

Evaluation of Three Methods to Predict Project Success: A Case Study

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Abstract. To increase the likelihood for software project success, it is important to be able to identify the drivers of success. This paper compares three methods to identify similar projects with the objective to predict project success. The hypothesis is that projects with similar characteristics are likely to have the same outcome in terms of success. Two of the methods are based on identifying similar projects using all available information. The first method of these aims at identifying the most similar project. The second method identifies a group of projects as most similar. Finally, the third method pinpoints some key characteristics to identify project similarity. Our measure of success for these identifications is whether project success for these projects identified as similar is the same. The comparison between methods is done in a case study with 46 projects with varying characteristics. The paper evaluates the performance of each method with regards to its ability to predict project success. The method using key drivers of project success is superior to the others in the case study. Thus, it is concluded that it is important for software developing organizations to identify its key project characteristics to improve its control over project success.

1 Introduction

There are many project characteristics that influence project success. If it is true that certain project characteristics lead to certain project outcomes, it becomes important to be able to identify similar projects, since they would likely lead to similar project outcomes. Nowadays when many software systems evolve over time and come in several releases, it becomes even more crucial to learn from past projects to increase the likelihood for success in future projects. Software organizations must understand which project characteristics are most important for them to ensure successful projects. This paper contributes with a comparison of three potential methods to use to predict project success.

Some examples of project characteristics include stability of requirements, knowledge of developers and management, inherent difficulty of the project, techniques and tools used (and how appropriate they are), tightness of schedule and type of application, required levels of reliability, fault tolerance, security, use of development techniques including use of object-oriented programming, design patterns, extreme programming, etc. Success indicators include timeliness of delivery, quality of software, as well as more long term properties such as maintainability and evolvability.

Some of these project characteristics can be measured objectively, while others have to be measured subjectively. The same is true for project success variables. We focus here on subjective measurement of both project characteristics and project success as also is the case in for example [1]. The focus here on subjective measures is primarily due to availability in the case study presented below.

In order to predict project success reliably, it is first necessary to find a method to identify similar projects. Projects are similar, if they show similar project characteristics and/or similar project outcomes. This paper investigates three methods to identify similar projects:

1. Nearest neighbor. This method takes a set of projects, the base set, and computes for a new project the distance to each project in the base set. The new project is most similar to the project with the smallest distance to the new project.
2. Friends. This approach also uses a base set of projects as well as the new project and groups them based on Principal Components Analysis (PCA) [2]. The new project is most similar to the projects with which it has been grouped.
3. Key success driver analysis. Not all project characteristics are equally important in predicting project success. This analysis method reduces the full set of project characteristics to those that behave similarly to project success. This reduced set of project characteristics is then used to rank projects by success and failure. New projects are identified as potentially successful or not based on this classification.

We selected these three approaches, because they represent three very different approaches to similarity identification. The first method is focused on identification of the most similar project using a distance measure [3], which is a simple measure used in case-based reasoning. The second method identifies a set of similar projects using all available information. Finally, the third method is based on identification of key success drivers. Based on these key success drivers, the most similar projects are identified.

Other methods would have been possible to use as for example neural networks, clustering and so forth. However, the main objective is not to make an exhaustive comparison of methods. The objective is primarily to investigate whether it makes more sense to focus on a few key variables (in particular the key success drivers in the context of this paper) rather than all data available for different projects.

All three methods are evaluated with respect to their ability to predict project outcome (success or not). Since the impact of project characteristics on project outcomes varies over time (for example, use of the software factory concept [4] will