

Project Management Practices: The Criteria for Success or Failure

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Abstract

Often, software managers have to monitor and manage many projects concurrently. Unfortunately, some projects were completed successfully but some were not completed on time, over budget or being cancelled. Some of the reasons of this project failure are: lack of user involvement, lack of planning, incomplete requirements, lack of resources, incorrect cost estimation, just to name a few. There are many project planning and scheduling techniques to manage and help to ensure project success. Some of these techniques, however, may not be suitable for specific types of projects and thus, cause projects to fail. This paper discusses the issues involved in project success and failure, and presents the feedback of 50 undergraduate students who undertook a team project of the project management course.

1. Introduction

A project is a complex, nonroutine, one-time effort limited by time, budget, resources, and performance specifications design to meet customer needs [1]. Project management is a set of tools, techniques, and knowledge that, when applied, helps to achieve the three main constraints of scope, cost and time [2]. However, based on literatures, 52.7% of projects were not able to complete on time and over cost, and 31.1% not fulfilled the scope [2, 3]. The growth in new knowledge has increased the complexity of projects because projects encompass the latest advances. Today, many companies focus on project management, as it focuses on achieving project objectives. It is important as it applies managerial process and has its tools that give managers a good opportunity to succeed in achieving objectives. A project manager can reform everything right from a project management perspective but the project can still fail depending on its success criteria to help to ensure project success. Project managers can use different techniques and tools that are useful to manage projects efficiently. These include network activity diagram, bar charts, macro and micro cost estimation approaches and resource scheduling techniques. The use of these techniques and tools

could lead to better chance of project success. Today, emphasis on an integrated project management process is the focus of all project effort towards the strategic plan of an organisation, and reinforces control of both the project management techniques and tools, and the interpersonal skills necessary to orchestrate successful project completion [3]. The following sections discuss the project classification, the factors that contributed to project success as well as resulted in project failure.

2. Project Classification

Basically, projects can be classified into three resolution types [3]:

- i. *Resolution Type 1 (project success):*
The project is completed on-time, on-budget, fulfilled all functions and features as specified.
- ii. *Resolution Type 2 (project challenged):* The project is completed and operational but over-budget, over the time estimate, and offers fewer functions and features than originally specified.
- iii. *Resolution Type 3 (project impaired):* The project is cancelled at some point during the development cycle.

Among these three types, the success rate was only 16.2%, while challenged projects accounted for 52.7%, and impaired (cancelled) was 31.1% [3].

3. Project success factors

According to the 1994 Standish CHAOS Report, there are top 10 factors found in successful projects. These factors are listed in Table 1 below [3].

Table 1: Project success factors

Project Success Factors	% of Responses
User Involvement	15.9%
Executive Management Support	13.9%
Clear Statement of Requirements	13.0%
Proper Planning	9.6%
Realistic Expectations	8.2%
Smaller Project Milestones	7.7%
Competent Staff	7.2%
Ownership	5.3%
Clear Vision and Objectives	2.9%
Hard-Working, Focused Staff	2.4%
Other	13.9%

The top four factors that contributed to project success are user involvement, executive management support, clear statement of requirements and proper planning are briefly discussed below.

i. *User involvement*

The absence of user involvement is the major cause of project failure. Even when delivered on time and on budget, a project can fail if it does not meet users' needs.

ii. *Executive management support*

This influences the process and progress of a project and lack of executive input can put a project at a severe disadvantage.

iii. *Clear statement of requirements*

This refers to the base level requirements. By creating a minimal, obtainable base level of requirements and then developing those features, the effect of change will be reduced. As a result,

an added benefit is that project managers are better prepared to articulate the needs and priorities of the next phase of the project.

iv. *Proper planning*

This is one of the keys to a successful project. Creating a project plan is the first thing to do when undertaking any kind of project.

An analysis of the CHAOS report over the last eight years as shown in Table 2, shows a steady improvement in project success based on the measures of "on budget, on cost, and to specification" [4]. Failures have also reduced significantly considering the number of projects that has almost doubled in the eight years of research. However, almost half of the projects remain "challenged." According to the Standish report, these projects are over budget, over time or under specification [4].

Table 2: CHAOS Report findings

	1994	1996	1998	2000	2002
Succeeded	16%	27%	26%	28%	34%
Challenged	53%	33%	46%	49%	51%
Failed	31%	40%	28%	23%	15%

4. Issues contributing to project management success

Research shows that when one or more projects were started, some important issues need to be considered to achieve project success [5, 6, 7]. Some of these issues and the activities involved that managers must give serious attention to are shown in Table 3 [5].

Table 3: Issues of project management success

Issues	Description	Activities
Project focus	Time, budget and quality.	Focused on achieving these broad goals.
Planning	Engage in planning – detailed and systematic.	Planning and replanning.
Sense of urgency	Limited time, money, and other resources.	Regular status checks, meetings, and reminders are essential.
Use a time-tested, proven project life cycle	Use standard models to build into project plans.	Identify the best project life cycle.
Visualised and communicated in vivid detail	Avoid vague descriptions.	Focused in the same direction.
Evolve gradually to succeed	Involvement of users in cost and time estimation and risk management.	Maintain a controlled evolution.
Clear approvals and sign-off by sponsors	Clear approval points.	Examine and approve.
Fight for time to do things right	Do it right the first time.	Demonstration and why it is necessary?
Matched by equivalent authority	Project outcomes.	Acquire and coordinate resources, request.
Project sponsors and stakeholders must be active participants, not passive customers	Most project sponsors and stakeholders rightfully demand the authority to approve project deliverables, either wholly or in part.	Helping to define deliverables. Keeping the project moving.
Acquire the best people	Get the most skilled, experienced and best qualified.	Identify the right team members.
Actively set priorities	Strategies, establishes criteria.	Choose the right leader to prevent multi-project log jams.

5. Causes of project failure

Projects fail mainly because of unable to plan and estimate correctly, or fail to implement the tasks according to plan or failure causes by human factor. The following sections explain these three causes of failure [3, 5, 6, 7, 8]:

5.1 Planning and Estimation factor

This factor refers to initial cost and schedule estimates are not revised when more information becomes available as a project progresses. Also plans are not used correctly or used to guide the project forward, thus causing the project to fail.

5.2 Implementation factor

This is caused by project scope changes, incorrect use of project methodology, major changes in the requirements and testing, and/or inspections are poorly done.

5.3 Human factor

Project managers are not trained to acquire the necessary management skills. Also, some managers are not able to apply and put the theory of project management into practice. Poor communications are also one of the human factors that cause a project to fail.

Among these three factors, the major cause of project failure is inappropriate use of project planning and scheduling methodology [5]. The next category of these from the Standish report deals with projects that proved to be “challenged,” that is they were completed but were over budget, over time, or did not contain all functions and features originally required [11, 12]. Successful and challenged projects showed good technical skills of the project managers, while failed projects showed the project manager had only fair skills. According to the 2002 Standish Report [4], three top factors that impacted on not completed projects are lack of user input, incomplete requirements and specifications, and changing requirements and specifications. These challenged factors are shown in Table 4.

Table 4: Project challenged factors

Project Challenged Factors	% of Responses
Lack of User Input	12.8%
Incomplete Requirements and Specifications	12.3%
Changing Requirements and Specifications	11.8%
Lack of Executive Support	7.5%
Technology Incompetence	7.0%
Lack of Resources	6.4%
Unrealistic Expectations	5.9%
Unclear Objectives	5.3%
Unrealistic Time Frames	4.3%
New Technology	3.7%
Other	23.0%

According to these results, the major reasons for not able to complete projects are the lack of input from the users, incomplete requirements and specifications given by the users and change of the requirements from the users. These causes the project manager could not use good planning to elicit user requirements. Finally, a list of all the top ten factors found in “Failed” projects is shown in Table 5.

Table 5: Project failed factors

Project Impaired Factors	% of Responses
Incomplete Requirements	13.1%
Lack of User Involvement	12.4%
Lack of Resources	10.6%
Unrealistic Expectations	9.9%
Lack of Executive Support	9.3%
Changing Requirements and Specifications	8.7%
Lack of Planning	8.1%
Did not Need It Any Longer	7.5%
Lack of IT Management	6.2%
Technology Illiteracy	4.3%
Other	9.9%

The three major reasons that a project failed are incomplete requirements, lack of user involvement, and lack of resources. Hence, with the ability to involve the users and to capture their requirements completely and correctly, the chance of success would increase dramatically [4]. Also according to the Standish Group report, some of these factors have changed over recent years. Therefore, further research to be conducted in this area. Doing case study on some projects is one of the methods that researchers can investigate and analyse new findings in this area. Hence, conducting a case study on

project undertaken by students can provide some insight to project success and failure.

6. Case study on student projects

A case study was conducted on a group of undergraduate computer science students from the Faculty of Computer Science and Information Technology, University of Malaya, who took the course WKES2202: Project Management. Forty-nine students are from the Department of Software Engineering and only one student is from the Department of Information Science. The students were assigned a team project which was chosen based

on their own preference. The details of the team projects and the formation of the project teams are described in the following section.

6.1 Project details and team structure

In this case study, three project titles were proposed by the course lecturer. Table 6 presents a brief description of the projects undertaken by these students. Each team consisted of 6-8 members comprising Chinese, Malay and/or Indian students.

Table 6: Project description and team structure

Team No.	Project title and description	Team structure		
		Race	Gender	Total
1	Development of a system for organising a talk The functionalities of the system shall include dissemination of information about the talk; registration of participants; keep track of fee paid by the participants; attendance of the participants; printing of certificate, etc.	Chinese = 3 Malay = 3	M = 4 F = 2	6
2	Development of animation frames of Malaysian Sign Language Develop animation frames to illustrate the signing of Malaysian Sign Language words using the graphical tool, 3D Poser. Students are also required to find the meaning of each word, its antonym, synonym, a picture to illustrate the word, its pronunciation, and construct a sample sentence to illustrate the usage of the word.	Chinese = 5 Malay = 2	M = 5 F = 2	7
3		Chinese = 5 Malay = 2	M = 5 F = 2	7
4	Development of a computer-aided system to teach the course: Music Appreciation Design and develop a system with multimedia features to teach the course: Music Appreciation. The functionalities of the system shall include lessons, exercises and activities. The lessons shall be illustrated with interesting and attractive graphics and sound features.	Chinese = 4 Malay = 3	M = 5 F = 2	7
5		Chinese = 6 Malay = 2	M = 3 F = 5	8
6		Chinese = 3 Malay = 4	M = 3 F = 4	7
7		Malay = 6 Indian = 2	M = 3 F = 5	8
Total No. of Students		50		

Keys: M-Male F-Female

6.2 Methodology

The objective of this case study is to investigate the causes of success and failure of the projects undertaken by the 50 undergraduate students. A questionnaire was designed to investigate the factors that contributed to project success and also factors that resulted in project failure. The questionnaire consists of two parts. Part A gathers information about the project title and team members. Part B contains assessment questions on project management issues. There are eight questions on project management practices which are rated based on a scale of 1 to 5 (Appendix A). Traditionally, meeting and/or exceeding the expectations of the customer and/or upper management in terms of cost (budget), time (schedule), and performance/quality

(scope) of a project is ultimately defined as project [1]. Hence, the questions formulated are closely related to project success, challenged and failure factors.

6.3 Analysis on student projects

After project completion, all project teams were invited to answer the questionnaire. The team leader was asked to answer both part A and part B of the questionnaire. But, the team members were requested to answer part B only. This questionnaire covered the key items in project management, namely, budget, time and scope. Table 7 shows the rating given by the seven team leaders on the eight questions.

Table 7: Rating given by the team leaders

Team No.	1	2	3	4	5	6	7
1	5.0	5.0	5.0	5.0	5.0	5.0	4.0
2	5.0	4.0	4.0	4.7	4.2	4.6	3.0
3	5.0	4.0	5.0	3.0	5.0	4.0	4.0
4	4.2	4.6	4.8	5.0	5.0	4.5	5.0
5	4.3	4.5	5.0	5.0	5.0	4.3	4.0
6	5.0	5.0	3.7	4.0	4.7	4.0	3.0
7	5.0	5.0	4.0	3.7	5.0	4.7	5.0
8	4.0	3.0	4.0	5.0	5.0	3.0	4.0

Table 8 shows the average rating given by the team members on the eight questions. The average rating is calculated by adding the score given by each member and then dividing the total score by the total number of team members in each team (excluding the team leader).

Table 8: Rating given by the team members

Team No.	1	2	3	4	5	6	7
1	5.0	4.0	5.0	4.5	4.5	4.0	4.2
2	5.0	4.7	4.5	4.0	5.0	5.0	4.0
3	4.0	5.0	5.0	4.0	4.8	3.0	4.0
4	5.0	4.0	4.0	4.3	4.4	4.0	4.0
5	4.0	5.0	4.3	4.3	4.8	4.8	5.0
6	4.5	5.0	5.0	5.0	5.0	4.0	3.0
7	5.0	4.0	4.4	4.5	4.8	4.0	3.0
8	4.0	4.0	4.0	5.0	4.8	4.0	4.0

6.4 Course lecturer's assessment on the student projects

Before making inferences on the feedback given by the students, the assessments on the projects were obtained from the course lecturer. The assessments made were focused on the budget, schedule and scope/quality of the projects. Table 9 shows the assessments given by the course lecturer.

Table 9: Course lecturer's assessment

Team No.	Assessment		
	Scope/ Quality	Budget	Schedule
1	Average	Under budget	On time
2	Good	Over budget	On time
3	Average	Over budget	On time
4	Average	Over budget	Over time
5	Poor	Over budget	On time
6	Average	Over budget	On time
7	Very Poor	Over budget	Over time

The assessment results show that five teams completed their respective project successfully. All the projects were completed with average or good quality except for team 5 and team 7, which they

failed to develop a system that fulfilled the customer's requirements.

On the other hand, analysis on project schedule shows that five projects were completed on time. This success could possibly be due to the fact that all the five teams were able to prepare a good project plan except for teams 4 and 7. These two teams were not able to deliver on time, because the project required team members with sound technical knowledge to develop the system. As these two teams only have one or two members who are good in programming and have mastered the development tools, they could not complete the system development on schedule.

Analysis on budget shows that only one team managed to complete their project within budget and the remaining six teams were over budget. Team 1 was able to estimate the cost quite accurately as the team members referred to the documentation of a similar project carried out in the previous year. This shows that project documentation could provide good guidance to project teams and be able to avoid any mistakes made in the past. For teams 2 and 3, the over budget was caused by imposing a smaller fee on each Malaysian Sign Language workshop participant than the actual fee. The purpose was to attract more participants to attend the workshop as too high a fee could result in low participation rate, and thus, resulting in project failure. For teams 4, 5, 6 and 7, as the project size is considerably large, and the team members were inexperienced in making good cost estimation, all teams failed to estimate the cost correctly.

Based on the outcomes of this case study, the top three factors that caused project failure are: lack of user involvement, lack of planning, incomplete requirements and technical illiteracy. Comparing these case study results with the Standish Group report, it reflects a match on some of the factors that caused projects to fail. Fig. 1 shows the teams' rating on planning and time estimation. According to these results, we can see that most of the teams indicated that they have good planning on their projects.

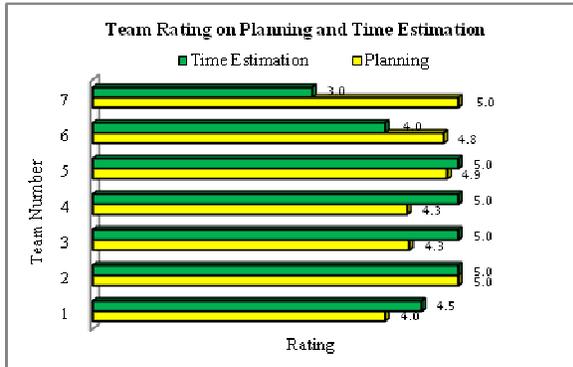


Fig. 1: Teams' rating on planning and time estimation

Based on the feedback of all team members, team 7 did not make good time estimation as shown in Fig. 1. Although team 4 indicated that they have made good time estimation, they failed to complete the project on time due to technical illiteracy as analysed above.

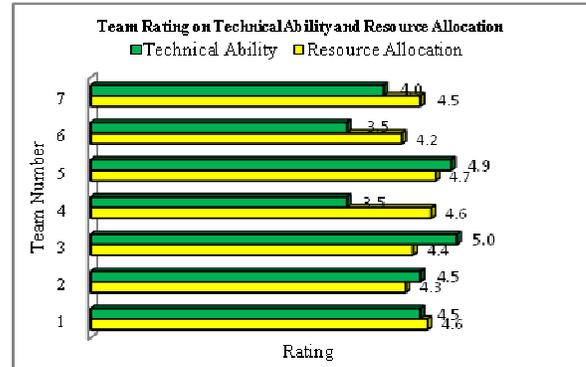


Fig. 3: Teams' rating on technical ability and resource allocation

According to comments given by some team members, teams 5 and 7 do not have good programming skills among most of the members. Hence, they failed to achieve project scope.

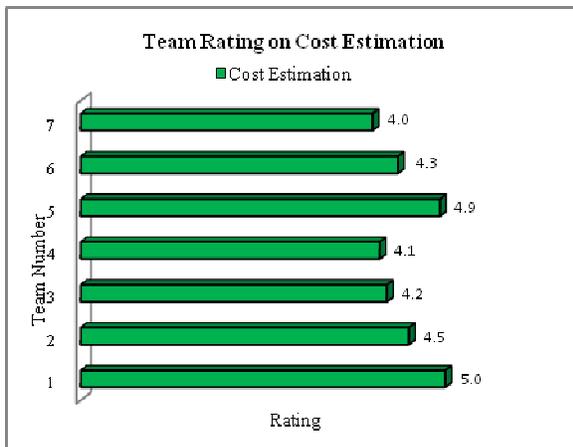


Fig. 2: Teams' rating on cost estimation

Fig. 2 shows teams' rating on cost estimation. As shown in Table 9, teams 2 to 7 were over project cost. Although teams 4, 5, 6 and 7 indicated that they made good estimate in project cost, they failed to complete the project within budget. This could possibly be due to the large project size and technical incompetency among most of the team members, thus resulting in over budget. These teams have to work over time (incurred additional cost) in order to complete system development.

Fig. 3 shows teams' rating on the technical ability and resource allocation. These factors are also very important as they also impact on project success or failure.

Fig. 4 shows teams' rating on requirements and user involvement. Analysis on these two items was performed on teams 4, 5, 6 and 7 only. This is because these four teams have to elicit requirements from the customer. Teams 1, 2 and 3 did not have to elicit requirements from the costumers, so, the feedback of these teams are not analysed. Although all four teams indicated that they have average (team 7) or good (teams 4, 5 and 6) user involvement and have defined the requirements clearly from the beginning of the projects, the actual project results show that all teams except for teams 5 and 7 did not fulfill the costumers requirements. This could possibly be due to the lack of user involvement with these two teams, and poor leadership of the two team leaders.

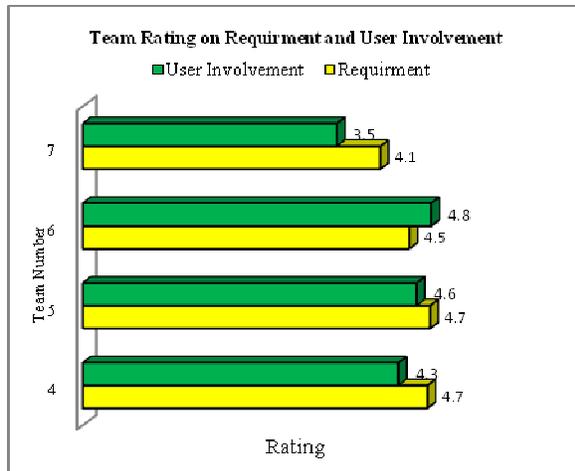


Fig. 4: Teams' rating on requirement and user involvement

7. Conclusion

This paper discusses about project success and failure, the project classification and the factors that contributed to project success and resulted in project failure. The case study outcomes and the feedback of the 50 students, reflect a match on some of the factors that caused project failure. Also, poor planning and scheduling are the main reasons of project failure. Other important issues that must not be neglected are the quality of the team leaders and team spirits among the team members. These are obvious from the project success achieved by teams 1, 2, 3 and 4, respectively. The top three factors that cause project success are: user involvement, good planning and estimations, good leadership and team members' technical skills. Comparing the case study results with the Standish Group report, it is obvious that these factors are fundamental and exhibit strong impact on many projects failure. Applying good project management practices would help to avoid these failure factors, and leading to project success.

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Appendix A

Project Management Questionnaire

Section A: Team Profile

1. Team No. :
2. Project Title :
3. Team Leader :
4. Team Members :

Section B: Team Rating

Please indicate the importance of the following eight factors that contributed to the success or resulted in failure of your project. Please rate the factors on a scale of 1 to 5.

1	2	3	4	5
Very Poor	Poor	Average	Good	Very Good

Table 1: Project assessment criteria

No.	Critical Factors	Rating	
		Team Leader	Team Member
1	Requirements: Requirements are clearly defined from the beginning.		
2	User Involvement: Frequency of project progress review with customer.		
3	Technical Ability: Use technical methods, tools and processes in managing a project and in system development.		
4	Resources Allocation: Use of resources and allocate appropriately.		
5	Planning: Apply Work Breakdown Structure (WBS), network activity diagram, etc.		
6	Time Estimation: Accuracy of time estimation.		
7	Cost Estimation: Accuracy of cost estimation.		
8	Leadership: Management skills of project leader.		

Thank you for your participation

The project success criteria have to be agreed upon between the project manager and the key stakeholders. The project goals, objectives and success criteria once formulated need to be clearly communicated to the entire team. Project success criteria can be very specific to each project. We can understand and define success criteria by analysing stakeholder expectations thoroughly. A project success criteria document can be prepared after thorough stakeholder analysis is done. There is no standard format for creating a success criteria document. But what is most important is to have such a document. Clear project success criteria must be identified and documented during the project initiation stage of the project itself. Project managers often wonder if they are measuring the right things on a project. It's difficult to know how much time to spend evaluating past performance and how much time to spend on keeping the work moving forward. Of course, there are many indicators of project success, but what do you need to be measuring while the project is in motion? At various points during the project, you want to evaluate five points: schedule, quality, cost, stakeholder satisfaction and performance against the business case. You should be doing this informally anyway. A formal project evaluation is of use during the end of a phase or stage as it can give you a clear indication of how the project is performing against the original estimates. Project management is the process of leading the work of a team to achieve goals and meet success criteria at a specified time. The primary challenge of project management is to achieve all of the project goals within the given constraints. This information is usually described in project documentation, created at the beginning of the development process. The primary constraints are scope, time, budget. The secondary challenge is to optimize the allocation of necessary inputs and apply them to meet...