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A SURVEY STUDY OF CRITICAL SUCCESS FACTORS IN INFORMATION SYSTEM PROJECT MANAGEMENT

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ABSTRACT

Critical success factors (CSFs) for project management significantly improve the chance for the success of projects. This research investigates the CSFs for project management using a quantitative approach. Five CSFs for project management were identified through a systematic literature review for this study. A survey study was conducted among information technology (IT) professionals from 50 projects conducted in 20 companies in the banking and finance sectors. On the basis of the results using factor analysis, the dimensions relating to the success factors for project management were determined. In addition, by using regression analysis, this study identified four significant factors relating to project success in information system (IS) project management.

Keyword: Project Management, Critical Success Factor, Information System Projects

1. INTRODUCTION

The fastest growing industry in developed countries is information technology (IT) [12]. Each year, the number of IT projects increases, creating the demand for project managers [2]. Given the necessity for IT departments to operate efficiently to enable organizations to remain competitive, academics and practitioners are beginning to focus on the research issues relating to the successful management of IT projects.

While IT has been applied in various disciplines, information system (IS) implementation itself does not consider all the critical factors that affect project success. In spite of the efforts to employ project management methodologies, project management has not been consistently successful. IT project failures have a direct impact on society, organizations, and individuals [9]. IT projects with frequently exceeded budgets and schedules, as well as the high volume of rework and cancellations are runaway projects that fail to meet the requirements [9]. New technology projects are often projected to finish with cost overruns quadrupling the original cost projections [9]. The above weaknesses have affected the bottom line for IT and enterprise implementation of a large-scale information systems. The challenge is how project management can be improved to avoid the above problems of wastes and inefficiency. Some researchers have posited that issues preventing successful IT projects are related to project management and organizational behavior rather than to the technology [12, 24]. Based on the existing project management framework which is a one-fit-all model, we attempt to develop a specific targeted project management framework for information system projects, which operates rather differently from the traditional framework.

The research presented in this study sought to identify and provide insights into the critical success factors (CSFs) that help project management to succeed. This research study identified the success factors in the literature review, collected feedback from 50 projects and consolidated them into possible success factors. A web-based survey was conducted to gather feedback from 50 projects conducted by 20 companies in Hong Kong, China from Jan, 2013 to April, 2013. The collected data were analyzed by using factor analysis, correlation and multiple regression methods.

2. LITERATURE REVIEW

This section reviews briefly the Critical Success Factor (CSF) approach, followed by a discussion of the various factors that affect the management of information systems projects. The CSF approach aims at identifying and measuring project performance, which was investigated by Rockhart [20], and the CSF approach was further developed by various researchers [3, 20]. Chow and Cao [27] propose four success attributes, as shown in Table 1, for identifying and measuring project success. CSFs are defined by Bullen and Rockhart [3] as "*the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization. CSFs are the few key areas where things must go right for the business to flourish and for the managers' goals to be attained*".

Table 1 Success attributes (*Source:* Chow and Cao, 2008, p.964)

Dimension	Attribute
Overall perceived level Of project success	1. **Quality** (deliverables with good quality) 2. **Scope** (meeting all requirements and objectives) 3. **Time** (delivering the products to meet the deadline) 4. **Cost** (Meet the requirements in terms of cost and effort)

Most of the existing project management frameworks are focused on a generic base framework which is in turn based on a high level point of view. There is a growing recognition that research into the factors affecting project success for information system project management requires specific constructs to be investigated [4, 10, 11, 15]. In order to identify the CSFs for information system project management [5, 7, 10, 13, 18, 22, 23], the review included both failures and successes in the literature in project management, because failures can contribute to the understanding of how to avoid certain serious pitfalls that are critical to the success of a project. In addition to success factors, many researchers propose a list of failure factors which contribute to the failure of information system project [1, 16, 19]. Chow and Cao [27] classify the factors into the list of success factors (as shown in Table 2) and the list of failure factors (as shown in Table 3). These factors can also be classified into four major categories [6, 14]: organizational, people, process, and technical.

Table 2 Success Factors (*Source:* Chow and Cao, 2008, p.963)

Dimension	Factor
Organizational	1. Strong executive support 2. Committed sponsor or manager 3. Cooperative organizational culture instead of hierarchal 4. Oral culture placing high value on face-to-face communication 5. Organizations where agile methodology is universally accepted 6. Collocation of the whole team 7. Facility with proper agile-style work environment 8. Reward system appropriate for agile
People	9. Team members with high competence and expertise 10. Team members with great motivation 11. Managers knowledgeable in agile process 12. Managers who have light-touch or adaptive management style 13. Coherent, self-organizing teamwork 14. Good customer relationship
Process	15. Following agile-oriented requirement management process 16. Following agile-oriented project management process 17. Following agile-oriented configuration management process 18. Strong communication focus with daily face-to-face meetings 19. Honoring regular working schedule – no overtime 20. Strong customer commitment and presence 21. Customer having full authority
Technical	22. Well-defined coding standards up front 23. Pursuing simple design 24. Rigorous refactoring activities 25. Right amount of documentation 26. Regular delivery of software 27. Delivering most important features first 28. Correct integration testing 29. Appropriate technical training to team
Project	30. Project nature being non-life-critical 31. Project type being of variable scope with emergent requirement 32. Projects with dynamic, accelerated schedule 33. Projects with small team 34. Projects with no multiple independent teams 35. Projects with up-front cost evaluation done 36. Projects with up-front risk analysis done

Table 3 Failure Factors (*Source:* Chow and Cao, 2008, p.963)

Dimension	Factor
Organizational	1.Lack of executive sponsorship
	2. Lack of management commitment
	3. Organizational culture too traditional
	4. Organizational culture too political
	5. Organizational size too large
	6. Lack of agile logistical arrangements
People	7. Lack of necessary skill-set
	8. Lack of project management competence
	9. Lack of team work
	10. Resistance from groups or individuals
	11. Bad customer relationship
Process	12. Ill-defined project scope
	13. Ill-defined project requirements
	14. Ill-defined project planning
	15. Lack of agile progress tracking mechanism
	16. Lack of customer presence
	17. Ill-defined customer role
Technical	18. Lack of complete set of correct agile practices
	19. Inappropriateness of technology and tools

3. RESEARCH QUESTIONS

The researchers attempted to explore the CSFs for project management. Through a review of the literature, five potential CSFs, namely, project definition process, project management process, customer involvement, team capability and management commitment, were identified. Then, the following questions were addressed in the study:

(1) Are these five factors truly the CSFs of information system project management?
(2) If so, what is the relative importance of each factor when compared to other factors?

4. DATA COLLECTION AND DEMOGRAPHIC INFORMATION

The data for this study were collected using a structured questionnaire. The items in the structured questionnaire were developed using a 7-point Likert scale. The questionnaire consists of items adapted from [28]. Through web-based survey development tools, the finalized questionnaire was hosted on a website. The companies in the banking and finance sectors were invited to complete the web-based questionnaire. A total of 50 completed responses were collected from these companies. Figure 1 presents the demographic profile of the respondents (including gender, age and position) generated by the Statistical Package for Social Science (SPSS) software.

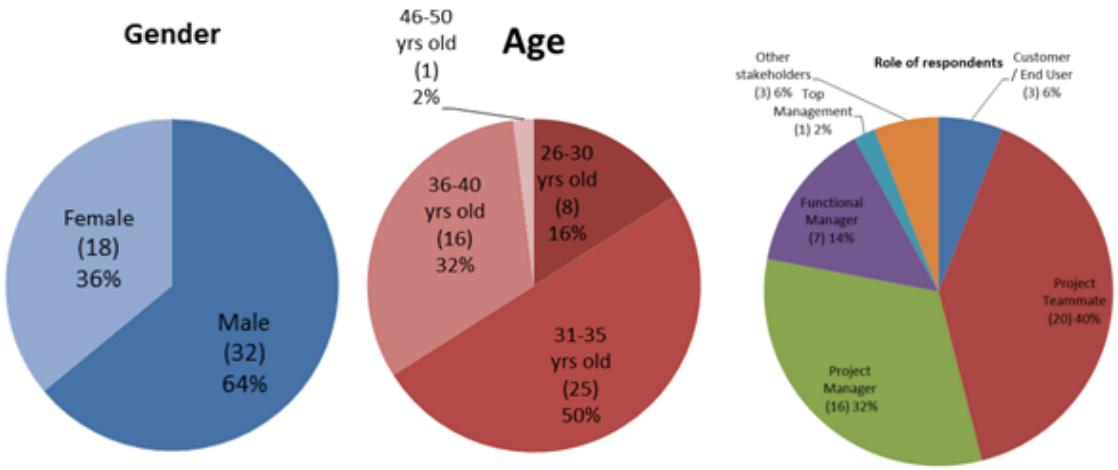

Figure 1 Demographic Profile of the Respondents

5. FACTOR ANALYSIS

This study employed factor analysis as a dimension reduction technique to identify the major dimensions relating to the conceptual framework of this study [26]. To have a better explanation on the factors which may affect the outcome of the project, exploratory factor analysis [8, 17, 21] was used for the latent variables (i.e. factors). A principal component factor analysis with Promax (Kappa:4) rotation was conducted. The factor extraction was based on eigenvalues greater than 1. The SPSS software generated six factors with eigenvalues greater than 1 from the data, which accounted for a substantial amount of variance towards what the instrument purports to measure. Hence, the factor analysis showed that the six-factor solution represented the major constructs that were measured in the combination of the original variables. Table 4 shows the result of factor analysis. Table 5 shows the descriptions (which included the questionnaire items adapted from [28]) of the variables used in the factor analysis. Out of the six factors, project success was identified as the factor corresponding to the dependent variable and the other five factors were identified as the independent factors. The proposed research framework was analyzed and tested using multiple regression analysis.

Table 4 Results of Factor Analysis

	Component					
	1	2	3	4	5	6
Proj_Def1	.788					
Proj_Def2	.778					
Proj_Def3	.757					
Proj_Def4	.743					
Proj_Def5	.707					
Proj_Suc1		.892				
Proj_Suc2		.800				
Proj_Suc3		.785				
Proj_Suc4		.722				
Cust_Inv1			.865			
Cust_Inv2			.722			
Cust_Inv3			.501	.779		
Proj_Mgt1				.662		
Proj_Mgt2	.526			.649		
Team_Cap1					.872	
Team_Cap2					.727	
Mgt_Com1						.874
Mgt_Com2						.650

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Table 5 Descriptions of the Questionnaire Items
(*Source:* Adapted from Dragan *et al*., 2013)

Variable	Questionnaire Item
Proj_Def1	Up-front risk analysis was conducted before the project starts.
Proj_Def2	The key persons for project management were knowledgeable in principles and processes.
Proj_Def3	An effective progress tracking mechanism was followed.
Proj_Def4	Well-defined project scope and objectives were developed for the project.
Proj_Def5	Up-front, detailed cost evaluations were performed and validated.
Proj_Suc1	The project was successful in terms of quality of the project outcome or of the resulting product.
Proj_Suc2	The project was successful in terms of costs and efforts being under budget or within estimates.
Proj_Suc3	The project was successful in terms of scope and requirements of the project being met.
Proj_Suc4	The project was successful in terms of timeliness of project completion.
Cust_Inv1	The customer representative on the project had full authority and knowledge to make decisions on-site.
Cust_Inv2	The project was conducted with strong customer commitment and presence.
Cust_Inv3	A good relationship with the customer was maintained throughout the project.
Proj_Mgt1	Project management staff cultivated great motivation and commitment among team members.
Proj_Mgt2	Project management staff had light-touch and/or adaptive management style.
Team_Cap1	All the team members in the project were capable of working in a coherent, self-organizing teamwork manner.
Team_Cap2	A high technical competence and expertise was demonstrated by the team members.
Mgt_Com1	The project was supported by management commitment through a committed sponsor or a committed organization manager.
Mgt_Com2	The project received strong executive and management support.

6. DEVELOPMENT OF HYPOTHESES AND RESEARCH FRAMEWORK

The factors found from the factor analysis are in line with the research framework for agile software development proposed by Chow and Cao [27], as shown in Figure 2. In this framework, the organizational factor (i.e. management commitment), the people factors (i.e. team capability and customer involvement) and the process factors (i.e.

project management process and project definition process) contribute to project success in terms of the success attributes (i.e. quality, scope, time and cost) specified in Table 1. This research framework was adopted for this study. In Figure 2, the factors contributing to perceived project success are indicated by the arrows pointing from these factors to the project success factor.

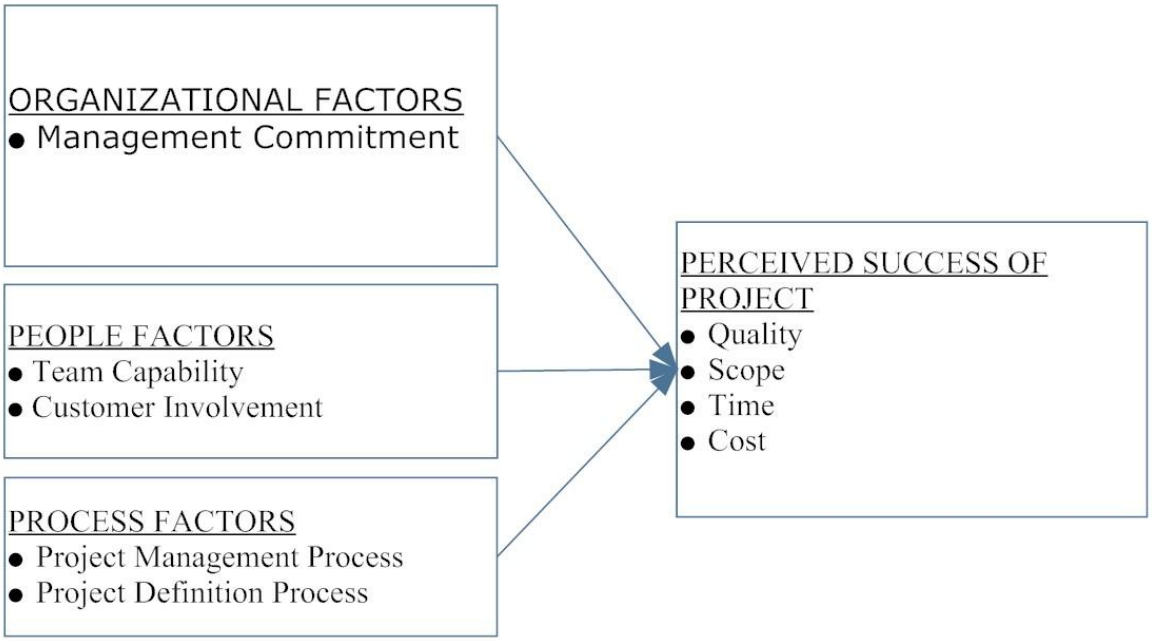

Figure 2 The Research Framework

The researchers may be curious about whether these factors actually lead to project success and the following hypotheses are formulated:

Hypothesis 1: *The existence of high management commitment has a significant influence on project success.*

Hypothesis 2: *The strong capability of a development team has a significant influence on project success.*

Hypothesis 3: *The existence of heavy customer/end-user involvement has a significant influence on project success.*

Hypothesis 4: *The adoption of a methodical project definition process has a significant influence on project success.*

Hypothesis 5: *The adoption and development of project management processes has a significant influence on project success.*

7. CORRELATION ANALYSIS

Correlation analysis was conducted to measure the correlation coefficient of linear association between two variables. The result indicated that the correlation between project definition process and project management process was significant at the 0.05 level (2-tailed). Also, the correlation between project management process and team capability was significant at the 0.05 level (2-tailed) (see Table 6).

Table 6 Correlation Analysis Result

		Project Definition Process	Project Management Process	Customer Involvement	Team Capability	Management Commitment
Project Definition Process	Pearson Correlation	1	.303*	.267	.100	.089
	Sig. (2-tailed)		.032	.061	.488	.539
Project Management Process	Pearson Correlation	.303*	1	.169	.305*	.080
	Sig. (2-tailed)	.032		.242	.032	.579
Customer Involvement	Pearson Correlation	.267	.169	1	.062	.196
	Sig. (2-tailed)	.061	.242		.668	.172
Team Capability	Pearson Correlation	.100	.305*	.062	1	-.011
	Sig. (2-tailed)	.488	.032	.668		.941
Management Commitment	Pearson Correlation	.089	.080	.196	-.011	1
	Sig. (2-tailed)	.539	.579	.172	.941	

*. Correlation is significant at the 0.05 level (2-tailed).

8. MULTIPLE REGRESSION ANALYSIS

The composite measure of multiple regression analysis was employed to assess the soundness of the research model, where a set of independent variables (IVs), and dependent variable (DV) were analyzed. Multiple regression enables examination of the contribution of each IV towards the model [25]. Essentially, it is a measurement based on the results of factor analysis. With the factor solutions presented previously, a solution with one-factor representation of the DV, as well as a five-factor representation of the IV was clearly identified. These factors were put into the regression model in combination, by having the DV as a function of the IVs. The results of multiple regression analysis are summarized in Table 7.

Table 7 Results of Multiple Regression Analysis

Quality		Scope		Time		Cost	
Selected variable	βvalue	Selected variable	βvalue	Selected variable	βvalue	Selected variable	βvalue
Project Management Process	0.466	Project Management Process	0.422	Customer Involvement	0.405	Project Definition Process	0.394
		Project Definition Process	0.312	Project Definition Process	0.291	Management Commitment	0.261

Summary outcome of two modeling

	Quality	Scope	Time	Cost
Management Commitment (H1)				✓ (Marginal) (p = 0.053) (t = 1.986)
Team Capability (H2)				
Customer Involvement (H3)			✓ (p = 0.004)	
Project Definition Process (H4)		✓ (p = 0.020)	✓ (p = 0.037)	✓ (p = 0.007)
Project Management Process (H5)	✓ (p = 0.002)	✓ (p= 0.003)		

Hypotheses testing results

9. RESEARCH FINDINGS

Based on the outcome of the regression analysis results in Table 7, it is possible to answer the research questions of this study.

Based on the literature review, this study developed a research framework to find out the critical success factors of project management. Five factors, namely project definition process, project management process, customer involvement, team capability and management commitment were considered in the research framework for the identification of critical success factors of project management.

Research question 1

The first research question is "Are these five factors truly the critical success factors of project management?" From the summary of findings listed in Table 7, the answer is clearly "No". Among those five factors, only four of them were found to significantly influence project success. The factors that significantly influence project success are:

1. Project Management Process
2. Project Definition Process
3. Customer Involvement
4. Management Commitment

Research question 2
The second research question is "What is the relative importance of each factor when compared to other factors?" Based on the summary of regression analysis listed in Table 7, project management process showed the highest beta value among all the factors (with a beta value of 0.466).

10. CONCLUSION

This study investigates the critical success factors that affect project success in information system projects using a quantitative approach. The data collected were analyzed and categorized in three dimensions - Organization, Process, and People. From the results of multiple regression analysis, the factors that significantly influenced project success are (1) a good project management process, (2) a clear project definition process, (3) a strong customer involvement, (4) a strong management commitment. By identifying the four significant factors, this study contributes to the key factors for effective project management.

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