ROOT CAUSES OF CHANGE IN IT PROJECTS

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ABSTRACT
In this paper the author studied 58 IT projects implemented during the period 2006 - 2007 and attempted to categorize the root causes of changes in those projects as well as identify the frequency of occurrence changes driven by each of those categories. The author also tried to discover relationships between the number of changes occurring and various project variables like project size, duration, etc. The research concluded that 22% of the projects implemented experienced at least one change and that the 2 most frequent causes of change were "Changed conditions" ("unbudgeted and unanticipated changes to baseline assumptions as they pertain to site conditions and weather) and "Programming Evolution" (change in/to the underlying basis of design as captured and identified in the baseline). This implies that more needs to done to identify risks that might derail the project and proactively plan responses to mitigate those risks. The fact that " "Changed Conditions" seem to be a strong driver to change as shown by this research is understandable as in today's complex IT projects and for a successful implementation many prerequisites and conditions need to be met and when they are not, change to projects become inevitable.
In this research the author was also able to show that the longer the duration between the creation of the SOW and the project start (kickoff meeting), the more likely that changes will occur in the project which implies that the longer the delay in project start the more there is a need to reevaluate some of the assumptions made during the planning phase.

KEYWORDS
IT Implementation, Project Management, Change

1) Introduction

Change is inevitable in many projects and it would be wrong to assume that all projects will proceed exactly as planned without any change occurring. Effectively managing projects and the dynamics of change is critical to success [1]. After studying the cumulative effect of change in construction projects, McCally [2] concluded that owners and contractors must jointly address the cost and effects of changes as and when they occur and agree on a method whereby these costs and effects can be reasonably estimated. Many companies implement a change management process in their overall project management methodology in order to better manage project change. Pappas [3] sites a survey in 2005 of 411 companies that indicated that 55% of those companies used a structural change management methodology up from 34% in 2003.
Tichacek [4] identified six root causes of change in projects:

1) Programming evolution which he described as change in/to the underlying basis of design as captured and identified in the baseline. He believed that this is a very common driver especially given the vast technological developments that occur during the often long planning to execution.

2) Market conditions which he described as the unanticipated, unbudgeted shortage of material, labor, or capital that bid-up pricing.
3) Oversight errors and omissions in the contract document
4) Failures in performance which he defined as the failure to provide complete or timely delivery of contractually committed events.
5) Changed conditions which he described as the "unbudgeted and unanticipated changes to baseline assumptions as they pertain to site conditions and weather.
6) Time related which he described as the deliberate and proactive decisions to "purchase time" in the project execution plan.

2) Project Management Methodology

In 2006-2007, the author worked as an IT project manager for a Fortune 1000 systems integrator in the United States and during that period, he managed tens of IT implementation projects for that company. The author identified all the changes that occurred in those projects and categorized them according to the Tichacek's [4] categories. The author hypothesized that the longer the period from the development of the statement of work (SOW) until the project start (project kickoff meeting), the more likely that a change will occur. The author also hypothesized that the larger the project (in terms of number of budgeted hours), the more likely that a change will occur.

The author followed the company's established project management methodology in managing the assigned project. The project's statement of Work (SOW) is created by the sales team and in it the project's cope, cost, as well as any other relevant information are documented. Once the customer signs that document, it is considered the legal contract that binds the company and the customer during this engagement. The project manager is then assigned and he/she discusses the project with the internal team and then schedules a kickoff meeting with the customer to signal the official launch of the project. During or even before the project implementation and once a change is identified, the project manager documents the change in a change request form identifying the effect on scope, cost, and schedule, and then submits it to the sales team who add the selling price. The customer then signs the change request form and then the change is implemented.

3) Data Analysis

The author already had all the project documents for the projects managed in 2006 and 2007 and he extracted from these documents a number of variables that are relevant to this study. The following information was then entered into Excel:

1) Project ID
2) Project cost
3) Number of changes
4) Description of change
5) Duration from creations of SOW to Kickoff meeting
6) Duration from kickoff meeting to project completion
7) Duration from creation of SOW to project completion.

The project population consisted of 58 projects of various sizes and scopes. Of those projects 13 had a documented change form created. Accordingly 22% of the projects incurred change. Overall there were 16 change forms.

The author then used Pearson correlation coefficient to assess if there is any correlation between the chance of change occurring and some of the other project variables. The results of the analysis are shown in table 1.0.
According to the above table and because of the very low p-value, there seems to be a correlation between the 4 variables and the number of changes occurring in projects. But after careful analysis of the data, the author noticed that one large project seemed to influence greatly the correlation between the project size and the number of changes. The author accordingly removed this project from the population and recalculated the Pearson Correlation Coefficient and the p-value (see table 2.).
According to the above table, the strongest correlations between the numbers of changes seem to be the following variables:

1. The duration between the creation of the SOW and the project completion
2. The duration between the creation of the SOW and the project kickoff meeting

3.2) Categories of Change

Out of the 58 projects implemented, 13 projects experienced a change and overall 14 changes were reported. The most frequent causes of change were "Changed conditions" and "Programming Evolution" with both occurring 5 times, followed by "Failure in Performance" which occurred 3 times, and then one occurrence of "Market Conditions" (see Fig 1.).

3.3) Examples of Change

The following are examples of some of the changes that occurred in the project as well as the root causes that drove those changes:

- Changed Conditions: The customer did not finish the migration of the Oracle Enterprise Manager before the site visit as planned, and accordingly the consultant could not proceed with the scope during the maintenance window and had to spend more time to finish the scope.
- Programming Evolution: the customer requested that the consultant spend 40 additional hours working on issues that were not identified in the scope.
- Failure in Performance: a second consultant had to be engaged to finish the scope because the first consultant had issues with the implementation.
- Market Conditions: the SOW had to be changed to replace the primary consultant because he retired.

4) Conclusion and Recommendations

This research studied 58 IT projects implemented in 2006-2007 and successfully categorized the root causes of change using the six categories developed by Tichacek [4]. The author was able to show that 22% of the projects implemented experienced at least one change. The 2 most frequent causes of change were "Changed conditions" ("unbudgeted and unanticipated changes to baseline assumptions as they pertain to site conditions and weather) and "Programming Evolution" (change in/to the underlying basis of design as captured and identified in the baseline). This implies that more needs to done to identify risks that might derail the project and proactively plan responses to mitigate those risks. This research confirms Tichacek's [4] position that "Programming Evolution" is a very common driver to change although it also shows that "Changed Conditions" seem to be as frequent in driving project change. This though

is no surprise especially that in today's complex IT projects and for a successful implementation many prerequisites and conditions need to be met.
In this research the author was also able to show that the longer the duration between the creation of the SOW and the project start (kickoff meeting), the more likely that change will occur in the project. This was further emphasized by the fact there was also a significant correlation between the number of changes and the duration between the creation of the SOW and the project completion. These findings imply that the longer the delay in project start the more there is a need to reevaluate some of the assumptions made during the planning phase.

5) References

[1] Pardu, Bill, May 1996. Managing change in a project environment. *CMA, Vol* 70, No. 4, pp. 6

[2] Bob M McCally, 2006. The Cumulative Effect of Change. *AACE International Transactions, pp.* CS51

[3] Lorna Pappas, Apr 2006. The speed of change. *PM Network, Vol* 20, No. 4, pp. 42

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6) Tables and Figures

Table 1.0 Correlation between project variables and number of project changes

Variable	**Pearson Correlation Coefficient (r)**	**Square of Correlation (R)**	**p-value**
Project Cost	.252	.063	6.0197E-08
Duration from creations of SOW to Kickoff meeting	.299	.09	5.21956E-09
Duration from kickoff meeting to project completion	.553	.306	1.25224E-09
Duration from creation of SOW to project completion.	.613	.376	1.5633E-14

Table 2. Correlation between project variables and number of project changes after removing the outlier project

Variable	**Pearson Correlation Coefficient (r)**	**Square of Correlation (R)**	**p-value**
Project Cost	.148	.022	8.1473E-10
Duration from creations of SOW to Kickoff meeting	.229	.053	3.81706E-09
Duration from kickoff meeting to project completion	.532	.283	2.82237E-09
Duration from creation of SOW to project completion.	.59	.384	4.9622E-15

Fig 1. Root causes of change