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Effects of Risk Management Practice on the Success of IT Project

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Abstract

The objectives of this research were to explore risk management practices influencing the success of IT projects. Data were collected from 200 project managers, IT managers, and IT analysts in the IT firms through questionnaires and analysed using the Independent Sample t-test, One-way ANOVA, and Multiple Linear Regression at the statistical significance level of 0.05. The results demonstrated that the differences in organisational types affected the success of IT projects in all aspects, while the differences in organisational sizes affected the success of IT projects in terms of the aspect of product performance as well as total aspects.

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Keywords: risk management; information technology; project success; project management

1. Introduction

Successful IT project management was the most desirable for all organizations and stakeholders. IT project success or failure had long been interesting for researchers over the past 20 years. High failure rates of IT projects were caused by completion beyond budget, behind schedule, and without meeting requirements, and could threaten the very existence of the company [1]. The McKinsey Global Institute (MGI) reported that in 2012, on average, large IT projects run 45 percent over budget and 7 percent over time, while delivering 56 percent less value than predicted. Standish group (2014) reported that only 12% of projects had finished on time and on budget. Randell et al. [2] described that "70% of software projects fail due to poor requirements with an associated rework spend just north of $45 billion annually". Jenner [3] elaborated on depressing project failure rates between 50% and 70%. With these

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high failure rates, there were several attempts to reduce those failure rates. Many researches were conducted on the factors related to IT project success. Among several factors, risk management was one of the important factors that affected project success. Project Experts' Goff mentioned that risk management was a key part of project management for any project size [4]. Didagra [5] elaborated that risk management was the most important management tool a project manager can use to increase the likelihood of project success.

Although there was high importance of risk management to IT project success, the adoption of these risk management methods in practice is inconsistent [6, 7]. In addition, there were a lot of project managers that decided not to apply any risk management due to financial reasons. This research aimed to explore the influence of risk management practices on IT project success. The results from this study would provide guidance on the practical implementation of risk management concerns for IT project success.

2. Literature Review

2.1. Project Risk Management

Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives [8]. Project risk management involved understanding potential problems that might occur on the project and how they might impede project success. Several research results indicated that poor risk management was a likely cause of project problems and failures. "Risk management is an essential process for the successful delivery of IT projects" [9, 10]. The body of research examining risk in IT projects spans over 30 years. Risk management researchers have focused on the examination of process models that provide prescriptions for risk management, typically including variations on the four processes of risk identification, assessment, response planning, and monitoring [11]. Schwalbe [8] expressed six processes that were involved risk management as follows: planning risk management, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring & control.

Didagra [5] developed a model to investigate the relationship between risk management and IT project success and the model consisted of risk management in four categories; risk identification, risk analysis, risk response planning, and risk monitoring & control. The research results found that risk identification and risk planning did not influence the subjective performance of the project in terms of reliability, easiness, flexibility, satisfaction and quality. There was no method of risk management that influenced the objective performance of the IT project in terms of cost, schedule and effort. Therefore, the conclusions couldn't be generalized to all IT companies due to the reduced sample size to an unacceptable error margin. Further research in this field is mandatory to formulate a solid conclusion regarding the role and effects of applying risk management in successful IT projects. Credar [12] elaborated that every project had risk for example; resources left the organization, leadership changed and budgets got cut etc. There were many factors beyond control. However, many risks to projects can be mitigated or even eliminated with some forethought and ongoing management.

This research intended to fulfil the research gap by extending Didagra's model with the addition of organization factors in both types and sizes. The size of an organization or business can be defined in many ways, by the value of its annual sales or shipments, or by its annual gross or net revenue, the size of its assets, or the number of its employees [13]. In different countries, the definition is quite different. For example, The Ministry of Industry Thailand defined the business size according to the number of employees. Small organizations had less than 50 employees. Medium organizations had 50 to 200 employees and large organizations had more than 200 employees. Large organizations tend to be formal and more decentralized in decision-making. The public and private organization types were considered due to the differences in hierarchy, flexibility, and freedom in the organization that may affect IT project success.

2.2. Project Success

The success of IT project was an area of concern for many organizations around the world. There were a variety of approaches about the measurement of project success. DeLone and McLean expressed 6 measures for information system's project success as follows: system quality, user satisfaction, information quality, information use,

organizational impact, and individual impact [14]. Many researchers have suggested that projects should be rated as successful when they are completed within or near the estimated schedule and budget, and produce an acceptable level of performance [15, 16]. Mahaney and Lederer [17] carried out a study using a project completed on time and within budget that worked as the measures to evaluate project success. Some studies were aware of the benefits, which were used as criteria to justify project success [18–20]. Gable et al. [21], Jones et al. [22] and Ward and Daniel [23] used organizational impact and user satisfaction as the criteria to measure the ERP system success. According to Baccarini [24], project success involves two components, such as project management success and product success. Project performance is the degree to which the software project achieves success in the perspective of process and product [25]. Process performance referred to time & budget, and product performance referred to requirements as shown in Table 1.

Table 1. Dimensions of project performance.

Dimension of performance	Nidumolu	Jun et al., Wallace et al.
Process performance	Learning	The project was completed within:
	Process control	budget
	Quality of interactions	schedule
Product performance	Operational efficiency	The application developed is:
	Responsiveness	reliable
	Flexibility	easy to use
		good flexibility
		meets user's intended
		functional requirements
		satisfied users
		overall high quality

Source: [5, 25, 26, 27].

The research framework was developed to explore the effect of organizational factors and risk management practice to the success of IT project as shown in Fig. 1.

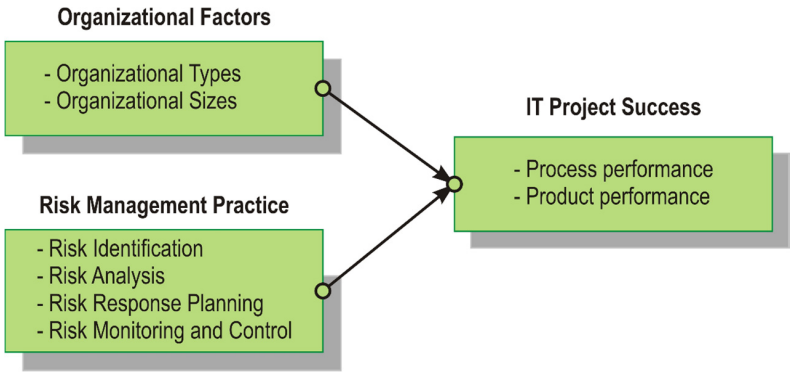

Fig. 1. Research framework.

3. Research Methodology

The research involved a literature review, questionnaires, and statistical analysis, both descriptive and inferential statistics, to answer the research questions. The questionnaire was adopted as a means of collecting reliable and

quantifiable data at a reasonable cost. The target population consisted of project managers, IT managers, and IT analysts from IT companies in Thailand and the sample was derived from the convenience sampling method. Questionnaires were distributed to 200 research samples. The questionnaires were categorized into 3 parts. In the first part, there were 2 questions about the organizational types and sizes and they were check list questions. There were 12 questions in the second part about risk management practices as follows: risk identification, risk analysis, risk response planning, and risk monitoring & control. In the third part, there were 10 questions about process performance that involved budget & time and product performance that involved project requirements. The second and third parts of the questionnaires used interval rating scale measurement with five-point Likert-Scale. The Cronbach's alpha value for reliability test of the questionnaires was 0.928. Descriptive statistics used to analyze data were frequencies, percentages, means, and standard deviations. Inferential statistics used to analyze data were independent samples t-test, one-way ANOVA, and multiple linear regressions at the statistical significant level of 0.05. The research hypotheses were that:

- There is a significant difference in organizational factors including organizational types and organizational sizes that affect IT project success
- Risk management practice including risk identification, risk analysis, risk response planning, and risk monitoring & control influence IT project success.

4. Results

The descriptive statistics results found that most of the organizations that participated in the survey were medium public organizations with 100-500 employees. The risk management practice in the aspect of risk identification, risk analysis and total aspect were in the high level of importance ($\bar{x}$ = 3.96, 3.55, 3.69, and S.D.= 0.644, 0.807, and 0.562). The aspect of risk response planning and risk monitoring and control were in the moderate level of importance ($\bar{x}$ = 3.49, 3.32, and S.D.= 0.680, 0.671) as shown in Table 2.

Table 2. Means, standard deviations, and level of importance on risk management practices.

Risk Management Practice	Level of Importance (Percentage)					$\bar{x}$	S.D.	Meaning	Ranking
	Highest	High	Moderate	Low	Lowest				
1. Risk Identification	18.0	60.0	21.5	0.5	-	3.96	0.644	High	1
2. Risk Analysis	14.0	33.0	47.0	6.0	-	3.55	0.807	High	2
3. Risk Response Planning	4.5	46.0	43.5	6.0	-	3.49	0.680	Moderate	3
4. Risk Monitoring & Control	4.0	31.5	57.0	7.5	-	3.32	0.671	Moderate	4
Total Aspect	5.0	59.0	36.0	-	-	3.69	0.562	High	

Table 3 shows that the IT project success in the aspect of process performance, product performance, and total aspect were in the high level of importance ($\bar{x}$ = 4.05, 3.91, 4.17, and S.D.= 0.788, 0.684, and 0.686). Table 4 shows that the differences on organizational types affected IT project success in the aspect of process performance, product performance, and total aspects. The differences on organizational sizes affected IT project success in the aspect of product performance and total aspects at the statistical significance level of 0.05. As shown in Table 5, the multiple correlation results found that dependent variables, which included process performance, product performance, and total aspect of IT project success, had R value of 0.560, 0.610 and 0.597, respectively, which was interpreted that the correlation between predictors and dependent variables were quite high in the same direction. The percentages of forecasting equation for process performance, product performance, and IT project success were 30.60, 36.20 and 35.00, respectively.

Table 3. Means, standard deviations, and level of importance on IT project success.

IT Project success	Level of Importance (Percentage)					$\bar{x}$	S.D.	Meaning	Ranking
	Highest	High	Moderate	Low	Lowest				
1. Process Performance	18.5	54.0	27.0	0.5	-	3.91	0.684	High	2
2. Product Performance	30.5	45.5	22.0	2.0	-	4.05	0.778	High	1
Total Aspect	32.5	52.0	15.0	0.5	-	4.17	0.686	High	

Table 4. The differences on organizational factors affected IT project success.

	Information Technology Project Success		
	Process Performance	Product Performance	IT Project Success
Organizational types	t (198) = 2.948 p = 0.004*	t (198) = 5.062 p = 0.000*	t (198) = 4.359 p = 0.000*
Organizational sizes	-	F(2, 197) = 4.940 p = 0.008*	F(2, 197) = 4.616 p = 0.011*

*Statistical significance level of 0.05.

Table 5. Multiple correlations between predictors and dependent variables.

Model	R	R Square	Adjusted R Square	Std. Error of Estimation
Process Performance	0.560	0.313	0.306	0.57216
Product Performance	0.610	0.372	0.362	0.62955
IT Project Success	0.597	0.356	0.350	0.55967

Predictor constants: risk identification, risk analysis, risk response planning, and risk monitoring & control.

The multiple linear regression analysis results found that risk identification (X_1), and risk response planning (X_3) influenced process performance at the statistical significance level of 0.05 as shown in Table 6. The highest beta coefficient is 0.398, which means that risk response planning had the greatest influence on predicting process performance, followed closely by risk identification with beta coefficient of 0.244. The multiple linear regression analysis results found that risk identification (X_1), risk analysis (X_2) and risk response planning (X_3) influenced product performance at the statistical significance level of 0.05 as shown in Table 7. The highest beta coefficient is 0.383, which means that risk identification had the greatest influence on predicting product performance, followed closely by risk response planning and risk analysis with the beta coefficient of 0.367 and 0.135, respectively.

Table 6. Multiple regressions between predictors and process performance.

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.456	0.277		5.257	0.000*
Risk Response Planning (X_3)	0.405	0.070	0.398	5.814	0.000*
Risk Identification (X_1)	0.262	0.073	0.244	3.565	0.000*

*Statistical significance level of 0.05.

The multiple linear regression analysis results found that risk identification (X_1) and risk response planning (X_3) influenced IT project success at the statistical significance level of 0.05 as shown in Table 8. The highest beta coefficient is 0.359, which means risk identification had the greatest influence on predicting IT project success, followed by risk response planning with the beta coefficient of 0.333. Table 9 demonstrated the forecasting equations

for process performance, product performance, and IT project success. The forecasting equations demonstrated that risk identification had greatest influence on both product performance and IT project success, followed closely by risk response planning.

Table 7. Multiple regressions between predictors and product performance.

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.145	0.320		3.577	0.000*
Risk Identification (X_1)	0.471	0.082	0.383	5.767	0.000*
Risk Response Planning (X_3)	0.428	0.079	0.367	5.419	0.000*
Risk Analysis (X_2)	-0.131	0.060	-0.135	-2.189	0.030*

*Statistical significance level of 0.05.

Table 8. Multiple regression between predictors and IT project success.

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.430	0.271		5.278	0.000*
Risk Identification (X_1)	0.388	0.072	0.359	5.412	0.000*
Risk Response Planning (X_3)	0.342	0.068	0.333	5.018	0.000*

*Statistical significance level of 0.05.

Table 9. Forecasting equations for each performance on IT project success.

IT project success	Forecasting Equations
Process performance	$\hat{Y}_1 = 1.456 + 0.405X_3 + 0.262X_1$
	(0.000*) (0.000*) (0.000*)
Product performance	$\hat{Y}_2 = 1.145 + 0.471X_1 + 0.428X_3 - 0.131X_2$
	(0.000*) (0.000*) (0.000*) (0.030*)
Total aspects of IT project success	$\hat{Y}_T = 1.430 + 0.388X_1 + 0.342X_3$
	(0.000*) (0.000*) (0.000*)

*Statistical significance level of 0.05.

Dependent variables were risk identification (X1), risk analysis (X2), and risk response planning (X3).

5. Conclusion

The purpose of this article was to explore organizational factors and risk management practices that affected IT project success. To achieve this purpose, the survey research from the sample group provided results that contribute to the development of IT project success. The results found that the differences on organizational types affected IT project success in all aspects. However, the differences on organizational sizes did not affect IT project success in the aspect of process performance. Risk identification and risk response planning influenced the process performance and the success of IT projects. Risk identification was the highest positive influence on product performance, followed closely by risk response, while risk analysis negatively influenced product performance. The results lead to the following implications for the practices:

- Organizational project types and sizes affected IT project success in the aspect of product performance. Project manager needs to be sure that all project requirements were well understood by all stakeholders from the early state, which will significantly improve the IT project success rate
- Process performance is concerned about the completion of the project on time and within the budget. The results found that the differences on organizational sizes made no differences on process performance. This implied that finishing IT projects on time and within budget was desired by organizations of all sizes
- Risk identification was the highest influence on all IT projects success, and risk identification needs to be completed first. Therefore, project managers should be aware of this practice to improve IT project success rate
- The forecasting equation for product performance indicated that product performance was positively influenced by risk identification and risk response planning, but was negatively influenced by risk analysis. This means that the less risk analysis was performed, the more product performance was expected. Organizations need to carefully consider performing risk management due to time and financial reasons supported by Didagra [5] that, from the practical point of view, a lot of project managers decide not to apply any risk management due to financial reasons.

Although interesting results were found, the relatively small sample groups were limited to IT projects at IT companies in Thailand. Further research could be conducted internationally on larger sample groups in a variety of industries to obtain more general results.

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