the future, and ensuring business success (Shenhar et al. 2001). Kloppenborg et al. (2012) wrote a literary review of major studies on project success in the 21st century and listed which factors were found to be relevant for project success; it is no surprise that from the 22 studies analyzed, 10 explicitly listed the efficiency factor as important, and it is still a measure used by many project managers (Bacarrini and Collins, 2004).

While efficacy success factors such as the future of a company and customer satisfaction are important, they can also be considered as factors linked to the conception of the project and more loosely related to the work of the project manager, which is more akin to the present of the project and more closely connected to efficacy. Hence, the criteria used for measuring success in this paper was "the completion of the project within the time frame originally planned". This measure of success motivated questions 1 and 2.

Question 1: does the use of time planning and management techniques lead to a higher chance of project success?

Question 2: which of the studied time planning and management techniques could be more closely related to achieving project success?

Project Planning

Project planning is oriented to "what" should be made and "how" it should be made (Martin & Miller, 1982). In most project types the "what" part, in which companies and organizations decide what they want to achieve, is determined prior to the project planning phase. After determining what to do, the "how" part follows, in which project management methodologies can be applied with the intention of reaching the desired outcome.

Project management methodologies are derived from project life cycles, which may range from linear to extreme project management (Wysocki, 2009):

- Linear project management: the whole is known before the project is started. Phases are sequential; the customer only sees the result at the end of the project. Any recalculation to add or remove scope, or to change the plans laid out from the start could be costly and time-consuming.
- Incremental life cycle: similar to the linear project management life cycle, but the scope of the project is divided into smaller sections, and the customer can receive each of the parts as they are completed. The problem is that, in reality, this is the linear life cycle split into multiple iterations, thus increasing the burden of documentation and project interdependencies.
- Adaptive: similar to the incremental life cycle, but customer interaction begins in the design phase.
- Extreme: commonly associated with research and development projects where the goal for the problem is clear but the solution might be refined throughout the project. Whatever planning there is might be made just in time, and the project might go through multiple cycles until its conclusion.
- Emertxe: it is the opposite of the extreme method (therefore its name); this cycle seeks for a problem to a known solution. It is associated to new products to which no use might have been found yet, for instance, 3M's post-it notes.

To make it easier to understand each of these cycles, Fernandez and Fernandez (2009) made a graphical representation (Figure 1).

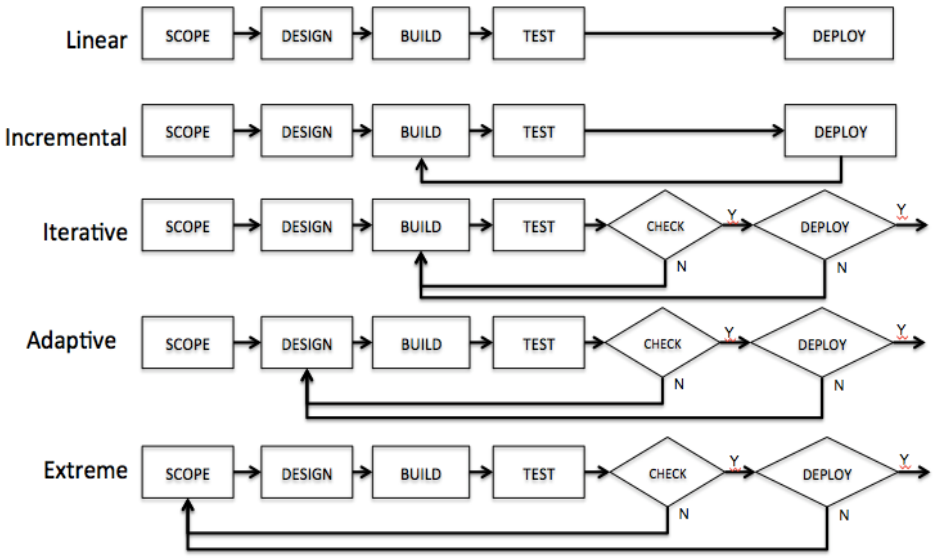

Figure 1 – Project life cycles (source: Fernandez and Fernandez, 2009)

The importance of noticing different project life cycles is that they can have distinct project methodologies and be applied to different types of projects, depending on the knowledge of its objective and solution (Table 1), thus minimizing some of the critiques of project planning, which seem to be geared towards agile projects managed with linear techniques.

Table 1 – Project life cycle according to project objective and solution (source: Adapted from Wysocki (2009, p. 300).

		Solution	
		Clear	Not Clear
Objective	Not Clear	I – Emertxe life cycle	II – Extreme life cycle
	Clear	III – Linear and incremental life cycle	IV – Adaptive and iterative life cycle

Linear project management

In the linear project management life cycle, the goal and the solution are known prior to the start of the project (Quadrant 3, Table 1), which allows the project manager to plan the entire project from beginning to end.

Problems can arise when the initial specification differs from what the client had envisioned, and the whole team might be planned to build something different than what the customer needs. Also, the originally planned sequence of activities may fail or be insufficient. In both of these scenarios re-calculating the schedule can be costly and troublesome. As a result of these shortcomings, some researchers have questioned the usefulness of project planning (Andersen, 1996, Dvir et al. 2003) while others have shown that linear tools and techniques can lead to project success in both efficiency and effectiveness success factors (Papke-Shields et al. 2010, Patanakul et al. 2010).

It is important to note that linear project management is not the panacea for any kind of project, and trying to fit linear project management in projects of a high degree of uncertainty possibly leads to the belief that "plans are nothing, changing plans is everything" (Dvir and Lechler, 2004). Inasmuch as IT projects are seen as having a higher degree of solution and goal uncertainty, linear project management would not be the most appropriate project life cycle, this motivated question 3.

Question 3: Do IT project managers in Brazil know and use linear time management techniques to manage their projects?

Agile project management

Project management was born in the engineering field (especially civil and naval engineering). This means that its original linear life cycle might not be well suited for IT projects, which possess distinct project life cycles and can be more iterative. Therefore, agile project management was born to fill this gap (Cervone, 2011).

One such agile practice is the Scrum methodology, originated from an article in which the authors, Takeuchi and Nonaka (1986), argued that project teams should have more autonomy and that, instead of being linear, project phases should overlap each other. This would generate more accountability, cooperation and initiative between project team members, and also enhanced speed and flexibility in project development.

In 1995, Ken and Schwaber discussed the first application of the agile method in the OOPSLA '95 conference (Cervone, 2011). Schwaber criticized the fact that linear project management methodologies do not respond well to change (Schwaber, 1997), which is precisely something that Scrum was born to solve. It is important to notice that,

to Schwaber, while project success seems to mean the delivery of a "useful system", efficiency factors are apparently not so relevant. For a good description of the Scrum process, I recommend reading Cervone (2001).

Agile methodologies are not without their share of shortcomings. In most companies, they represent a shift from what project managers are used to, and they can be challenging to scale, making them harder to implement in bigger companies or teams (Qumer and Handerson-Sellers, 2008). Nonetheless, since they are heralded as appropriate for IT projects, question 4 was proposed.

Question 4: Do IT project managers in Brazil know and use agile time management techniques to manage their projects?

Agile and linear time planning and management techniques

There are many time planning and management techniques. However, the purpose of this article was not to collect all available for study, save for those with a higher chance of being used by project managers and that were also used by other researchers, authors, or PMI's PMBOK® Guide.

The techniques selected are shown in Table 2.

Table 2 – Time planning and management techniques studied in this research

Technique	
T1 – Monte Carlo analysis	T2 – Project schedule
T3 – Analogous estimating	T4 – Bottom-up estimating
T5 – Parametric estimating	T6 – Top-down estimating
T7 – Three-point estimating	T8 – Resource breakdown structure
T9 – Change request form	T10 – Earned value management
T11 – Gantt chart	T12 – GERT
T13 – Schedule baseline	T14 – Activity list
T15 – Critical Chain method	T16 – Critical Path method
T17 – Milestone planning	T18 – Schedule management plan
T19 – Status report	T20 – Burndown chart
T21 – Daily Scrum	T22 – Sprint planning
T23 – Planning poker	T24 – Task Board

Source: Collected from Besner and Hobbs, 2006, Papke-Shields, et al. 2010, Patanakul, et al. 2010, Kniberg, 2007, Deemer, et al. 2012, Sims and Johnson, 2014, and the PMBOK® Guide.

Research Methodology

For data collection, the survey method was selected because it is a standard and economic way of quickly collecting information (Saunders, et al. 2009). Also, previous researches in project management have shown that historical project databases are either inaccessible for researchers or do not provide reliable data (Ibbs and Kwak, 2000, Ling et al. 2009).

Following the method suggested by Hunt et al. (1982), a pre-test was held with 13 people, divided in 3 groups – lay people, master students, and project managers – to assure that the form would be understood by the intended sample. Results were

consolidated in a table adapted from Fowler (1995, p. 123), and changes in the survey were made where appropriate.

The statistical techniques selected for data analysis were: linear regression, in order to detect any correlation between technique use and project success, and factor analysis, which enabled the grouping of techniques that could be related to project success.

A sample size of 300 was defined, using the rules of thumb described by VanVoorhis and Morgan (2007), based on the number of independent variables (24) and the statistical techniques that would be used.

Discussion

The researcher did not achieve the target sample size of 300. São Paulo's PMI branch and university professors of project management were contacted but did not reply, making their databases of members and students unavailable. This compelled the survey to be sent to the researcher's personal contacts. The final sample size was 77 IT project managers, from which 55 questionnaires could be considered complete and useful for the research.

Table 3 – Research sample demographics

Certification in project management	69% possess it and 31% do not.
Specialization in project management	51% possess it and 49% do not.
Company size (annual revenue)	71% large company, 11% medium-large 9% medium, 5% small, 2% micro, 2% preferred not to answer.
Company size (number of employees)	78% large company, 14% medium, 4% small and 4% preferred not to answer.
Frequency of success (frequency that project managers reached success in the past 2 years)	4% always, 62% frequently, 24% sometimes, 9% rarely, 2% never.

Table 4 – Project managed by the project managers

Project management experience (years)	6,03	2,47	1	12
Average Project duration (months)	6,81	3,73	1	18
Average project value (US$)	US$ 165,759	US$ 144,200	US$ 37.87	US$ 378,787

The demographics of the sample are laid out in Table 3 and Table 4 and show a great deal of variation in the sample, with almost half of the project managers having a specialization degree in project management and 31% possessing a certification in project management. This somewhat helps to diminish one of the problems of a convenience sample, where all individuals have the same characteristics. The average number of years as a project manager (6, Table 4) shows that this is an experienced sample of project managers. The bias in the sample can be attributed to company size, seeing that the majority of participants work in big companies.

For the first question, if the use of time planning and management techniques does enhance the frequency of project success, a new variable was created as the average use of the techniques for each project manager, then this average was plotted in a scatter plot versus the frequency of success achieved by each project manager. As shown in figure 2, as the frequency of use of the techniques grows, so does the frequency of success. This is a refreshing conclusion, especially because most of the techniques researched do not overlap and could be used in tandem. The R^2 obtained also shows a correlation between use and success of 0,13 ($p < 0,005$). While a small number, this could mean that other fields of knowledge also do influence project success, such as cost, scope, human resources etc.

The second question was, "of the 24 techniques studied in this research, which could have a stronger correlation with project success?" Due to the small sample size, factor analysis for data reduction was used, and it was possible to group the techniques into 4 different factors: linear techniques, agile techniques, alternate methods for activity duration estimation, and lesser-used linear techniques. A multiple linear regression, with the scores of each of the factors found, showed statistical significance ($p < 0,03$) for the first group – linear techniques –, which was composed of tools T2, T3, T9, T11, T13, T14, T16, T17, and T19. It is worth noticing that T16 was one of the few techniques, used frequently and always, by less than 50% of the project managers and appears in this group of techniques related with project success.

The final questions (questions 3 and 4) analyzed whether or not project managers knew and used linear and agile project management techniques (lack of knowledge was measured by the "unsure" category). The results (Figure 1) disclosed, perhaps not surprisingly, that agile project management techniques were less known and used, even in a sample where the project managers work in the IT field, which should be prone to the use of such strategies. It was also possible to notice that project managers rely mostly on well-known techniques (such as schedule and activity list) and do not use other methods – such as Monte Carlo analysis, critical chain, critical path, and three-point estimation – that could incorporate risk and uncertainty in their plans. This might explain part of the failures in IT projects to be concluded within their original planned time.

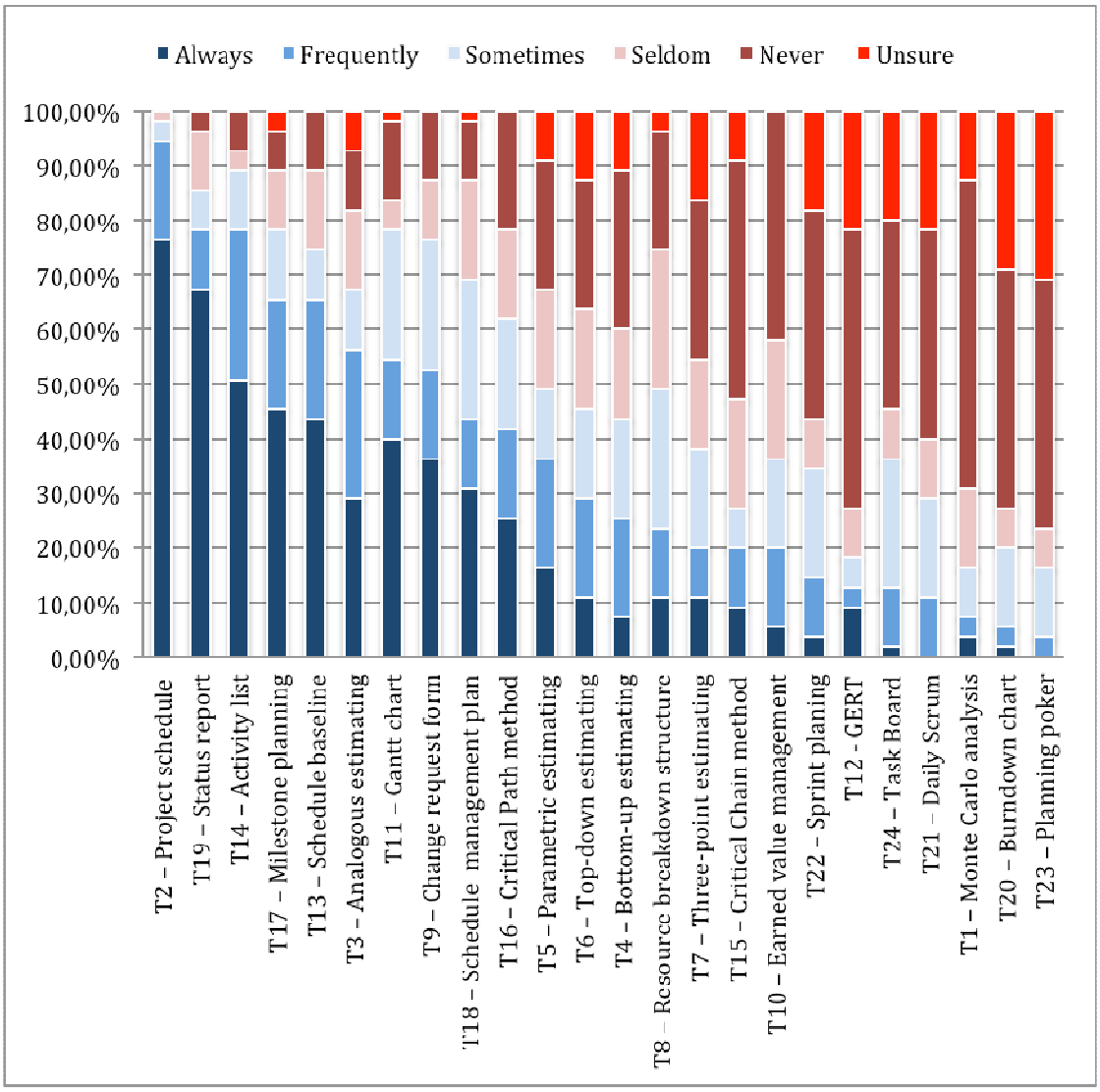

Figure 1 – Frequency of use and knowledge of each technique, from most to least used (source: graph generated with Microsoft Excel).

Conclusion

The objective of this paper was to analyze if project managers use time planning and management techniques, and if these techniques can contribute to the frequency of project success, where project success is measured by the completion of the project within the originally planned time. Results have revealed that project managers use basic techniques and seldom use techniques that would help them incorporate risk into their schedules. The good news for the project management area is that increased use of project management techniques also leads to a higher frequency of project success; furthermore, for this sample, it was possible to single out which techniques were correlated with project success.

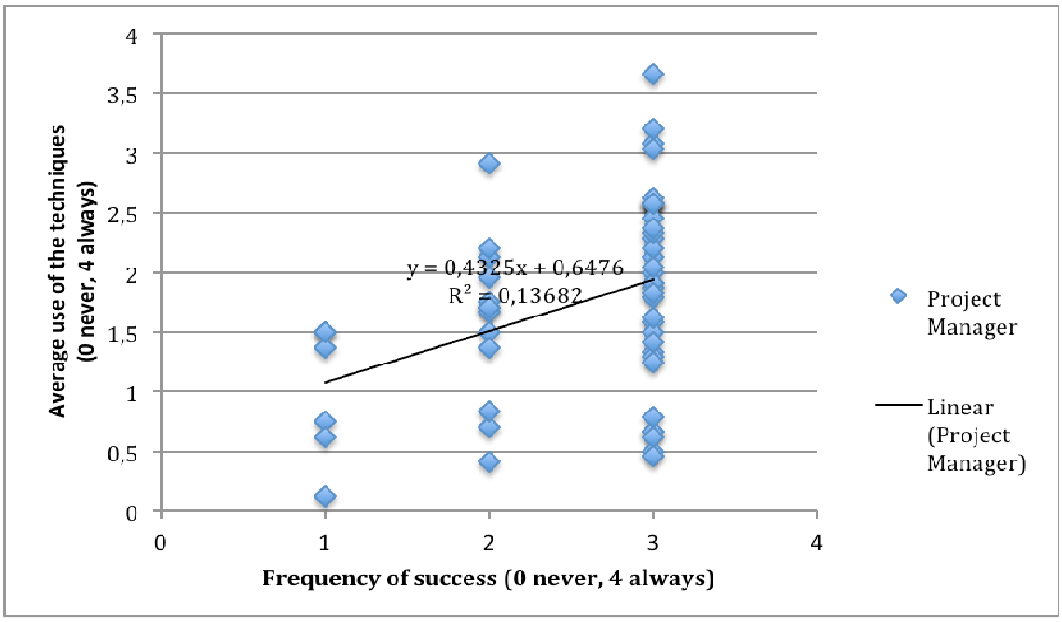

Figure 2 – Average of use versus success level (source: graph generated using Microsoft Excel).

Note: there were two respondents that always achieved success; they were grouped into the immediately preceding category (3); and there was only one respondent that never achieved success; he was grouped into the immediately superior category (1); this was done as there were so few cases in these extremes; they would have had very little relevance in the model.

Limitations

It is important to single out some of the limitations of this research. First, the small sample size means that these results are not statistically significant for the whole IT project management population in Brazil. Also, because of its small size, some techniques could have been misrepresented; such is the case of the agile techniques, which were seldom used or known by this sample, and for this reason would hardly appear as correlated with project success. Moreover, time management techniques might lead to success in other aspects, such as customer satisfaction, which were not measured in this survey. Finally, both independent and dependent variables were answered by the project manager; this could lead to unstable correlations, also known as common source bias.

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