

Evaluation of Risk Management Practices in Information Systems Project in the Public Sector

(Penilaian Amalan Pengurusan Risiko dalam Projek Sistem Maklumat di Sektor Awam)

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ABSTRACT

Risk has been identified as one of the important factors that influences the success of Information Systems projects. Poor risk management could pose a threat to project performance and outcome. Many risk management models and standards have been developed to assist project managers and teams to overcome or minimize the impact of project risk. Despite continuous attention and emphasis on the positive contributions of risk management to a project, risk management practices are relatively lacking and it have not been practiced in its entirety. Hence, this study intended to identify the level of risk management practice and its influencing factors in IS projects. A case study was carried out by adopting the risk management maturity model to evaluate the level of risk management practices in IS projects. Factors that influence risk management practices in IS projects were identified and validated by experts. The findings can be used as a guideline for improving and enhancing implementation of risk management in project development.

Keywords: Information systems project; risk management; risk management practice; risk management driver; risk management adoptions

ABSTRAK

Risiko telah dikenalpasti sebagai satu daripada faktor penting yang memberi kesan kepada kejayaan projek sistem maklumat. Pengurusan risiko yang lemah boleh mengancam kualiti sistem yang dibangunkan dan meningkatkan kos projek yang menyebabkan kegagalan mencapai objektif projek. Pelbagai piawaian pengurusan risiko telah dibangunkan untuk membantu mengatasi dan mengurangkan impak risiko kepada projek. Meskipun perhatian dan penekanan yang berterusan diberi terhadap sumbangan positif pengurusan risiko dalam sesebuah projek, amalan pengurusan risiko masih rendah dan tidak dilaksanakan dengan sepenuhnya. Satu kajian kes dilaksanakan dengan mengadaptasi model kematangan pengurusan risiko untuk menilai tahap amalan pengurusan risiko dalam projek sistem maklumat. Faktor amalan pengurusan risiko projek sistem maklumat dikenalpasti dan dinilai oleh pakar. Penemuan ini boleh digunakan sebagai panduan untuk menambahbaik dan meningkatkan pelaksanaan pengurusan risiko dalam pembangunan projek.

Kata kunci: Projek sistem maklumat; pengurusan risiko; amalan pengurusan risiko; pemandu pengurusan risiko, adaptasi pengurusan risiko

INTRODUCTION

Information systems (IS) enable the government to improve its accountability, effective management and service delivery to the people, business communities and government entities (Abdullah, Yusof & Jambari 2016; Husin, Lohmani & Abidin 2017). As of 2015, approximately 86% of government services were delivered online involving more than 11,000 services (MAMPU 2016). Although IS has a positive impact on an organization, its failure rate has led to deep concerns (Lawani & Moore 2016; Naw, Rahman & Ibrahim 2011, 2012; Reddick & Turner 2012; Schwindt & Zimmermann 2015) and raised questions about the feasibility and sustainability of IS projects (Paulin 2014, 2015). The success of ICT projects success is divided into three categories, namely (1) Successful – projects that meet users' requirements, project costs, time and scope, (2)

Challenging – projects are successfully completed and meet the needs of consumers but are offset by planning time and costs, and (3) Fail – projects are terminated before being set up or are not used by users (Standish 2013). The performance of e-Government projects is often associated with a high failure rate due to inadequate business needs as well as low-level system acceptance and satisfaction. Based on the Standish Group report, only 39% of projects were categorized as "Successful," while the rest were "Fail" and "Challenging." Although various standards have been developed, the high failure rate of IS project have become a major topic of discourse. Most failure factors related to public sector IS projects were attributed to unclear objective statements and poor project management (Anthopoulos et al. 2015) including inefficient risk management (RM) (Nawi et al., 2012). An IS project that fails to manage risks is likely to encounter problems such as poor software quality, not

meeting consumer needs, increased costs and premature termination. Effective management of RM will increase the success rate of an IS project in terms of cost savings, product or service quality improvement, as well as anticipated completion of projects (Christiansen et al. 2015; DIDRAGA 2013). However, RM is often seen as an alternative to project management, which indirectly causes inconsistent RM practices. In some cases, project managers tend to only focus on some of the RM processes that lead to the risk of the project not managed systematically and completely (Bannerman 2007; Grau, Back & Hossain 2016; Schwindt & Zimmermann 2015). Therefore, this paper presents a case study finding and expert review on the level of RM practices and its contributing factors.

RISK MANAGEMENT

A risk in an IS project is “the possibility of suffering loss that could be described as the impact on a project that could be in the form of poor quality software solutions, increased costs, failure, or delayed completion (Sharif, Basri & Ali 2014)”. RM is a process, strategy, tool, or method used to assist project management (PM) in identifying, controlling, preventing and solving risks to ensure that the project’s objectives, requirements, and goals are achieved (DIDRAGA 2013; Firmenich 2017; Kungwani 2014; Talet, Mat-zin & Houari 2014). There are two approaches to RM, namely assessment and management. The assessment approach identifies and analyses risk information (risk factors) from previous projects and develops a checklist of risks to be used for future project development. However, this approach does not directly contribute to the success of a project. Meanwhile, the management approach collects and analyses information to support decisions pertaining to a project. During the risk identification process, a checklist is developed through brainstorming in order to identify any risk that the project might encounter. This approach contributes directly to the project’s success (Bakker, Boonstra & Wortmann 2010; Didraga 2013).

RISK MANAGEMENT IMPACT

Poor RM in IS projects is prone to problems such as poor software quality and the inability to meet user requirements, rising costs and termination of projects (Christiansen et al. 2015; Bakker et al. 2010; Didraga 2013; Hillson 2002; Janjua, Jaafar & Lai 2016; Project Management Institute 2013; Sanchez, Robert, Bourgault & Pellerin 2009; Ward & Chapman 2003). Studies have shown that there is a positive correlation between RM and project performance (Zaleha et al. 2017). In the recent study by Rana, Hoque and Jacobs (2018) found that focus and accountability of public organisations towards their tasks and responsibilities will be improved due to rule-

based RM framework established, hence contribute to a positive outcome. In a project, the RM process allows risks to be identified and controlled during project development (Baloch et al. 2014; Chawan, Patil & Naik 2013). The chances of completing a project according to time and budget is much higher if organizations are willing to invest in RM. Even with minimum application, RM is still able to reduce negative effects and increase potential advantages and opportunities of a project (McConnell 1998). Indirectly, it improves the success rate of an IS project (DIDRAGA 2013) and leads to a significant impact on project outcome, such as cost savings, high standard of product or service quality and completion according to schedule (Wet & Visser 2013; Raz, Shenhar & Dvir 2002). In addition, Olson and Wu (2010) also stressed that RM can develop effective communication lines between all parties and influence the development of clear project objectives and accurate decision-making processes. Moreover, participation and commitment in each RM process allows the stakeholders in the project to realize the presence of risks and understand its impact on the project. Therefore, stakeholders need to revise their expectations in order to minimize the possibility of unstable projects to meet user requirements (Bakker et al. 2010). However, many software project managers excluded RM in their project and who excluded RM were affected by high risks (Zwikael & Ahn 2011).

RISK MANAGEMENT PROCESSES

The selection of an appropriate model depends on the project’s unique criteria such as nature of project, resources, opportunities, budget, time, and outcome. The most suitable method for one project might well be the most inefficient method for another project (Stern & Arias 2011). A hybrid approach that combines techniques from different models and tools might support the project team in managing risks (Ahmed, Berman & Sataporn 2007). RM involves a number of interrelated processes, such as Risk Identification, Risk Analysis, Risk Classification, Risk Mitigation and Risk Control (Reed & Knight 2011). According to Firmenich (2017), proper risk identification is an essential process in RM. During this process, the cause of a risk event can be analysed to enable a project manager to understand the cause-effect of the event prior to planning suitable risk mitigation actions. In a similar vein, a risk analysis is required for every complex project. Risk analysis includes an impact analysis performance by using various methods such as Program Evaluation and Review Technique (PERT), the probability-impact risk matrix, decision trees, System Dynamics models, sensitivity analysis, and several other good practices (Muriana & Vizzini 2017) to assign values (cost and schedule) to the identified risk. Although it is suggested that risk classification is an optional step, the classification is required when there is a need to prioritize risk in the case of limited resources. Risk mitigation is crucial as most of the positive impacts or

chances prevail during this process. Meanwhile, risk can be minimized through other available techniques, such as risk reduction, elimination, insurance, transfer and acceptance. Risk control is categorized as an optional step that is necessary when long-term quantitative RM is required. It helps project managers to continuously improve and manage projects effectively. According to Pimchangthong and Boonjing (2017) apart from the risk analysis process, other RM processes such as risk identification and response will influence positively on project performance.

ASSESSMENT OF RISK MANAGEMENT PRACTICES

Despite continuous attention and emphasis on the importance of RM during project implementation, many studies have found low levels of RM practice compared to other areas of PM (Hartono et al. 2014; Hu et al. 2013; Ibbs & Kwak 2000; Mnkandla 2012; Schwindt & Zimmermann 2015; Silva, Trigo & Varajao 2012). Although the level of RM awareness is high, it is not widely and consistently practiced. Unfortunately, the public sector also contributes to this deficiency (Bannerman 2007). Literature has shown that the risk identification process is the most practiced process compared to other RM processes. There is a tendency for project managers to overly focus on only the two initial processes, which is risk identification and analysis (Adeleye, Annansingh & Nunes 2004; Kutsch et al. 2013). In contrast, Baharuddin and Yusof (2017) stated that insufficient attention to other risk processes, such as risk classification and mitigation, had posed risks in most IS projects and cause it to remain unattended and untreated. Project managers were inclined to abstain from implementing mitigation actions for important risks that were identified and assessed earlier. Schwindt and Zimmermann (2015) also agreed that most project managers are involved in RM activities to some extent but do not follow the RM methods in detail; they only have limited understanding about the risk concept and its impact on a project where at least medium skill and experience of RM is required to implement risk processes efficiently (Bahamid & Doh 2017). In addition, many IS development experts are not familiar with specific and formal RM; thus, hindering them from providing basic information about events that might affect project performance and results (Abdullah et al. 2016; Grau, Back & Hossain 2016).

RISK MANAGEMENT MATURITY MODEL

The Risk Management Maturity Model (RMMM) was introduced by Hillson in 1995 for assessing the maturity of risk management according to four dimensions, namely culture, process, experience and application (Antonucci 2016). RMMM has been used as a tool in various industries, including project management, to enable organizations to understand complicated RM processes as well as reliability and effectiveness in identifying,

assessing and managing risks and opportunities in a project (Andersen & Jessen 2003; Chapman 2011; Ren, Yeo & Ren 2014; Wendler 2012). These models also offer a benchmarking guide specifically meant to identify weak points in RM maturity and allow improvement of RM practices (Andersen & Jessen 2003). However, this study only focused on the first three dimensions; it excluded the Application Dimension as it focused on the use of risk management systems, which is beyond the scope of this study (Njagi & Njuguna 2017; Zhao, Hwang & Low 2014). The RMMM also provides a systematic approach for assessing different maturity dimension levels in risk management. To ensure each dimension is accurately assessed, it is divided into sub-dimensions that comprise several key elements, as described in Table 1.

RISK MANAGEMENT MATURITY LEVEL

The RM Dimensions can be mapped according to four (4) maturity levels: Ad-hoc, Initial, Repeatable and Managed. Table 2 shows the RM Maturity Set's correlation between dimensions and the maturity level.

FACTORS INFLUENCING RISK MANAGEMENT PRACTICES

RM offers numerous advantages, but RM malpractices might complicate the implementation of RM (Corvellec 2009; Lalonde & Boiral 2012). Hence, identifying these factors would ensure that barriers to RM implementation could be overcome through a number of appropriate measures, such as awareness and training programs. Moreover, voluntary RM practices, instead of enforced practices, also affect RM practices (Golshan & Rasid 2012a). Factors that influence RM practices have been raised by previous researchers, as summarized in Table 3 below.

This study identified key factors that influence RM practices in IS projects implemented in the public sector and suggested 5 most cited RM practice factors. These factors are RM structure, culture, size and character, policy and regulation, and control environment (internal and external influence).

METHODOLOGY

This study employed two qualitative design methods, namely case study and expert review, to evaluate the level of RM practices in IS projects and identify factors that influence RM practices in IS projects.

CASE STUDY

The case study method was chosen in order to understand and assess the use of RM practices in IS projects. Project X was selected based on its ability to fulfil the following criteria: (1) the project is categorized as Successful, (2) has a high level of complexity, (3) has high risk diversity and exposure, and (4) has schedule feasibility

TABLE 1. RM dimensions and key elements

No.	Dimension	Sub-dimension	Key Elements
1	Culture	Commitment from top management	<ul style="list-style-type: none"> - RM plan is developed and approved - Risk-related action is based on RM plan - Active top management involvement in RM - Definition of roles and responsibilities in RM - Risk owner is authorized to manage risks - RM included as risk owner's performance
		Risk Awareness Culture	<ul style="list-style-type: none"> - Risk culture is created and the team possesses risk awareness - Risk-awareness culture is applied to the project. Project team reacts as expected
2	Process	Objective Setting	<ul style="list-style-type: none"> - Project objective is clearly identified and understood - All objectives have performance measures
		Risk Identification	<ul style="list-style-type: none"> - Risk is identified during the early project stage - Diverse sources are considered for risk identification - Opportunities are identified and explored - Root causes of risks and effects are identified
		Risk Analysis and Classification Risk Mitigation and Control	<ul style="list-style-type: none"> - Risk's likelihood and magnitude are analysed - Risk control is documented and assessed - Appropriate risk response is developed - Risk response is designed to combat root causes of risk - Emerging project risks are identified proactively - Timely and accountable execution of risk response - Critical risks are reported to top management - Clear line of communication is established for risk reporting
		Risk Appetite and Tolerance	<ul style="list-style-type: none"> - Risk appetite and tolerance are clearly defined - Risk appetite is explained to each project team member
3	Experience	Sufficient Resources	<ul style="list-style-type: none"> - Project resources for RM policy, plan, skills, process and tools are continuously improved - Sufficient internal, qualified resources - External consultant or experts are hired to assist project risks management
		Training Program	<ul style="list-style-type: none"> - Formal and regular RM training

Source: Adapted from David C. Hall (2002) and Ren & Yeo (2004)

for the assessment of RM practices. This project was implemented over four years and comprised system development (2 years) and maintenance (2 years) phases. This project was very complex as it needed to be integrated with existing systems in various agencies from different sectors, such as transportation, banking and finance, health sciences, emergency services, energy, information and communication. Informants were selected based on their active role in the project, while the assessment was based on interview sessions totalling 6 hours through semi-structured group focus interviews regarding project X (see Table 4). The interview questions were prepared based on an established RMM instrument model.

EXPERT EVALUATION

This study had conducted an interview with 4 experts to evaluate the proposed list of factors involved in RM practices. The experts were selected based on their experience and expertise in ICT projects and system development. Additional criteria such as duration of

service (more than 10 years) and recognition as an ICT specialist or consultant were also considered (see Table 5). Semi-structured, one-to-one, face-to-face interview sessions were conducted for a total of 4 hours to obtain the expert's views and decisions. Interview questions were prepared based on a list of constructed RM practice factors.

FINDINGS

RISK MANAGEMENT PRACTICES ASSESSMENT

The assessment of RM practices was divided into three dimensions, namely Culture, Process and Experience. These dimensions consist of several key elements that were evaluated according to a score of "1 = present" or "0 = otherwise". The scores were calibrated to obtain the Raw Score for each sub-dimension. The Raw Score was then divided by the Ideal Score (full presence of all key elements) to obtain the percentage of each dimension. The percentage was then mapped according to the appropriate

TABLE 2. RM maturity correlation set. Data for dimension and maturity level (Hall 2002; Ren & Yeo 2004)

Dimensions	Maturity Percentage Range			
	0-20%	21-50%	51-70%	71-100%
	Maturity Level and Character			
	Level 1 Ad-hoc	Level 2 Initial	Level 3 Repeatable	Level 4 Managed
<p>Dimension: Culture</p> <p>Sub-dimension: Commitment from top management</p> <p>6 Key Elements</p> <ul style="list-style-type: none"> - RM plan is developed and approved - Risk-related action based on the RM plan - Active top management involvement in RM - Roles and responsibilities of RM are defined - Risk owner is authorized to manage risks - RM included as risk owner performance <p>Sub-dimension: Risk Awareness Culture</p> <p>2 Key Elements</p> <ul style="list-style-type: none"> - Risk culture is created and the team possess risk awareness - Risk-awareness culture is applied to the project. Project team reacts as expected 	<ul style="list-style-type: none"> - No senior management support and involvement - Unaware of the need for risk management 	<ul style="list-style-type: none"> - Partial acceptance of risk management - Initial assignment of responsibility and accountability regarding risks 	<ul style="list-style-type: none"> - Accepted Plan for RM - Risk awareness at the organizational level - Recognition of risk ownership and allocation of risks and responsibility 	<ul style="list-style-type: none"> - Top-down commitment to RM, with leadership by example - Strong top management support - Strong risk-awareness culture with proactive approach to RM - Risk-based organization that is dynamic and energetic, and flexible
<p>Dimension: Process</p> <p>Sub-dimension: Objective Setting</p> <p>2 Key Elements</p> <ul style="list-style-type: none"> - Project objective is clearly identified and understood - All objectives have performance measures <p>Sub-dimension: Risk Identification Process</p> <p>4 Key Elements</p> <ul style="list-style-type: none"> - Risk are identified at the early project stage - Diverse sources are considered for risk identification - Opportunities are identified and explored - Root causes and effects of risks are identified <p>Sub-dimension: Risk Analysis and Classification process</p> <p>2 Key Elements</p> <ul style="list-style-type: none"> - Likelihood and magnitude of risks are analyzed - Risk control is documented and assessed <p>Sub-dimension: Risk Mitigation and Control Process</p>	<ul style="list-style-type: none"> - Absence of RM processes or practices - No RM data are consistently collected or analysed 	<ul style="list-style-type: none"> - Informal RM processes are defined - RM problems are seldom systematically identified and analysed - Fragmented RM data are collected 	<ul style="list-style-type: none"> - Formal project planning and control systems are established and applied - RM system and procedures are used to identify, confront and mitigate risks continuously - Ensure real time monitoring of budgets and schedules 	<ul style="list-style-type: none"> - RM process integrated with other PM processes - Consistent and systematic RM for project portfolios internally and with external partners - RM process data are quantitatively analysed, measured, and stored continuously - RM processes are continuously improved

TABLE 2. *Continued*

Dimensions	Maturity Percentage Range			
	0-20%	21-50%	51-70%	71-100%
	Maturity Level and Character			
	Level 1 Ad-hoc	Level 2 Initial	Level 3 Repeatable	Level 4 Managed
<p>6 Key Elements</p> <ul style="list-style-type: none"> - Appropriate risk response is developed - Risk response is designed for root causes of risk - Emerging new project risks are identified proactively - Timely and accountable execution of risk response - Critical risks are reported to top management - Clear communication is established for risk reporting <p>Sub-dimension: Risk Appetite and Tolerance</p> <p>2 Key Elements</p> <ul style="list-style-type: none"> - Risk appetite and tolerance are clearly defined - Risk appetite is emphasized to each project team member 				
<p>Dimension: Experience</p> <p>Sub-dimension: Sufficient Resources</p> <p>3 Key Elements</p> <ul style="list-style-type: none"> - Project resources for RM policy, plan, skills, process and tools are continuously improved - Sufficient internal qualified resources - External consultant or experts used to assist managing project risks <p>Sub-dimension: Training Program</p> <p>2 Key Elements</p> <ul style="list-style-type: none"> - Formal RM training - Regular RM training provide 	<ul style="list-style-type: none"> - No understanding of risk principles and language - No RM tools in use 	<ul style="list-style-type: none"> - Informal training of RM skills and practices - Limited to individuals who might have little or no formal training - RM tools are used in some activities - Partial knowledge on RM principle and language 	<ul style="list-style-type: none"> - Dedicated resources to RM - Formal training of RM skills and practices - Full understanding of RM principle and language - The personnel in charge of RM have a high level of RM competence - Mastering basic RM tools and techniques 	<ul style="list-style-type: none"> - Strong teamwork, even with external partners - Staff who are monitoring risks are aware and capable of using basic risk skills - Continuous formal RM training for project teams - Continuous RM learning - RM knowledge is shared and transferred

TABLE 3. Factors that affect RM practices

Factor	Sources
RM Structure	(Golshan & Rasid 2012a) (Kleffner, Lee & Mcgannon 2003) (Kanhai & Ganesh 2014) (Hudin & Hamid 2014) (Fadun 2013) (Manab, Kassim & Hussin. 2010) (Dahlstrom et al. 2009) (Njagi & Njuguna 2017)
Organization Size	(Paape & Speklé 2012) (Golshan & Rasid 2012a) (Hudin & Hamid 2014) (Njagi & Njuguna 2017)
Organization Culture	(Kipyegen, Mwangi & Kimani 2012) (Shahzed & Holt 2013) (Kleffner, Lee & Mcgannon 2003) (Kanhai & Ganesh 2014) (Fadun 2013) (Manab, Kassim & Hussin. 2010) (Ismail et al. 2012) (Njagi & Njuguna 2017)
Organization Complexity	(Golshan & Rasid 2012a)
Organization Character	(Paape & Speklé 2012) (Golshan & Rasid 2012b)(Golshan & Rasid 2012a) (Hudin & Hamid 2014) (Ismail et al. 2012)
Policy and regulation	(Paape & Speklé 2012) (Kipyegen, Mwangi & Kimani 2012) (Golshan & Rasid 2012a) (Kanhai & Ganesh 2014) (Hudin & Hamid 2014) (Manab, Kassim & Hussin. 2010) (Njagi & Njuguna 2017)
Internal Influence	(Paape & Speklé 2012) (Hudin & Hamid 2014) (Fadun 2013) (Ismail et al. 2012)(Njagi & Njuguna 2017)
External Influence	(Golshan & Rasid 2012b)(Golshan & Rasid 2012a) (Hudin & Hamid 2014) (Fadun 2013) (Ismail et al. 2012) (Njagi & Njuguna 2017)
Ownership	(Paape & Speklé 2012)
Motivation	(Kipyegen, Mwangi & Kimani 2012)
Technology and new business trend	(Shahzed & Holt 2013) (Hudin & Hamid 2014) (Manab, Kassim & Hussin. 2010)
Risk Strategy	(Golshan & Rasid 2012a) (Shahzed & Holt 2013) (Kleffner, Lee & Mcgannon 2003)
Risk Control and Risk Monitor	(Shahzed & Holt 2013) (Kleffner, Lee & Mcgannon 2003)
Training and Development	(Kipyegen, Mwangi & Kimani 2012) (Shahzed & Holt 2013) (Kleffner, Lee & Mcgannon 2003) (Fadun 2013)
Awareness	(Kipyegen, Mwangi & Kimani 2012) (Hudin & Hamid 2014)

TABLE 4. List of informants

Code	Position	Project Role	Project Management Experience (Year)	IS Development Involvement (Year)	PM / RM Model Exposure
P1	Administration and Diplomatic Officer, Grade 52	Project Manager	10	2	PMBOK
P2	Administration and Diplomatic Officer, Grade 44	Project Management Office (PMO)	2	1	PMBOK
P3	Administration and Diplomatic Officer, Grade 44	PMO & Infrastructure	2	1	-
P4	Information Technology Officer, Grade 44	Technical & ICT Infrastructure	5	2	-
P5	Information Technology Officer, Grade 41	Application and System Development	1	1	-
P6	Information Technology Officer, Grade 41	Technical and System Development	3	1	-

(N = 6)

TABLE 5. List of experts

Code	Positions and areas of expertise	Working experience (Year)	Number of agencies served	Involvement in IS (large scale)	Exposure to project / RM model
E1	IT Officer, Head of ICT Consultant and system development expert	36	7	<ul style="list-style-type: none"> - uCustoms - 1 Government Financial Management Accounting System (1GFMAS) - Integrated Foreign Workers Management System (EPPAX) - Chief Executive Management IS (SMPKE) - Human Resource Management System (HRMIS) - Asset Management System (SPATA) - Registry of Societies Electronic System (eRoses) - Disaster Management System - National Cyber Control and Coordination Centre Project 	PMBOK
E2	IT Officer, ICT-PM Consultant and Certified Expert	25	3	<ul style="list-style-type: none"> - MyGovernment Portal - Land Management System Asset Management System (SPATA) 	PMBOK
E3	IT Officer, ICT-IS Consultant	27	5	<ul style="list-style-type: none"> - 1Malaysia One Call Centre (1MOCC) - skills development system - Finance Management System (FISU) 	PMBOK
E4	IT Officer, ICT-PM Consultant	14	2	<ul style="list-style-type: none"> - uCustoms - National Immigration Control System (SKIN) - Advanced Passenger Screening System (APSS) 	PRINCE 2

(N=4)

TABLE 6. Culture dimension score

Dimension	Raw Score	Total Score	Score Percentage	Maturity Level
Culture				
Top management commitment	5/6	5/8	63%	Level 3 Repeatable
Risk Awareness Culture	0/2			

RM maturity level as shown in Table 1 (Beasley, Branson & Hancock 2012; Ren & Yeo 2004).

Culture Dimension This study assessed the presence of commitment and support from top management towards the RM process based on a number of key elements (see Table 1) to determine the Raw Score for each sub-dimension. The Raw Score was divided by the Total Score to determine the score percentage, which was then mapped to the appropriate maturity level, as shown in Table 6.

The total score for this dimension was high in terms of top management commitment and support towards RM activities but relatively low in creating a risk awareness culture in the project. Therefore, this dimension was categorized as Level 3: Repeatable, due to the presence of the RM Plan as well as recognition of risk ownership and allocation of risk. This finding shows that top management plays an active role in managing

and controlling critical project risks. The project risks were constantly managed and controlled by the technical and steering committees represented by senior officers from all projects stakeholders. According to P1: "Due to our project structure, a lot of things will be managed and solved at the project director level; however, all critical risks will be referred to top management since we have technical and steering committees."

Despite the commitment and support given by the top management, risk awareness culture was poorly emphasized to stimulate the project team's response towards project risks. P2 illustrated how the project team reacted towards project risks: "It feels like it will take a long time to prepare for a risk; so, when it [risk] occurs, we will handle it accordingly but it was a disappointment to us for not being able to notice the risk earlier." It is argued that although top management support encourages RM practices, low risk awareness might result in low perceived usefulness of RM among lower management

staff, particularly the project team. This finding is in line with findings by Njagi and Njuguna (2017) and Altuntas, Berry-Stolzle and Hoyt (2011).

Process Dimension Process dimension covers three sub-dimensions, such as objective setting, basic RM processes, risk appetite and tolerance. The results are shown in Table 7. Most of the RM activities were generally performed in the project. However, project risk planning and tracking activities were occasionally implemented or missing due to poor risk appetite and awareness by the project team towards the potential benefits of managing its project risks. Therefore, this dimension was categorized as Level 3: Repeatable. According to Kleffner et al. (2003), objective setting is a vital step in RM processes because project risks are identified and analysed based on its objectives. This was agreed by the informants who stressed that objective setting was defined clearly and explained to all project teams at the outset of the project. Project objectives are measured against their predetermined deliverables. However, low-level attention to risk appetite yields potential project risks at a later stage. The presence of experts and consultants in this project was implicitly exposed and encourages risk appetite and awareness.

TABLE 7. Process dimension score

Dimension	Raw Score	Total Score	Score Percentage	Maturity Level
Process				
Objective Setting	2/2			
Risk Identification	3/4	11/16	68%	Level 3: Repeatable
Risk Analysis and Classification	2/2			
Risk Mitigation and Control	4/6			
Risk Appetite and Tolerance	0/2			

We have key persons, experts and consultants [who] in RM; so, RM is indeed cultivated [during the project development]. We will consider their opinions prior to any decision-making including that of project risks. I believe that the culture to consider risks prior to any action, is there. (P1)

This was also discovered by Fadun (2013), who believed that the presence of experts throughout the implementation of the project informally provided RM information and significantly impacted the RM practices. This study also discovered findings similar to Teklemariam and Mnkandla (2017) and Wet & Visser (2013) on the insignificant acceptance rate of formal RM during project development. This finding shows that although the RM process seemed to be well-practiced but, in some cases, no formal model or standard were used.

Experience Dimension This dimension consists of 2 sub-dimensions, namely sufficient resources, and training programs that are measured by 5 key elements. The results for this dimension are shown in Table 8.

TABLE 8. Experience dimension score

Dimension	Raw Score	Total Score	Score Percentage	Maturity Level
Experience				
Sufficient Resources	1/3	1/5	20%	Ad-hoc
Training Program	0/2			

The lack of attention on formal training by top management resulted in the low level of skills and knowledge on RM. Therefore, this dimension is categorized as Level 1: Ad-hoc, due to limited individual awareness on formal RM and absence of formal training to enhance knowledge on the RM process and skills (Table 9). This study also found that project resources and RM practices were interrelated whereby inadequate resources influenced the level of RM practice. All informants agreed that inadequate resources for implementing RM resulted in low levels of practice. P4 stressed this issue by saying: “Yes, we have lack of resources to implement the whole RM process during project implementation. If we have problems completing our job because of the shortcomings, will we spend on risk management? Definitely not.”

Kipyegen et al. (2012), Fadun (2013) and Abdul-Rahman and Yazid (2015) underlined the need for formal training on RM skills and awareness to ensure that RM processes and techniques are adapted by project teams and all organizational members. Commitment from top management to provide adequate training and cultural creation will benefit the progress of systematic RM practices (Manab et al. 2010). This study suggests that the constraints of human resources, finance, time and technology have impacted on RM practices. This was agreed by Abdullah et al. (2017) claiming that these factors are why risk management is difficult to be cultivated.

RISK MANAGEMENT PRACTICES FACTORS

The five significant RM practice factors derived from literature consist of RM structure, culture, organization size and character, policy and regulation, as well as a controlled environment (internal and external influence). These factors were then evaluated by experts and discussed below.

RM Structure The RM structure defines the responsibilities and escalation levels pertinent to managing risks throughout the project. The essence is to have independent sources for the project with appropriate skill sets such as credibility of the project’s executive sponsor, RM project experience and knowledge of the industry. The majority of experts believe that the presence of individuals or small units that advocate the RM process will have a direct impact on RM practice. However, there is need to clearly define responsibilities for individuals or teams so as to avoid irrelevant resources in a project. This was raised by E3, “I agree with assigning people in charge of RM, but [we] must know what the Terms of Reference (TOR) are

TABLE 9. Implication of RM maturity

Dimension	Level	Description
Culture	3: Repeatable	Stakeholders' involvement during project implementation has helped to increase their knowledge of project risks. Commitment by top management addresses project risks but is very poor in embracing RM practices during project implementation. The poor RM awareness of each team member has implicated the inconsistent involvement of stakeholders. Unfortunately, this also affects the risk management process by causing it to become unsystematic and delay the identification of risks after an issue has occurred.
Process	3: Repeatable	It is clear that the intention of managing risk is crucial in ensuring project risk mitigation. Although risk management processes were implemented, its continuation was inconsistent, unsystematic and inadequately performed. Hence, project risks were discovered at a later stage after the project was implemented.
Experience	1: Ad-hoc	There is a huge gap in efficiency and experience needed to manage project risks among project team members. Hence, experts and consultants in IS projects would compensate the lack of experience among project team members. The process of sharing knowledge on risk management is informally implemented. Exposure and training on proper risk management tools and processes should be implemented at the earliest stage in the project to provide each project team member the basic knowledge in managing project risks efficiently and systematically

and clarify role definitions.” Njagi and Njuguna (2017) stated that RM maturity and practices will increase if roles and responsibilities are clearly defined. Similarly, E2 also emphasized the importance of having personnel or units that understand how to properly implement the RM process: “You can have very good processes and better methodology, but finally [it is] the human [who] will do the work. If [we] do not execute as [what] we planned [and] the people are not aware on the [RM plan], the plan will not work”. The findings are in line with the study by Abdullah and Shukor (2017) on the needs of best risk governance structure to improve the RM capabilities and thus enhance stakeholder confidence.

Culture According to Twining et al. (2010), risk culture can be defined as “the norms and traditions of individuals as well as group behaviour in an organization that determines the way in which they identify, understand, discuss and act on the risks the organization confronts or takes.” RM culture is described as a critical factor and essential component for successfully establishing the RM process (Fadun 2013; Kanhai & Ganesh 2014; Kleffner et al. 2003). A similar point was expressed by E3: “Attention should be given to cultivating [culture] risk management in order for employees in the agency to understand and practices it. This enables the best practices of risk management to be implemented in the organization so that project can be managed effectively”.

Experts agreed that training can be used as an approach to emphasize the importance of RM in a project and to improve the level of practice. This was highlighted by E4, who said that the risk awareness culture will be enhanced if formal training is conducted to emphasize the importance of project risks and how it is managed. Yeo and Ren (2011) argued that the RM process will not be practiced if risk awareness does not subsist adequately in a project. Thus, proper training will provide RM knowledge

to the project team and subsequently motivate them to practice RM in a project's environment (Kwak & Stoddard 2004).

Size and Character The size and character of the organization could also affect the level of RM practices due to the greater potential of resources (Beasley, Clune & Hermanson 2005; Kleffner et al. 2003). Some studies have shown a significant relationship between factors such as size, character and the implementation of RM (Golshan & Rasid 2012b, 2012a; Hudin & Hamid 2014; Ismail et al. 2012; Paape & Speklé 2012) and experts agree that organizational ability to provide adequate resources and budget for RM will definitely improve its practices. In reality, E2 stressed that poor attention given by project management to RM resulted in inadequate budget allocation and resources during project implementation.

The practices of RM during project implementation depends entirely on the agency's awareness about RM. The higher RM awareness in the agency, the higher chance they will practice it in a project. A contrary situation could happen if the management does not realize RM benefit in a project. (E4)

This clearly demonstrates that the level of awareness and emphasis on RM practices are crucial to ensure organizational support (whether voluntarily or mandatory) when implementing RM projects upon receiving sufficient resources.

Policy and Regulation Experts believe that risk awareness culture in IS projects is already in existence and being practiced. However, the culture is still in its infancy. E4 also felt that sometimes RM is only considered as a value-added activity, instead of being essential or project deliverability. All the experts argued that effective policies and regulations could establish a controlled environment for RM practices in IS projects.

We [Government] must write proper policies and guidelines to ensure that RM can be implemented successfully. Good policies and guidelines must provide clear direction on how to implement RM and terms of reference (TOR) for stakeholders. (E2)

This finding also supports Kipyegen et al. (2012) regarding the need for proper policy enforcement to ensure that stakeholders take this practice seriously. In addition, Bannerman (2008) stated that besides undefined policies, poor culture, and motivation in the RM area also results in inconsistent practices.

Controlled Environment A highly controlled environment by regulatory agencies, such as the national auditor and top management, significantly influences RM practices (Ahmad, Ng & McManus 2014). There is a convincing correlation between a controlled environment and policy and regulation, as underlined by E2 and E4:

Through clear and specific policies, effective monitoring can be carried out by project teams. (E2)

It will be a force factor for implementing [RM]. Despite being forced, it will cultivate a risk culture in the long run. (E4)

Experts also argued that a controlled environment can not only play an imperative role in establishing a higher level of control awareness, it can also produce systematic and standard RM practices. This affects the quality and reliability of the project documentation were, in turn, helping the project to achieve the objective of acceptable levels of risk. This result support Abdullah, Shukor & Rahmat (2017) which also emphasizes that the presence of the auditors will have a positive impact on the readiness of the RM implementation.

DISCUSSION

Different maturity levels have been obtained for each dimension studied. Table 9 discusses the implications faced by each dimension based on their respective maturity levels.

In addition, Figure 1 shown that there are four sub-dimensions were classified as weak due to 1) a lack of emphasis on risk awareness culture by top management by the project team (Culture Dimension), 2) the absence of a formal statement of risk appetite to guide RM practices (Process Dimension), 3) inadequate number of qualified resources to initiate and implement RM practices throughout the project cycle, and 4) unavailable training programs to enhance team knowledge on project and RM (Experience Dimension). All key elements are crucial in facilitating RM. Paradoxically, these elements were completely neglected by project management who underestimated its potential impact on RM practices. All stakeholders paid less attention to RM culture although the top management was aware of the lack of RM experience among the team. The top management failed to take appropriate steps to overcome the issue, whilst the project team was not keen to increase its knowledge on risk management. The high dependency of the team on consultants had discouraged them from proactively identifying and mitigating risks. On the other hand, misunderstandings on RM need to be rectified, whereby RM activities should not only be viewed as a “value added” element to a project. This misleading and incorrect perception leads to a challenge in identifying project risks, inaccurate analysis outcome, and improper response plans, which subsequently leads to numerous project risks that were not attended and

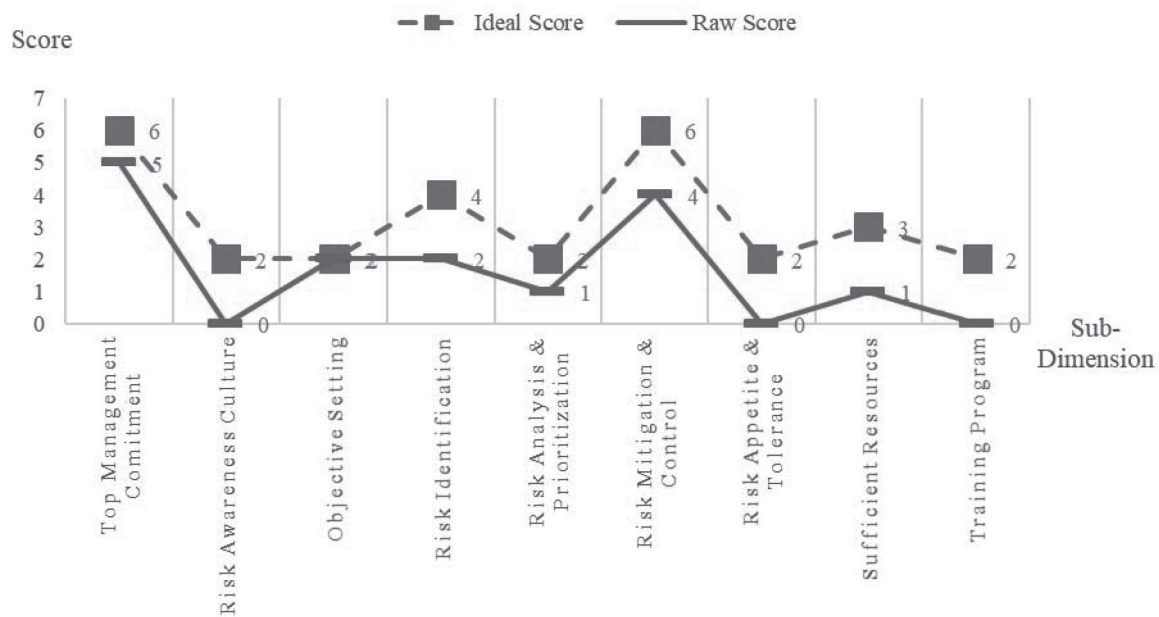


FIGURE 1. Sub-dimension score

mitigated appropriately when completing a project. Policies and structures can be considered as critical factors that influence RM practices in IS projects. Comprehensive policies help the implementation of RM as a fundamental project activity. In addition, the establishment of effective RM roles and responsibilities will ensure that RM activities are observed and implemented properly so that project risks are managed and controlled optimally.

CONCLUSION

This study assessed the level of RM maturity in IS projects in the public sector to improve the implementation of RM. This case study showed that RM's level of practice was at Level 3: Repeatable, where two out of three dimensions scored more than 60% maturity. Most of the basic RM processes were put into practice and the top management played an active role by showing commitment in RM activities. However, low scores in the "experience dimension" indicates that RM has not received full attention from responsible parties. Inadequately qualified resources and absence of formal regular training that emphasizes the importance and potential of RM has affected the interpretation of most project team members who considered RM as a "value-added" activity in the project. Despite the presence of RM processes in the project, poor knowledge and skills in RM has limited the systematic practice of RM processes during the implementation of projects. Most risks cannot be identified earlier as it only surfaces following the occurrence of major issues. It is imperative that top management plays an active role not only in addressing threats and risks in the project, but also to emphasize the risk appetite among project members so that each member is aware of his risk-related responsibilities. This study clearly shows the need for a policy that emphasizes the implementation of RM in an IS project. The policy should be explained clearly in terms of why, how, and who should be responsible for implementing RM in projects. This includes providing adequate resources such as establishing RM structures and budget preparation specifically to support its implementation. However, the policy is an initial step to inculcate RM in the project. Risk culture allows a group of people to share similar goals, values, beliefs, knowledge, attitude, and understanding about RM. Hence, it is important for the Government to develop a comprehensive strategy to cultivate the RM culture in order to provide a clear understanding and action for RM implementation during project development.

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