**TOP 9 SQUEEZING FACTORS ON SOFTWARE DEVELOPMENT PROJECT MANAGER DURING DEVELOPMENT OF PROJECT**

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# TOP 9 SQUEEZING FACTORS ON SOFTWARE DEVELOPMENT PROJECT MANAGER DURING DEVELOPMENT OF PROJECT

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### ABSTRACT

Islam MK, Das SK, Hossain MA (2012) Top 9 squeezing factors on software development project manager during development of project. *J. Innov. Dev. Strategy.* 6(2), 68-72.

Software plays a crucial role in overall economy. As businesses become more dependent on information technology for their operations and software development projects have a reputation that they often fail, software project managers are under increasing pressure to deliver quality applications software on time and within budget. Thus, in addition to their technical skills, they must master the necessary management skills to lead and control software development projects. The key responsibility of the project manager is to successfully accomplish the project objectives by balancing the competing demands for quality, scope, time, and cost. During development of project, the project managers feel much trouble that affects in success of project. In this paper, some important factors have identified and discussed that creates pressures on software project managers.

*Key words:* project risk, product quality, quality assurance, aggressive estimates, quality triangle, project's deliverables

## INTRODUCTION

Software applications are the driving force of modern business operations, but software is also viewed by many chief executives as one of the major problem areas faced by large corporations (Yourdon and Death, 1997; Glass 1998; Johnson and James, 2000; Mensah and Kweku, 2003). Software development is a complex process involving such activities as domain analysis, requirements specification, communication with the customers and end-users, designing and producing different artifacts, adopting new paradigms and technologies, evaluating and testing software products, installing and maintaining the application at the end-user's site, providing customer support, organizing end-user's training, envisioning potential upgrades and negotiating about them with the customers, and many more. In order to organize and manage a software development project successfully, one must combine specific knowledge, skills, efforts, experience, capabilities, and even intuition.

Software project management always involves various organizational aspects, such as creating and staffing development teams, assigning roles to the team members, modalities of software development, leadership considerations, interpersonal communication at work, staff training and embracing new technologies, organization's culture, social and ethical issues, and so on (Athey 1998; Beck 2000; Booch 1996). There is a vast amount of knowledge the manager should possess that transcends the boundaries of any specific project. One of the primary duties of the manager of a software development project is to ensure that all of the project activities follow a certain predefined *process*, i.e. that the activities are organized as a series of actions conducing to a desirable end (Lindvall and Rus, 2000). The activities are usually organized in distinct *phases*, and the process specifies what artifacts should be developed and delivered in each phase. For a software development team, conforming to a certain process means complying with an appropriate *order* of actions or operations. For the project manager, the process provides means for control and guidance of the individual team members and the team as a whole, as it offers criteria for tracing and evaluation of the project's deliverables and activities. When software project managers (PMs) themselves are interviewed, they concur that the three major complaints levied against software projects are real and serious. However, from the point of view of software managers, corporate executives also contribute to software problems (Jones and Capers, 1995). However consider the following 'Scope Triangle' or the 'Quality Triangle' that shows the trade-offs inherent in any project.



Fig. 1. Scope triangle of software project

The triangle illustrates the relationship between three primary forces in a project. Time is the available time to deliver the project, cost represents the amount of money or resources available and quality represents the "fit-to-purpose" that the project must achieve to be a success.

Hence the software development project managers have to race between two goals. The first one is to deliver the cheapest system, in the shortest time that just about gets the job done" and the second one is to deliver the best sales and marketing system on the market. And the software project managers feel pressures to achieve the

above two goals with available resources. In this paper, we have tried to discover different type factors that create mental pressures on project managers. The later sections in this paper, we have described the identified squeezing factors depending on a survey has been done on 10 failed projects and 5 successful projects from Bangladeshi software project practitioners. The practitioners were mainly project managers from above 15 projects. We have ranked the factors depending on importance given by the practitioners.

The next section describes the squeezing factors for project managers during development of software project. The section after next section describes the survey data related to the squeezing factors. And the last section summarizes the findings of this research and gives some future research dimension depending on this paper.

**Pressures on Project Manager**

The key responsibility of the project manager is to successfully accomplish the project objectives by balancing the competing demands for quality, scope, time, and cost (Project Management Institute 2004).

In order to keep everything under control, eliminate delays, always stay within the budget, and prevent project runaways, i.e. situations in which cost and time exceed what was planned, software project managers must exercise control and guidance over the development team throughout the project's lifecycle (Ahituv *et al.* 1999). Hence during the project on run, the software project manager feels different kinds of pressure. In this paper we have identified some factors that create pressures on software development project manager. And they are

### *Pressures related to project team (F1)*

Organizational aspects of software development are crucial for all successful projects. They are neither about hardware nor about software – they are about ``peopleware''. A project team is comprised of a group of people who will realise the project result and have various backgrounds, each of whom contributes knowledge and skills. Good team members have high self-esteem and strong commitment to the project's success (Jurison 1999). Project managers analyze the work packages and define the 'human resource requirements'. These define the roles required in the project. The project manager also defines the relationships between the roles to enable the effective coordination and control of the project. But software development manager feels pressures from the following facts

- Top management always tries to invest minimum human resources to get maximum profit. And sometimes they force project managers to build team with insufficient number of human resources.
- Unavailability of experienced personnel forces project manager to invest inexperienced personnel in project. And here experience is badly in need to overcome obstacles technical problems about this fact.
- Rapid decreases in the number of staff can be a problem because the loss of expertise before the project is finished can drastically slow the rate at which problems are solved. When experienced staffs leave a project, time should be set aside for them to transfer their knowledge to other staff.
- Another fact is unprofessional behaviour from team member. Communication among team members is one of the factors to deliver project successfully. Effective teamwork requires collaboration among team members (Jurison 1999). But unprofessional behaviour from team member creates problems in sharing knowledge among the team members.

### *Pressures related to schedule (F2)*

Unrealistic schedule pressure by executives or clients is a common software risk factor (Capers and Jones, 2006). The larger the project, the greater the gap between the actual delivery date and the planned delivery date of the application (Jones and Capers, 2005). The executives believe that the short the project duration the lower development cost, the maximum the profit. And by creating unrealistic setting up the deadlines result destruction the rhythm of the project, putting an extra workload to the team members. If the mandated schedule is quite impossible to achieve, then a more drastic option would be project cancellation (Capers and Jones, 2006). And here the executive will not be happy. So the project manager feels so much pressure to deliver the project successfully.

### *Pressures related to budget (F3)*

Optimistic estimation is still one of the two most common causes for runaway projects (Glass 2001). The more accurate the budget plan, the more chance the software to be successful (Islam and Das, 2012). But according to Capers and Jones (Capers and Jones, 2006), the following were found to be the major root causes of cost estimating problems

- Formal estimates are demanded before requirements are fully defined.
- Historical data is seldom available for calibration of estimates.
- New requirements are added, but the original estimate cannot be changed.
- Modern estimating tools are not always utilized on major software projects.
- Conservative estimates may be overruled and replaced by aggressive estimates.

The $2^{nd}$, $4^{th}$ and $5^{th}$ causes can be solved easily. But others are really difficult to solve. So these difficulties create pressure on software development project managers to continue and deliver the project.

### Pressures related to user's requirement (F4)

The root causes of requirements changes are dynamic businesses. There will always be new requirements to support, slightly better ways of modifying your data model and better ways to design an application (Islam and Das, 2012). It is not possible to freeze the requirements of any real-world application. And change is continuous. But what about cost estimation and schedule? Hence project manager feels pressures from the following facts

- Some parts of the implementation may depend on the availability of future technology,
- Some new user requirements are anticipated but not yet known,
- Some requirements may be significantly more difficult to meet than others,
- Inclusion of user's new requirements may cause problems to deliver the product within predefined timeframe.

### Pressures related to business (F5)

Long-term business success for the supplier is that it is less likely that the customer might have more projects with that supplier in future (Islam and Das, 2012). And so the top management of supplier side always tries to maximize the profit from a project while customers want product with maximum quality. But the project developing software Company is in business and it has competitors. So actually project manager has to maximize profit with maximum quality to increase the reputation of his company. But it is very much difficult job. And so he feels pressure.

### Pressures related to communication among customers, developers, and users (F6)

Only customer knows what is his need and cooperation with supplier is needed to help supplier to realize the need (Islam and Das, 2012). Project managers must identify the people or groups the project deals with, both within the parent organization and outside. A project may have interfaces to initiators, end users, suppliers, subcontractors, the prime contractor, and other subsystem developers. When defining external project interfaces, the project manager should channel all communications between the project and external groups through as few people as possible; User involvement, particularly during the planning phase, leads to better and more realistic definition of system requirements and user commitment to the project (Jurison 1999).

### Pressures related to product quality (F7)

Quality assurance (QA) makes sure that the product meets use requirements and that it provides the desired functionality and quality (Project Management Institute 2004). Effective software quality control is the most important single factor that separates successful projects from delays and disasters. The reason for this success is that finding and fixing bugs is the most expensive cost element for large systems, and it takes more time than any other activity. There is a race between two concerns. The first one is executives are worried about cost of development and the second one is the stakeholder/user are worried about the quality. This race introduces pressures to maintain "all is well".

### Pressures related to stakeholder politics (F8)

There is a proverb that if you are awakens then it not possible to awake you. Sometimes stakeholder creates pressures on project manager intentionally. Here the pressure may come from stakeholder from the fact that at time budget planning, stakeholder hides some of requirements because they think it decreases the amount of total budget and time. But at the development phase they demand the hidden requirements and sometimes they want to cancel the contract. As it is not good for business and so project manager tries to fulfill stakeholder's demand. But it creates pressures on project manager to complete the project within budget and time.

### Pressure related to used technology (F9)

Every technology has its own advantages and disadvantages. The choice of proper technology in software development project should be done carefully depending on its features (Islam and Das, 2012). The project managers feel pressures from two facts-

- The first one is to use of immature technology in project. Though very new methods have more features, but they are often immature, as practical experience with a method is necessary to refine it. Furthermore, very new methods normally lack of human resources and tool support. And the less experienced the team with the technology of the project, the greater the project risk.
- The second is to use of outdated technology. The outdated methods have limited features and they are unable to run with other current technology. Moreover sometimes they are too complex to work with.

**Validation and Assessment**

An assessment has been done on 10 failed and 5 successful projects from Bangladeshi software companies. The interviewees were mainly project managers from above 15 projects. Depending on their personal identified squeezing factors, we have listed the top 9 factors those happen most frequently. They also give each factor a pressure value where the high the ranking value indicates the more the squeezing factor. The following Fig. 2 shows the rank value for each factor with project manager's feedback.
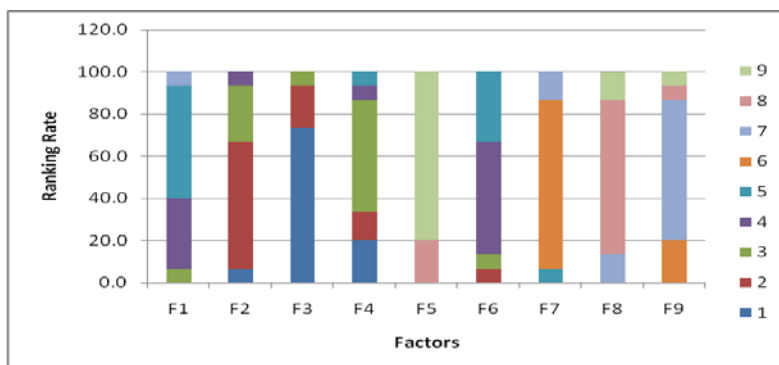
Fig. 2. Project Manager's ranking for each factor

From the above Fig. 2, we can set the priority for each factor can be set depending on project manager's feedback. The following Table 1 shows the priority value for each pressure creating factor.

Table 1. Priority of Pressure Creating Factor on Project Manager

| Pressure Creating Factor | Priority |
|---|---|
| Pressures related to project team (F1) | 5 |
| Pressures related to schedule (F2) | 2 |
| Pressures related to budget (F3) | 1 |
| Pressures related to user's requirement (F4) | 3 |
| Pressures related to business (F5) | 9 |
| Pressures related to communication among customers, developers, and users (F6) | 4 |
| Pressures related to product quality (F7) | 6 |
| Pressures related to stakeholder politics (F8) | 8 |
| Pressure related to used technology (F9) | 7 |

From the above Table 1; the pressures creating factors can be arranged in decreasing order of priority as F3, F2, F4, F6, F1, F7, F9, F8, F5. From the above table it can be said that the most pressure creating factors on software project manager are budget and schedule related. And here both the project supplier and customer need to negotiate to successfully complete the project.

**CONCLUSION**

The project manager is the driving force in the management control loop. No other management activity can benefit more from effective project management than software development. The objective of every project manager is to deliver the product on time, within budget and with the required quality. But whether a project is successful or fail, the responsibility goes to its project manager. The project manager feels pressure around this point. There are many factors that create the pressures. We have identified some of the important factors.

To validate the factors; a survey have been done on 10 failed and 5 successful projects. The result of this survey can be figured as Fig. 2. Fig. 2 shows the data on the pressures creating factors on project managers. From Table 1, for each factor we can set the priority of level of pressure depending on rank value.

In this paper, some of the squeezing factors for project managers during development of project have been identified and a survey has been executed to check the validity of these factors. Depending on this survey, priority has been set for each factor. There may be some other factors that leave for future research. Another dimension of research is to define some ways of decreasing the pressures on project managers. We believe that if the pressures can be minimized then the productivity of project managers will be increased and the average failure rate of software development project will be minimized.

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