Evaluating Critical Success Factors in Distributive Software Projects: Implementation Efforts

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Abstract: **The size and complexity of projects in the software development are growing very fast. At the same time, the proportion of successful projects is still quite low according to the previous research. Although almost every project's team knows main areas of responsibility which would help to finish project on time and on budget, this knowledge is rarely used in practice. So it is important to evaluate the success of existing software development projects and to suggest a method for evaluating success chances which can be used in the software development projects. The main aim of this study is to evaluate the success of projects in the selected geographical region. The second aim is to compare existing models of success prediction and to determine their strengths and weaknesses. The research includes to study various software projects success factors related to their process improvements. It includes specifically distributed software projects.**

Keywords: **success factors, success prediction, distributed projects, communication problems, process improvement, success criteria.**

1. INTRODUCTION

The process of software project implementation, involving the successful development and introduction of projects in the organization, presents an ongoing challenge for managers. The project implementation process is complex, usually requiring simultaneous attention to a wide variety of human, budgetary, and technical variables. The size and complexity of projects in the software development are growing very fast. At the same time, the proportion of successful projects is still quite low according to the previous research. Although almost every project's team knows main areas of responsibility which would help to finish project on time and on budget, this knowledge is rarely used in practice. So it is important to evaluate the success of existing software development projects and to suggest a method for evaluating success chances which can be used in the software development projects for process improving. The main aim of this study is to evaluate the success of projects in the selected geographical region (Pune). The second aim is to compare existing models of success prediction and to determine their strengths and weaknesses. It was found out that there are many problems in the software development projects. These problems are widely known and were discussed in literature many times. There search showed that most of the projects have problems with schedule, requirements, architecture, quality, and budget, although there are many more specific objectives such as executive support, user involvement and formal methodology. According to Erdogmus (1999), decision making in software projects is hard. These factors include not only cost and schedule but also flexibility , complexity, etc Atkinson(2006) also mentioned these three objectives as performance criteria of evaluating software projects.

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2. LITERATURE REVIEW

The most common and widely used definition of risk and success in projects in terms of exposure to specific factors that present a threat in achieving the expected outcomes of a project. Evaluating the success of software development projects is a difficult and wide task (Hillam et al., 2000). It covers all project activities from gathering requirements to sending project to the customer. Numerous studies have been conducted on identification and management of the software risks. All the previous studies provide the great insight into factors affecting the success of software projects. Not many studies have concentrated o the overall success aspects of the project and not all studies have find out project constraints or success constructs(budget, schedule and quality. This understanding is important as it help to identify key factors that are individually responsible for affecting three main project constructs.

At first, it should be determined what success is. There is no standard definition of success but every company, or even every project, has its own definition (Rikkiev and Makinen, 2009). The problem is that very specific definitions cannot be used for the research which covers many different projects because every project should be estimated in the same manner. As a result the following metrics are chosen for success measurements:

Time, budget, and quality because they can be measured for every project (Soini et al., 2006). Every project requires a lot of decisions during lifecycle (Glass, 1998a). The time required for making decision depends on the management hierarchy. There are three main organizational structures: projectized, functional, and matrix (Morisio et al., 2002).Also Outsourcing is very popular today because of software market. As a result many software development projects became outsourced. Software development project cannot be done without people so communications between team members is one of the key factors for success (Constantantine, 2001). Possible problems in communications are also important.
The next question is how to use measured factors for success prediction. The Standish Group (Standish Group, 1994) and McConnell's (McConnell, 1997) models are chosen because of their popularity (Little, 2006). These two models of success prediction are described here.

This research is specific to distributed software's, their implementation issues and success factors.

1. Distributed projects

A theoretical framework Project Management Institute (2004) for studying distributed projects was suggested by Roberto Evaristo and Richard Scudder (Evaristo and Scudder, 2000). They identified 10 dimensions of "distributedness". Distributedness means that distributed projects have many different factors affecting their success or failure so they should be analyzed as an multidimensional entity. Dimensions are presented in Figure 1.

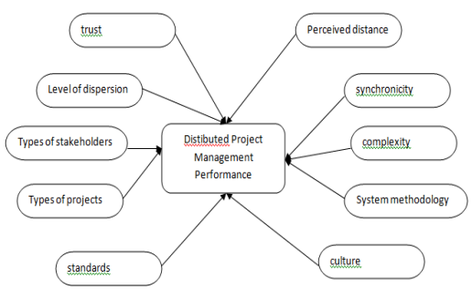

Fig. 1: Distributedness dimensions (Evaristo and Scudder, 2000)

2. Existing success definition

Glass (1998) says that a software runaway is a project that goes out of control primarily because of the difficulty of building the software needed by the system. "Out of control" is defined as unmanageable — impossible to manage it to meet its original target goal. Another definition of the runaway is the KPMG's definition — "A runaway project is one which has failed significantly to achieve its objectives and/or has exceeded its original budget by at least 30 percent" (KPMG, 1995). The first definition is more general because it includes second statement. According to Glass, successful project is a project which is manageable. The project can have budget and time overrun over 100 percent but be successful if it meets target goals. Standish Group (1994) definition is stricter. Successful project is a project which is finished on or under time and budget. Any overrun means failure. The next definition of success says that it does not matter how much resources were spent if stakeholders are satisfied .These two approaches present opposite views to the success measurement techniques. Glass' definition does not give a method which allows us to understand that project is unmanageable.IBM Corporation (IBM, 2010) suggests to split project success criteria into several parts and each of these parts can be measured.

3. Organizational Structure

Project Management Institute divides organizational structure types into three groups.

- Projectized (Figure 2) - team members are often collocated, most of the organization's resources are involved in project work. The project managers have a great deal of independence and authority departments report directly to the project managers or provide support services to the various projects.

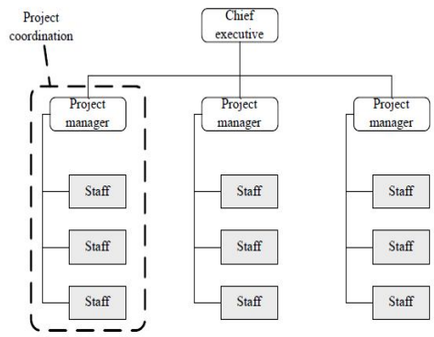

Fig. 2: Projectized organization

- Functional (Figure 3) - Each employee has one clear superior and staff members are grouped by specialty such as production, marketing, accounting ,etc .Scope of the project is usually limited to the boundaries of the function. Engineering department will do its work independent of the manufacturing or marketing departments.

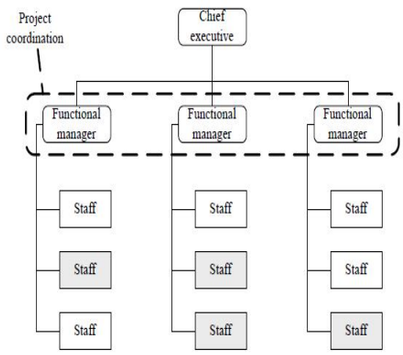

Fig. 3: Functional organization

- Matrix (Figure 4) - Blend of functional and projectized characteristics which recognizes the need for a project manager but do not provide the project manager with the full authority over the project and project funding

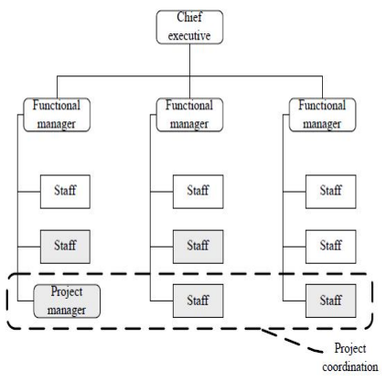

Fig. 4: Matrix

4. Examples of project success criteria

- Total project cost does not exceed X% of the initial budget.
- The actual delivery schedule is within X percent of the initial deadline.
- All high-priority functionality defined in the requirements specification is delivered in the first release.
- The estimated number of residual defects does not exceed X per function point.
- Load testing confirms successful scale-up to X concurrent users, with page download
- Times no longer than Y seconds over a 56K dial-up connection.
- All unauthorized network intrusions are intercepted, prevented, logged, and reported.
- The mean time to failure under specified load conditions is at least X hours.
- The average installation time of the product is less than X minutes, with Y% of installations being error-free and requiring no support call.
- At least X% of software components was reused from previous applications.
- Prerelease development rework does not exceed ten percent of total development effort.

The problem of this approach is that most of the criteria look like requirements. These "requirements" can be used only in a concrete project in a concrete company. It becomes impossible to compare various projects because there is no standardized criterion which is suitable for every project. It means that universal metrics should be chosen for investigation (Boehm, 1994). The main customer's business goal is to get a product in time by using allocated resources and with appropriate level of quality (Atlee and Wieringa, 2006). Time, budget and quality metrics are popular and widely used because they are associated with business objectives of customers (Nan and Harter, 2009). Some research of successful projects, such as Standish Group (1994) and McConnell (1997), are using these metrics too. So if new research results are based on these metrics, they can be compared with other results.

3. NEED OF THE STUDY

Nowadays software development market is growing very fast (Market Research, 2009).Projects require more and more resources and complexity becomes a problem. In the last thirty years technologies have changed considerably. New programming languages, devices, microprocessors were invented and reinvented many times (Mahoney, 1988) but management methodologies have not changed substantially (McCarthy and Matthern, 1999). It leads to a high ratio of unsuccessful projects even with good financial support. Economic situation requires new effective methods for managing software development projects . So we should evaluate the critical success factors of existing software development projects and define a baseline which describes current situation. Later we will be able to compare new results with this baseline. The need of the study for following purpose:

1. Collection of information about software development projects in selected geographical region.
2. Analyzing collected information.
3. Evaluating the success of these projects.

4. Based on above information suggesting improvements in success factors of software development projects and it leads to minimize mistakes occurs during software development process.

4. SCOPE OF THE STUDY

Pune is one of the largest IT hubs in the India. Every year Pune software development market shows a modest growth. This research evaluates the main factors that affect the success of software development projects. These factors are management (development process, resource estimation, project planning) and people ware (communication problems inside the team, team size, organizational structures) according to Belbin (1981), De Marco and Lister (1999), respectively. Other factors such as political situation (Stribrny and Mackin, 2006), economic situation (Aoyama, 1997), and risk management (Hua et al., 2006) are not evaluated here. Another purpose is to compare two existing models which allow us to predict chances for success based on the prevailing situation in project. Knowledge of these chances will help companies to save money (Hui and Liu, 2004). The last purpose is to share information about the causes of software development projects failures. The importance of this task cannot be underestimated as nobody likes to tell about failures. In the software development industry failures are covered up, ignored and rationalized (Boehm, 2000). As a result, this leads to constantly repeating mistakes.

The main objective of the study is to answer three research questions:

1. What are the main reasons for success or failure of the software development Projects in the selected geographical region?
2. How to predict the success chances in the distributed projects?
3. Which of the two models (Standish vs. McConnell) is better for success prediction?

5. OBJECTIVE OF THE STUDY

Critical success factors are factors that, if addressed appropriately, will significantly improve the chances of project success (Pinto and Rouhiainen, 2001). Over the past several decades, numerous research studies (Pinto and Mantel, 1990; Belassi and Tukel, 1996) have been performed in the area of project management to identify critical factors that influence the success and/or failure of projects. However, the critical factors are usually identified for projects in various industries, such as engineering, manufacturing, construction and training, rather than focusing on software development or IT projects. Managing a software project is different from managing any other project due to the complexity, conformity, visibility and malleability of the software itself (Brooks, 1995) and because software development is intellectually intensive work (Fairly, 2009). Additionally, software has certain unique characteristics (Brooks, 1995) that cause software development projects to differ from other typical engineering projects. Most researchers agree that there are differences in project management among different industry types (Cooke-Davies and Arzymanow, 2002) suggested that project success factors are not universal to all projects. Thus, the critical success factors identified in other industries cannot be used as valid critical factors for software projects. In this research study, however, we did not differentiate between IT projects and software development projects because IT projects. Objective is to study success factors and how it helps software projects to improve development process and get the better output.

6. RESEARCH METHODOLOGY

Projects will be divided into 6 different categories as follow:

1. Project finished without budget and time overhead.
2. Project finished with time overhead.
3. Project finished with budget overhead.
4. Project finished with budget and time overhead.
5. Project not finished yet.
6. Project cancelled

According to Jarvinen (2004), Jenkins (1985) model of the research consists of 8 steps which are presented in Figure 5. Jenkins says that his model is general and every research has many other steps. In addition, Jenkins underlines that the model is over simplification because research process is iterative. In this research Jenkin's model was used as a base but it was tailored for the current study and eight sequential steps were replaced by three phases.

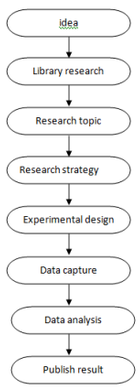

Fig :5 Jenkins' model (Jarvinen, 2004)

The first phase covers Jenkin's steps from 1 to 4, the second covers steps 5 and 6 and the last two steps of Jenkin's model were covered by the third phase .In the Introduction three research questions are presented:

1. What are the main reasons for success or failure of IT projects in the selected geographical region (Pune)?
2. How to predict the success chances in the distributed projects?
3. Which of two models (Standish vs. McConnell) is better for success prediction?

To answer these questions it is necessary to collect data from different projects. So the research should be done as an empirical study (Basili, 2006). Two methods of gathering information were chosen: survey with structured forms and theme-based interviews. The research divided into three phases.

The research started from the discussions with top managers and IT directors about the relevance of the topic. After the conversation it was obvious that the study of such kind is useful. The second phase started with searching people who are ready to participate. The third phase was dedicated to summarizing and analyzing the information which were collected during previous two phases.

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