Risk factors in software development projects:
Analysis of the Chilean software industry

Javier Pereira (jpereira@utalca.cl)
Narciso Cerpa (ncerpa@utalca.cl)
Mario Rivas (mrivasm@utalca.cl)

Departamento de Ingeniería de Sistemas,
Facultad de Ingeniería, Universidad de Talca
Camino Los Niches, Curicó, Chile

Abstract

Here, we present some results and future perspectives of an investigation looking for identification and description of risk factors in the Chilean software development industry. Data has been obtained by questionnaires asking for seven risk categories identified in the international literature. Two experimental questions encourage our research. Firstly, are these risk categories present in the Chilean case? If not, for those relevant and new categories found in the Chilean case, what are the relevant variables describing them? Secondly, is it possible to define the software project success in terms of risk factors and, consequently, find a synthetic cause-effect model, in the Chilean reality, where a software project manager could search for answer elements in front of a specific project?

Actually, we have already questioned a number of software development enterprises, groups and professionals. Using data analysis we found some interesting results indicating characteristics of a successful project, as perceived by people: 1) improvement of professional expectations, 2) enhancement of satisfactory labor relationships and 3) detailed project scheduling. In the next step, we are currently searching for regression models which could explain the project success by variables as methodology, estimating, management commitment, sponsorship, and others. Further, a Bayesian belief network is being built to have a causal model of project success in terms of risk factors. The final stage of our investigation is that network implemented in a decision support system.

1. Introduction

A lot of studies have shown that success or failure in software project development are notions dependent on people perceptions and, consequently, both may change from one project to another [10][19]. Other studies enhance differences among project manager and team members when they are asked about their particular notions or perceptions of success in software development projects [6][15]. In such of those studies, performed on several projects, the sole success criteria mentioned were accomplishment of user requirements, to get the purpose, to accomplish the project scheduling, to accomplish the project budget, to get customer satisfaction, deliver a product of quality [8].

Successful software development projects are commonly perceived as those projects satisfying business goals and scheduling and time commitments [11][1][8][20][21]. Other success definitions include: extend in what a project attain objectives, reliability, maintainability, customer satisfaction, team work, professional satisfaction of the project manager [7][12], and extend of software utilization [5]. A single and largely accepted project success definition does not exist and, more important, project managers do not understand how to reach it [3][9].

Pressman [12] and Linberg [8] indicate risk factors in software development projects: failures in estimating and programming activities; failures in requirements specification; failures in communicating with customer/user; poor organizational structure; lack of leadership; lack of superior management support; lack of effort; personality conflicts; inappropriate software development methodologies; inappropriate business processes and resources; inadequate project management process and tracking tools.

In general, seven risk categories in software development project may be identified: 1) management, 2) customer and users, 3) requirements, 4) estimation and scheduling of activities, 5) project manager, 6) software development process and 7) development team [18][17][13][14]. Other researchers have proposed different risk categories [16]: scheduling of activities, functionality of software, contracts, requirements management, the management of resources and performance, and the personnel management. A rigorous and quantitative approach is needed in order to best understand what a risk is, how different risk factors interact, and what the effects
of risks on the project success or failure are. In [2][4] we find suggestions in order to unfold an empiric science for the software engineering, as soon as possible. Our research is grounded on that idea.

2. Research Project Scheme

The purpose of this investigation project is the development of risk analysis and mitigation models which could aid project managers in identifying, analyzing and controlling potential risks in the software development project life cycle. Activities defined for this research are as follows:

- Collecting data related to success and risk perception in software development projects, in the Chilean context.
- Development of statistical models relating risks, success factors and mitigation actions, in order to aid in success or failure prediction of software projects.
- Development of a decision support system implementing risk and success models.

Currently, we have concluded the collecting data phase. A number of software development enterprises, groups and professionals, in Chile, were questioned. Notice that most of the participant enterprises were engaged in their own software process improvement activities (CMM/SW, CMMI or ISO 9000 frameworks) and were very sensitive to our project.

Two questionnaires were elaborated. The first one, called the Project Perception Questionnaire (PRP), addressed the people perception about success factors in general. The second one, called Personnel Perception Questionnaire (PEP), was directed to project managers and looked for their perceptions of success or failure in a recently finished software development project. Questions in these tools were organized after seven risk categories: management/process, estimating, customer/user, requirements, personnel/professional, development team, interpersonal relationships, and other aspects (non classed on previous categories).

3. First results

Among the first data analysis techniques used in our project, factorial analysis was applied to the PRP questionnaire. Three success factors were identified, each one constituting a factor:

- **Professional status:**
  People consider that a successful project allows improved economic conditions, a best professional profile and an advantageous organizational position.
- **Interpersonal relationships:**
  A successful project is perceived as an opportunity to have appropriate relationships among pairs and superiors

management levels.

- **Project planning:**
  In a successful project, a detailed work breakdown structure is specified and time of activities is estimated more precisely, which is perceived as a good plan.

In a management perspective, this kind of results means that a good project is administrated by a project manager who is capable to manage motivation, labor relationships and commitments. Particularly, one can conclude on some interesting variables which should aid to enhance project success: economic rewarding, career development, responsibility management, job security, and learning.

In the Chilean context, people do not replace economic improvement (the more important variable in our results) and other kind of motivation. It is our content that this calls for extended studies in order to investigate how organizations administrate motivation. We believe that the economic reward appears as a compensatory effect to inadequate administration of other motivational aspects.

It is interesting to notice the absence of important risk variables mentioned in the international literature such as the requirements management, the customer/user relationship, or the sponsorship. We thought that those aspects must be studied in the Chilean reality in order to precisely know in what extend they are treated in the industry and professional education.

4. Next steps

The next step in our research has begun. At the present, some regression models have been developed and they are in a validation stage. Those models allow the incorporation of significant variables to the searched success-risk causal models. Actually, structural equation modeling is being applied to alternative Bayesian belief networks in order to test validity and stability of networks. Some structural and previous knowledge is being incorporated to models, principally concerning some obvious relations among explicative variables of success.

Even if the Bayesian models elaborated up to here have not been validated, they allow for a more natural and simple visualization of mitigation strategies. Thus, this kind of tools is an excellent laboratory to simulate different project conditions and controlling actions addressing project success.

Acknowledgement

This research has been funded by the Chilean grant FONDECYT 1030785.

5. References


