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The Importance of Knowledge-Based Risk Processes to Risk Analysis

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ABSTRACT

Knowledge-based risk processes are suitable key elements within organizations since they can minimize the possibility and impact of an information technology (IT) project. The aim of this paper is to explain how the alignment between knowledge-based risk processes to validate risk analysis. A questionnaire was developed and distributed to a sample of 135 respondents who were actively engaged in IT. The proposed research model explained that 50 to 62% from of the variance in knowledge-based risk processes to risk analysis. The results showed that the two selected factors (identification and sharing) have a partially mediate and significant impact on risk analysis by knowledge-based risk repository. On the other hand, the examination is not mediated and not a significant impact on risk analysis. The findings of this study imply the understanding of knowledge-based risk processes to risk analysis This study will contribute to the field by examining the effects knowledge-based risk on risk analysis for IT projects.

KEYWORDS

IT Projects, Knowledge, Knowledge-Based Risk Repository, Risk, Risk Analysis

INTRODUCTION

Knowledge and its creation are vital competitive advantage and business opportunities bases of for most modern organizations (Alavi & Leidner, 2001). On the other hand the new technologies provide opportunities for sharing knowledge that it is considered among scholars in order to create strategic benefits to the organizations (Schniederjans et al., 2020).

Risk can have a major impact on the operation (Mees, 2007), whereas risk management (RM) involves a number necessary managerial processes that companies apply in managing and controlling risks in any projects. Furthermore, Management of risks by repetitive process that addresses the planning, analysis, implementation, control and supervision of the policies and measures of security policy implementation can reduce the risk (Suroso & Fakhrozi, 2018).

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Additionally, RM is described as a systematic and iterative process of identifying, analyzing, and responding to project risks in order to reduce the potential negative events and maximizing the positive events in terms of consequences and probabilities (Kasap & Kaymak, 2007). Thalmann & Ilvonen (2020) defined that the concept of knowledge risk as severity of adverse effects, or in other terms, the consequences of knowledge risk incidents that can have serious effects for firms and that both preventive and reactive measures.

Many projects failed due the lack of knowledge sharing during project development. Therefore, KM processes become a strategic resource to reduce organizations' risks (Karadsheh et al., 2008; Nehari Talet et al., 2018).

Jennex, & Durcikova (2014) noted that if knowledge management (KM) and information security are combined well enough to protect knowledge assets from the persistent threats of disclosure, modification, and destruction in order to support KM managers to be familiar with organizational Information Security

An effective RM process model can't be completed without the support of a well-established KM process model Rodriguez-Montes & Edwards (2008). Then, a well-defined and designed integrated KM and RM framework is essential to improve decision-making in IT projects. Additionally, Aven & Kristensen (2019) mentioned that the RM is viewed as the procedure of making sure that the overall knowledge is adequately and professionally used, including the identification of the detailed knowledge needed, and guaranteeing sufficient specific knowledge and control when evaluating risk and decision-making. Therefore, partners in such relationships must continually assess collaboration risks and approach risk management depending on needs and resource endowments by shared, acquired, and deployed the knowledge (Singh et al., 2018). Durst et al. (2019) noted that the concept of risks related to knowledge would form an important fragment of any organization's RM and therefore, knowledge. Also, Teklemariam & Mnkandla (2017) stated that there is limited knowledge on the part of project managers when it comes RM properly.

Additionally, the separation between KM and RM is part of current organizational reality by perceived quality of risk control to representing the operational level of RM; and perceived value of the Enterprise RM implementation to representing the strategic level (Rodriguez & Edwards, 2014). Thus, organizations must minimize risk from managing Knowledge-Based risk Processes and Knowledge-Based risk Repository appropriately.

There was a significant lack of literature focusing on the Knowledge-Based risk Processes impact and risk analysis model. So, this study will seek to contribute to this area by providing a reliable technique of employing the risk analysis as an effective model.

This study first started with an overview of the literature review includes analysis of previous research, then followed by the proposed research model, hypotheses, the research methodology, results, and discussions. Finally, conclusions, limitations and possible directions for future research are highlighted.

LITERATURE REVIEW

Knowledge Management and Risk Processes

Today's modern, industrialized society is based on globalization. Therefore, Dickinson (2001) presented knowledge as a reason to reduce the risk; for that reason risk modeling Knowledge is one of the pieces to make use of it. Zhang et al. (2018) classified the different types of risks and KM capabilities (Cultural, technological, and structural) level KM should be matched to achieve effective RM (Social system risk, Technical system risk, Project management risk. Be aware of knowledge risks and the effects of them eventually requires understanding real world incidents, but empirical work on the topic is limited; a lot of the work so far has been conceptual or theoretical in nature (Durst, 2019). According to Durst & Zieba (2020) knowledge risk is a measure of the likelihood and gravity of undesirable effects of any activities involving or associated somehow to knowledge that can have an effect on the performance of an organization on any level.

KM comprises a set of actions intended at designing and influencing processes of knowledge has become the most dominant new organization practice (Kautz & Mahnke, 2003). Knowledge management is defined as the practice of selectively applying knowledge from previous experiences of decision-making to current and future decision-making activities with the express purpose of improving the organization's effectiveness (Jennex & Olfman 2005). (Holsapple & Joshi, 2004; Alavi & Leidner, 2001), mentioned that the main constituents of KM applying knowledge for managerial decision and processes for searching, capturing, storing, and retrieving knowledge. Eventually, KM needs to concentrate on transferring selected knowledge to where it can be relevant. KM is mission-focused on using knowledge as an asset to get better processes (Keen & Tan, 2007).

Additionally, Au and Fung (2019) noted that KM helps organizations to knowledge centric information security to provide directions for developing a new and generic Information security audit model and investigate how IT governance mediates the influence of Information security knowledge on Information security audit, as well as a more solid foundation for adopting KM practices in Information security protection and audit.

Eventually, there are two major missions for KM: (1) Leveraging what the organization "knows" so that it can better utilize its knowledge assets. (2) Connecting knowledge generators, holders and users to facilitate the flow of knowledge through the organization (Jennex, 2014).

Recently, Jennex & Durcikova (2020) proposed in a template the risk assessment for KM/knowledge systems, that identified all the different knowledge assets (knowledge from particular expert or knowledge worker), then categorized every threat (misuse, abuse, disclosure, and loss of knowledge) and grouped in (technical, behavioral, and legal threats). They suggested how to calculate the risk score by identifying possible impact areas (Financial, Productivity, Reputation, Legal, and Safety).

The importance of each area must be ranked as (low/medium/high), therefore, organization can pick from one to four risk control strategies (accept, mitigate, share, or defer) to allows organization for a faster documentation of assets/threats, their potential impact, and risk mitigation techniques.

Moreover, Durst & Zieba (2020) suggested six steps as a dynamic and ongoing process related to knowledge risks on business sustainability, namely: Identification of possible knowledge risks; Analysis of the potential impact; identified knowledge risks with the most probable and severe impact on sustainability; Identification and selection of ways to either eliminate of identified knowledge risks; Design and implementation of a knowledge risk management plan; finally, concurrently watching out for new risks and preventive actions.

RM is the identification, evaluation, and prioritization of actions taken to master risks (Stoneburner et al., 2007 followed by coordinated and economical application of resources to minimize, monitor, and control the probability or impact of unfortunate events (Douglas, 2009). Generally, four basic phases can be identified from risk management processes. These are for example (Lichtenstein, 1996): Asset and risk identification; Risk analysis; Risk-reducing measures and Risk monitoring.

In the other hand, RM is perceived as a series of stages that assist a software team to identify and manage uncertainty (Bandyopadhyay et al., 1999).

Considering risk as somewhat more than a hazard is extremely relevant to risk management in KM (Jennex & Zyngier, 2007). Ilvonen et al. (2015) introduced a model to manage knowledge security risks in organizations by knowledge sharing to sense making process that should be carried out by managers.

Even though KM risks can direct to negative results, they can also represent considerable prospects for savings or business development (Jennex, 2014).

Effective RM process model cannot be achieved without the assistant of a well-established KM process model. Therefore a well-defined and design integrated KM and RM framework is essential to improve decision-making in IT projects (Rodriguez-Montes & Edwards, 2008). In fact, RM might be subjected to ineffectiveness and inefficiencies without KM as a communication tool risks among the project team members.(Schwalbe, 2007). Moreover, there are numerous motivating reasons for a KM driven approach to RM for any company.

Relationship Between Knowledge-Based Risk and Risk Analysis

In fact, RM is a distinct discipline, which integrates knowledge from a variety of other business fields. It is a discipline in which a variety of methodologies are brought to stand on a specific problem. RM is very important and integral part of any business and well recognized by the project management institutions (Del Cano & Cruz, 2002; Alhawri et al, 2017).

Moreover RM has considerable implications for competitiveness and Business, Lima et al. (2020) noted that to overcome these challenges, companies must seek high standards to attend customers' demands and to be well positioned in the market. To do that, every company has to hold a solid knowledge of its own business and its strengths, weaknesses, threats and opportunities.

Also, Lamine et al. (2020) noted that the risk manager will use the risk factors knowledge in the context of processes to better conduct risk analysis and handling identify the analysis step is based on the knowledge of risk analysis and risk assessment to leader the plan of a new target process based on the results of the process analysis to determine risk levels, or propose criteria for classification of risks in a risk map.

Cornford (1998) noted that risk analysis of the consequences of the possible risks by scoring their impact on the necessities should they occur. The result is a requirement-driven risk list where failures are listed based on their impact on weighted requirements. Comparable projects risk data may facilitate to the project manager during the estimates of existence likelihood and impact to analyze how this risk has behaved in comparable projects of the organization, verifying if it has become a problem, its consequences and impact it has caused. In the risk analysis phase, the detected risks are separately analyzed to understand what type of risks and how considerable effects they may cause. Ilvonen et al. (2015) provided a framework for the organization with situational awareness of the risk environment the organization is facing.

(Farias et al., 2003). Hock-Doepgen et al. (2020) hypothesize that the extent to which internal KM capabilities which includes the (KM structure, culture, Technology) and external KM capabilities which includes the (KM acquisition process, KM conversion process, KM application process) lead to business model innovation and how these effects are moderated by its risk-taking tolerance to enables the organization to identify new business model opportunities and potential threats.

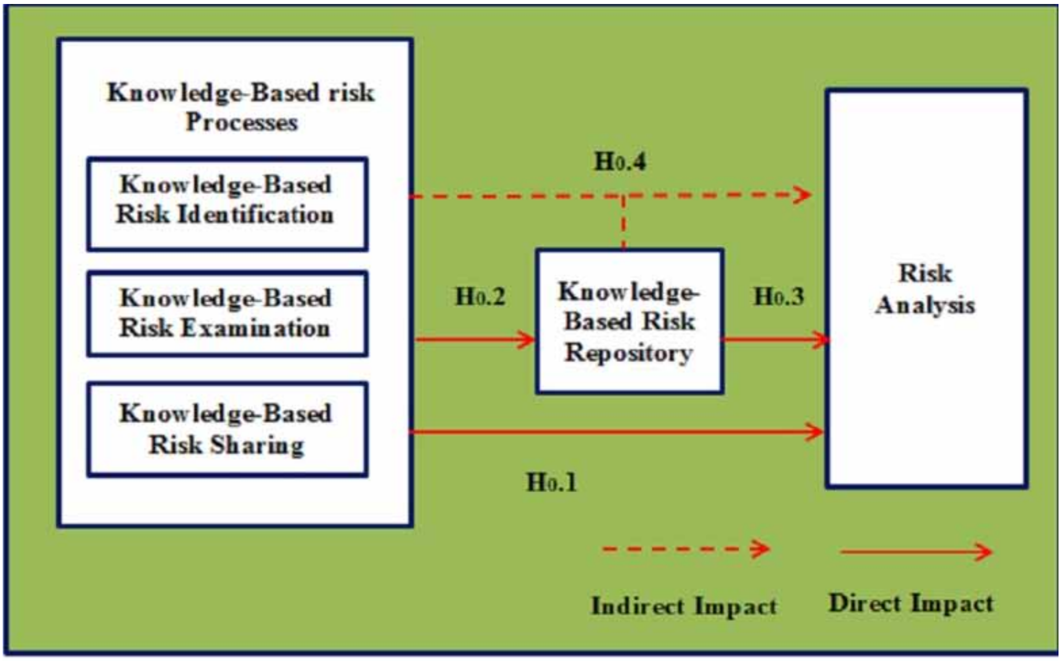
Additionally, Dey et al. (2007) propose risk management as a framework designed from a developer's perspective, which includes studying functional requirements, as an integrated way, therefore, functional people is needed for its success by a deep requirement analysis of risk. And the output of the Risk Analysis process is a detailed description of every confirmed risk, severity, impact, priority, probability and impact estimates. This phase provides the means to establish the needed security controls in order to reduce the impact of the risk to an acceptable level by the organization (Alhawari et al., 2008).

Padyab et al (2014) consider that the development an information asset profile with genre properties in order to gather information about risk analysis and defined by a risk analyst which refer to knowledge about security risks. Additionally

During the Risk Analysis, the data collected is being transformed into decision making information (Alhawari et al., 2008). Also, Risk Analysis will classified the risk based on the probability of occurrence, impact and extend of loss (Higuera & Haimes, 1996). These risks are subsequently recorded on a risk matrix by two dimensional plot of risks characterized by the corresponding probability and influence values for the sake of prioritization (risk analysis) and choosing risk mitigation actions (Qazi & Akhtar, 2020).

One more principal step is the sharing knowledge in the process is to break the planning team into subgroups and to give a portion master segment list to each subgroup. Additionally, KM as a discipline can certainly contribute to RM implementation in condition to data and information

Figure 1. Model of Knowledge-Based risk Process impact on Knowledge-Based risk Repository and Risk Analysis



management, risk-knowledge sharing, analysis consolidation and reporting, (Shaw, 2005). Software development projects are particularly requiring risk analysis, Roy (2004) in which they include an extensive risk factors multiplicity among stakeholders' defined perceptions.

Research Model and Hypotheses Development

The proposed model incorporates five concepts of Knowledge-Based risk Processes impact Risk Analysis in this section. The hypothetical research model is prepared in terms of hypotheses, which can be tested, to check a causal relationship between direct and indirect constructs.

The authors proposed a model to represent the importance relationships between the Knowledge-Based risk Processes to support successfully Risk Analysis based on prior studies. In this research, the Knowledge-Based risk Repository has a mediation role in the relation between Knowledge-Based risk Processes and Risk Analysis as shown in Figure 1.

Constructs Measurements

The research constructs were derived from existing literature on Knowledge-Based risk Processes, Knowledge-Based risk Repository and Risk Analysis and used scales used to measure them. Appropriate research variables have to be evaluated to analyze the research model. Measurement items were either developed or adapted from relevant prior research studies (Rodriguez-Montes & Edwards, 2008; Alhawari et al., 2012; Kautz & Mahnke, 2003; Farias et al., 2003). To suit the context of this study some measurement items were revised. They were adapted to particulars dimension and included in the final survey instrument. Table (1) shows the research constructs measurement and items.

Based on the confirmed risks identified in the previous stage, risk analysis will perform analysis on each risk. The team members will share their experience on confirmed risks based on probability of occurrence, impact and extend of loss. Many organizations generally incorporated Knowledge-Based risk Repository and risk Analysis widely to enhance risk Analysis.

Table 1. Constructs Measurements

Variables	Item	Measure
Knowledge-Based Risk Identification	KBRID1	Risk Identification and Knowledge Capture are iterative processes
	KBRID2	interviewing key personnel facilitate identifying the precise source of identified risk
	KBRID3	common sense as a reliable source of risk identification
	KBRID4	lessons learned reports may be considered as a reliable source for risk identification
Knowledge-Based Risk Examination	KBREX1	The purpose of Knowledge Examination is to carefully examine the list of risks against accuracy
	KBREX2	Knowledge Examination attempts to filter the identified risks before feeding the information for risk analysis.
	KBREX3	Knowledge Examination eliminates risk not related to the project's progress
	KBREX4	The techniques that may be used in Knowledge Examination are team discussion sessions to discover risks.
Knowledge-Based Risk Sharing	KBRSH1	Knowledge Sharing is the process in which explicit or tacit knowledge is communicated to other individuals.
	KBRSH2	Knowledge Sharing is executed by the captured risks from the organization source
	KBRSH3	Knowledge Sharing is viewed as an iterative process for both the risk analysis
	KBRSH4	Knowledge Sharing attempts to assist project team work by accessing the knowledge repository of former projects
Knowledge-Based Risk Repository	KBRR1	All captured risks must be stored in a central knowledge repository, and made accessible to involved personnel
	KBRR2	Knowledge discovery can facilitate and improve risk repository quality
	KBRR3	Knowledge capture can facilitate and improve risk repository quality
	KBRR4	Combining knowledge discovery and capture will enhance the risk repository quality
Risk Analysis	RISKANA1	Risk analysis relies on having team working together, to share the risks associated with the IT project.
	RISKANA2	Data mining software is an analytical tool for analyzing risk
	RISKANA3	Risk analysis relies on communicating to share the risks associated with the IT project.
	RISKANA4	Risk analysis examine the consequences of the possible risks by scoring their impact on the necessities should they occur

Ten hypotheses describe all relations in the research model which are as followed: First of all, consider the direct effects of Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, Knowledge-Based risk Sharing) and Risk Analysis in H0.1.

Three sub-hypotheses are presented as follows:

H0.1.1: There is no significant impact of "Knowledge-Based risk Identification" on "Risk Analysis" at ($\alpha < 0.05$).

H0.1.2: There is no significant impact of "Knowledge-Based risk Examination" on "Risk Analysis" at ($\alpha < 0.05$).

H0.1.3: There is no significant impact of "Knowledge-Based risk Sharing" on "Risk Analysis" at ($\alpha < 0.05$).

Then, two sub-hypotheses stated the direct effects of Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, Knowledge-Based risk Sharing) and "Knowledge-Based risk Repository" in H0.2.

H0.2.1: There is no significant impact of "Knowledge-Based risk Identification" on" Knowledge-Based risk Repository" at ($\alpha < 0.05$).
H0.2.2: There is no significant impact of "Knowledge-Based risk Examination" on" Knowledge-Based risk Repository" at ($\alpha < 0.05$).
H0.2.3: There is no significant impact of "Knowledge-Based risk Sharing" on" Knowledge-Based risk Repository" at ($\alpha < 0.05$).

Thirdly, we will examine the relationship between "Knowledge-Based risk Repository" and "Risk Analysis" in H0.3 will be tested.

H0.3.1: There is no significant impact of "Knowledge-Based risk Repository "on" "Risk Analysis" at ($\alpha < 0.05$).

Lastly, the important perspectives for achieving Knowledge-Based risk Processes are the incidental effects between Knowledge-Based risk Processes mediation by "Knowledge-Based risk Repository". The relationships between Knowledge-Based risk Processes impact on "Knowledge-Based risk Repository" and "Risk Analysis" are examined in H0.4. The underlying assumptions are that Knowledge-Based risk Processes will improve "Risk Analysis" by mediation of "Knowledge-Based risk Repository". It is hypothesized (Knowledge-Based risk Identification, Knowledge-Based risk Examination, Knowledge-Based risk Sharing) with succeeding "Risk Analysis" by mediation of "Knowledge-Based risk Repository; therefore, H0.4 is tested based on three sub-hypotheses.

H0.4.1: "Knowledge-Based risk Repository" does not mediate the relation of "Knowledge-Based risk Identification" and "Risk Analysis" at ($\alpha < 0.05$).
H0.4.2: "Knowledge-Based risk Repository" does not mediate the relation of "Knowledge-Based risk Examination" and "Risk Analysis" at ($\alpha < 0.05$).
H0.4.3: "Knowledge-Based risk Repository" does not mediate the relation of "Knowledge-Based risk Sharing" and "Risk Analysis" at ($\alpha < 0.05$).

RESEARCH METHODOLOGY

The Questionnaire

Measurement items were developed and tailored from appropriate previous research studies. A questionnaire was developed for this research study. The draft version of the questionnaire items is extracted from various previous research studies and adapted for this research (Rodriguez-Montes & Edwards, 2008; Alhawari et al., 2012; Kautz & Mahnke, 2003; and Farias, 2003). Some measurement items were rephrased or re-worded to suit the context of this study. The survey instrument consisted of two parts. Part one utilized to collect user information such as gender, age, area of specialization, years of experience in IT projects. The second part was designed to capture information on the main study See appendix (1).

Table 2. Demographic data

Description	Variable	Result	Percentage
Gender	Male	105	77.8
	Female	30	22.2
	Total	**135**	
Age	Less than 25	18	13.3
	25 to 30	37	27.4
	31 to 35	45	33.3
	more than 35	35	25.9
	Total	**135**	
Area of Specialization	Hardware and software	39	28.9
	System analyst	49	36.3
	Risk management	30	22.2
	Other	17	12.6
	Total	**135**	
Experience	Less than 1 years	4	3
	2-7years	37	27.4
	7-13 years	69	51.1
	More than 13 years	25	18.5
	Total	**135**	

Sample Size

The target population was the individuals with experience in IT projects. The sample of the survey was distributed to ten Information Technology (IT) Companies in Jordan. Some questionnaires were distributed manually and others online, generating 135 usable responses

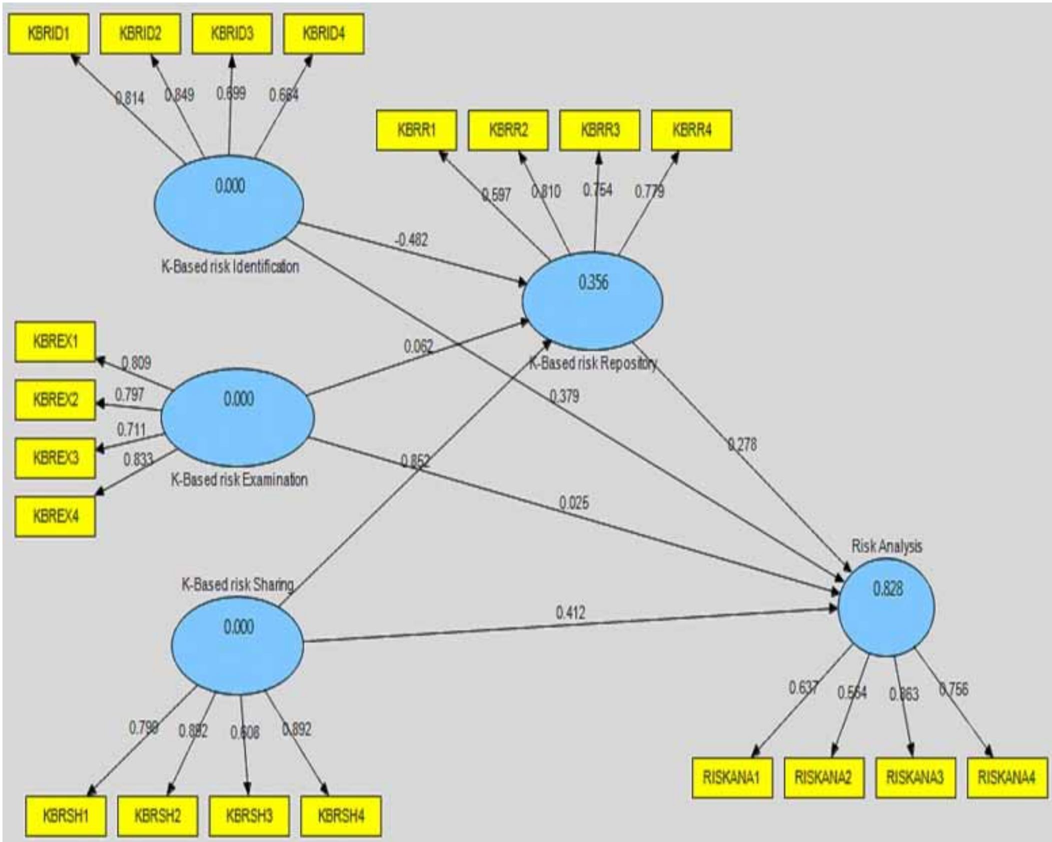
DATA ANALYSIS AND RESULT

Table 2 summarizes the demographic characteristics of the survey respondents. Most respondents were male about (77.8%). The respondents between (31 and 35 years old) are (33.33%), (25 and 30 years old represent (27.4%), (more than 35) years old are (25.9%), and less than 25 years old are (13.3%), System analyst in the area of specialization is the highest with (36.3%), and the average year's professional experience is 51.1% for people who have 7-13 years.

Test Hypotheses

The research model was tested using the partial least square (PLS) used to test the research model by applying the software application SmartPLS 2.0. (Ringle et al., 2005). PLS was selected primarily because it is mainly to demonstrate hidden hypotheses under non-normality and small to medium sample sizes. Based on the use of PLS, the research model follows a two-stage process (Chin et al., 2010). The first stage is investigating the reliability and the convergent and categorize the constructs validity. The second stage is testing the significance of the coefficients path between the model constructs.

Figure 2. Factors analysis result



Path Loadings (Factors Analysis Result)

Based on the recommendations' Falk and Miller (1992) the proposed model considered all variables related since the path loadings for all variables were above (0.55), (as shown in Figure 2.

The Measurement Model

Table 3 presents Cronbach Alpha (CA) and Composite Reliability(CR) and Average Variance Extracted(AVE) scores exceeded the recommended value of 0.70 (Nunnally & Bernstein; and 1994, Larcker, 1981), which indicates that all constructs possessed good reliability. AVE value of 0,500 or above demonstrates sufficient convergent validity as presented in Table 3.

R (Square) Test

R (Square) value for the variable (i.e. Risk Analysis) without mediation is (0.32) reveals an acceptable prediction level. On the other hand, the R (Square) value for the variable (i.e. Risk Analysis) with mediation is (0.85) is also acceptable (Gaur and Gaur, 2006). The increased percentage of Risk Analysis R (Square) value is (53%), (from 32% to 85%) when the Knowledge-Based risk Repository is used as the mediation variable in the relation between Knowledge-Based risk Processes and Risk Analysis.

Additionally, the principal focus variables are overall Risk Analysis shows R (Square) value above (0.85), (i.e., the model shows that risk analysis is 85%) which means is a valid model's predictive (Hair et al., 2006).

Table 3. Reliability scores

Constructs	CA	(AVE)	(CR)
Knowledge-Based risk Identification	0.75	0.50	0.78
Knowledge-Based risk Examination	0.80	0.62	0.86
Knowledge-Based risk Sharing	0.81	0.54	0.87
Knowledge-Based risk Repository	0.73	0.54	0.82
Risk Analysis	0.69	0.51	0.80

Testing Hypotheses

The researchers used the systematic analysis of the proposed model to present a complete explanation of the results and to test all hypotheses by using smart PLS to find (T value).

First of all, T value for Knowledge-Based risk Processes on Risk Analysis without mediation of Knowledge-Based risk Repository is illustrated in Figure 3.

Based on Figure 3; by using the Smart Partial Least Square (PLS) to test the hypothesis related to Knowledge-Based risk Processes on Risk Analysis without mediation of Knowledge-Based risk Repository. T value is (2.26) is between the Knowledge-Based risk Identification and Risk Analysis,

Figure 3. Bootstrapping (T value) for Knowledge-Based risk Processes on Risk Analysis without mediation of Knowledge-Based Repository

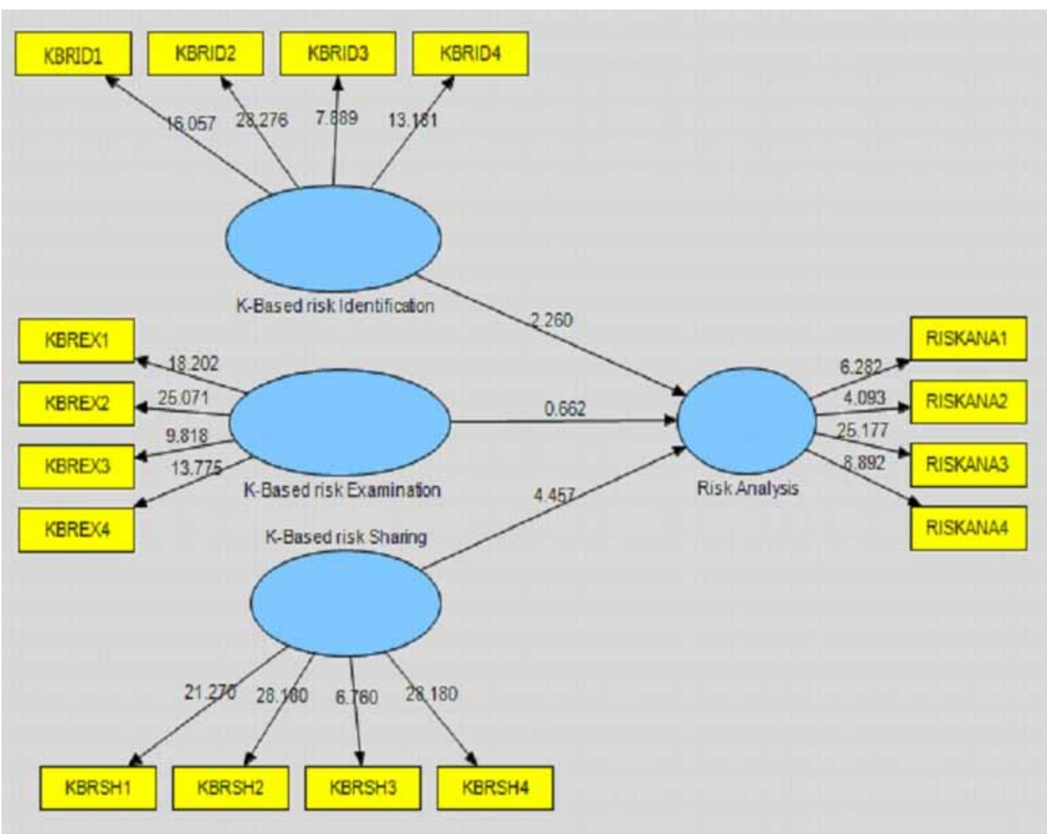
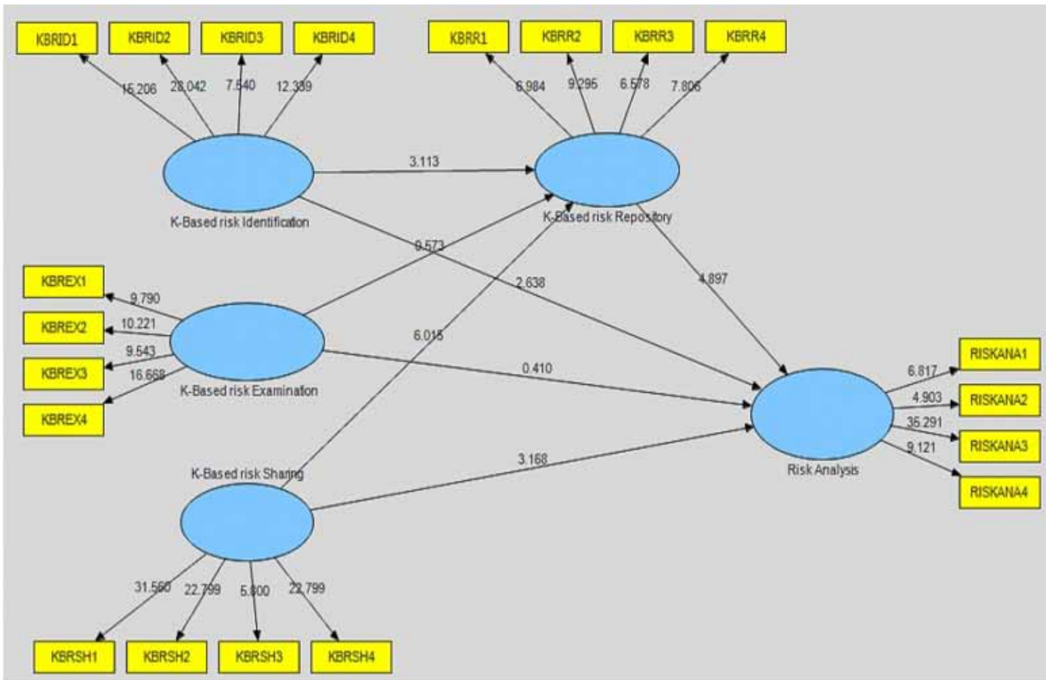


Figure 4. Bootstrapping (T value) for Knowledge-Based risk Process on Risk Analysis with mediation of Knowledge-Based risk Repository



is significant at level (0.05). Additionally, the value of (Beta) is (0.37), specifies the alteration of Knowledge-Based risk Identification will cause in an alteration of (0.37) in Risk Analysis. These results presented strongly do not support the hypothesis of H0.1.1.

T value is (0.66) is not significant at level (0.05) between the Knowledge-Based risk Examination and Risk Analysis. Additionally, the value of (Beta) is (0.02), indicates the alteration in Knowledge-Based risk Examination and cause alteration of (0.02) in Risk Analysis. These results showed strongly support the hypothesis: H0.1.2.

Finally, T value is (4.45), is between the Knowledge-Based risk Sharing and Risk Analysis, and is also significant at level (0.05). In addition, the value of (Beta) is (0.41), identifies that Knowledge-Based risk Sharing will cause in correction of (0.41) in Risk Analysis. These results do not support the hypothesis: H0.1.3.

Next: T value for research model is illustrated in Figure 4.

Based on Figure 4, Smart Partial Least Square (PLS) is used to test all hypothesis related to Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, Knowledge-Based risk Sharing) and Knowledge-Based risk Repository.

T value is (3.1), between the Knowledge-Based risk Identification and Knowledge-Based risk Repository. It is significant at a level (0.05). Additionally, the value of (Beta) is (0.48), change in Knowledge-Based risk Repository which indicates the rejection of the hypothesis:

H0.2.1: There is no significant impact of "Knowledge-Based risk Identification "on" Knowledge-Based risk Repository" at (α£ 0.05). T value is (0.57) is relating the Knowledge-Based risk Examination and Knowledge-Based risk Repository; it is not significant at a level (0.05). Additionally, the value of (Beta) is (- 0.06), which specifies the alteration of one amount in

Table 4. Test results for Knowledge-Based risk Identification and Risk Analysis mediating by Knowledge-Based risk Repository

Relation	Direct Effect	Direct Effect	Indirect Effect	Total Effect	Total Effect
	T Value	Beta	Beta	T Value	Beta
Knowledge-Based risk Identification on Knowledge-Based risk Repository	3.1	0.48		3.1	0.48
Knowledge-Based risk Repository on Risk Analysis	4.8	0.27		4.8	0.27
Knowledge-Based risk Identification on Risk Analysis mediating by Knowledge-Based risk Repository			0.129		
Knowledge-Based risk Identification on Risk Analysis	2.26	0.37		0.82	0.49

Knowledge-Based risk Examination will cause in an alteration of (- 0.06) amount in Knowledge-Based risk Repository. These results are accepted in the hypothesis H0.2.2.

To conclude, T value between the Knowledge-Based risk Sharing and Knowledge-Based risk Repository is (6.0), at significant level (0.05). (Beta) is (0.85), identifies the adaptation in Knowledge-Based risk sharing in Knowledge-Based risk Repository. The hypothesis H0.2.3 is rejected.

Besides to figure 4, the researchers use the (T value) test in the Smart Partial Least Square (PLS) to study the hypothesis related to Knowledge-Based risk Repository and Risk Analysis.

The T value of is (4.8) between the Knowledge-Based risk Repository and Risk Analysis, was significant at the level (0.05). Additionally, the value of (Beta) is (0.27), shows the alteration in Risk Analysis. It does not support the hypothesis H0.3.

To sum up T value test confirm that the Knowledge-Based risk Repository mediating the relationship between Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, Knowledge-Based risk Sharing) on Risk Analysis. See table 9, 10 and 11 respectively.

Referring to Table 9, T value is (3.1), was significant at a level (0.05), however T value is (4.8) between Knowledge-Based risk Repository and Risk Analysis, is not significant at a level (0.05), and the value of (Beta) for (Indirect Effect) is (0.129), specifies the alteration of Knowledge-Based risk Identification and Knowledge-Based risk Repository in Risk Analysis. Then the hypothesis H0.4.1is rejected at level ($\alpha < 0.05$).

T value is (0.57), is between the Knowledge-Based risk Examination and Knowledge-Based risk Repository, is significant at a level (0.05), on the other hand T value is (4.8) between Knowledge-Based risk Repository and Risk Analysis, is not significant at a level (0.05). (Beta) value for (Indirect Effect) is (-0.01), reflects the alteration of in Knowledge-Based risk Examination and in Risk Analysis as shown in Table 5. The hypothesis H0.4.2 is accepted.

Finally, referring to table 6, T value is (6.0), which is between the Knowledge-Based risk Sharing and Knowledge-Based risk Repository which it is significant at a level (0.05). On the other hand, the T value is (4.8) between Knowledge-Based risk Repository and Risk Analysis is not significant at a level (0.05) and (Beta) value for (Indirect Effect) is (0.59), shows the alteration in Knowledge-Based risk Sharing and Knowledge-Based risk Repository then the hypothesis H0.4.3 is rejected.

Model Implementation

To realize the projected model, the researchers will try to clarify how the model can be applied and show the usefulness of the projected model.

Table 5. Test results for Knowledge-Based risk Examination and Risk Analysis mediating by Knowledge-Based risk Repository

Relation	Direct Effect	Direct Effect	Indirect Effect	Total Effect	Total Effect
	T Value	Beta	Beta	T Value	Beta
Knowledge-Based risk Examination on Knowledge-Based risk Repository	0.57	- 0.06		0.57	- 0.06
Knowledge-Based risk Repository on Risk Analysis	4.8	0.27		4.8	0.27
Knowledge-Based risk Examination on Risk Analysis mediating by Knowledge-Based risk Repository			-0.01		
Knowledge-Based risk Examination on Risk Analysis	0.66	0.02		0.82	0.01

Once the project was chosen, the project team will attempt to analyze the applicable risks for the project during risk analysis phase. The project team relies on collecting information on possible risks from different sources such as: brainstorming, experience, interviews and self-assessment, SWOT analysis, and/or scenario analysis. Another source is lesson learned, and/or a database of previous projects. Many companies rely on storing completed projects in a central database. This database is searchable using specific keywords, which helps project team to identify risk(s) to the new project.

Database is vital to the current and future project's success. Therefore, the database should combine the knowledge from previous projects. Feeding the database should not be limited to one source. On the contrary, the database can be more affluent by utilizing multiple inputs such as risk identification, and risk sharing. Therefore, the proposed model permits to determine the risks captured. It is important to ensure that during, and after each project, the risks discovered or captured will be stored in the main repository for future retrieval. This helps to evaluate any similarity to the new project preserving time and money.

Findings Implications

This research paper originates significant importance of an effective Knowledge-Based risk Process, and Knowledge-Based risk Repository impact on the Risk Analysis. Then this paper comes to cover this gap in the literature through examining the impact of the Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, and Knowledge-Based

Table 6. Test results for Knowledge-Based risk Sharing and Risk Analysis mediating by Knowledge-Based risk Repository

Relation	Direct Effect	Direct Effect	Indirect Effect	Total Effect	Total Effect
	T Value	Beta	Beta	T Value	Beta
Knowledge-Based risk Sharing on Knowledge-Based risk Repository	6.0	0.85		6.0	0.85
Knowledge-Based risk Repository on Risk Analysis	4.8	0.27		4.8	0.27
Knowledge-Based risk Sharing on Risk Analysis mediating by Knowledge-Based risk Repository			0.59		
Knowledge-Based risk Sharing on Risk Analysis	4.45	0.41		0.82	1.0

risk Sharing) on the Risk Analysis mediating by (Knowledge-Based risk repository) in the IT sector in Jordan.

Because there are several processes to risk Analysis, it is needed to identify certain characteristics for each of them, and uses the appropriate risk Analysis. We will obtain similar results if we do not consider the knowledge even with more processes in risk Analysis with the same major principles. This indicates that the management will have a clear vision into the overall process of risk Analysis, and will know how to predict shortcomings and manage risk Analysis in a more excellence approach within the project based on the knowledge process.

The other interesting aspect from a theoretical perspective is the variety of risk Analysis factors. Some of the risk Analysis factors identified do not consider the knowledge process role, which is often observed in risk Analysis measures such as: (Knowledge-Based risk Identification, Knowledge-Based risk Examination, and Knowledge-Based risk Sharing). In addition, the risk Analysis factors did not include any elements linked to the content of the knowledge (Knowledge-Based risk Repository). This causes the comparability issue of different knowledge risk management, which requires the contributions of practitioners, since, knowledge is growing to be a strategic asset of risk Analysis in IT projects.

The Knowledge-Based risk factors mediated by Knowledge-Based risk repository will permit to managers to consider the possible threats to their analysis initiatives. Additionally, the organization is allowed to estimate the consequences of risks.

The research attempted to find the direct, and indirect effect between the two domains: Knowledge-Based risk Processes (Knowledge-Based risk Identification, Knowledge-Based risk Examination, and Knowledge-Based risk Sharing) and how they can be related with the mediation factor (Knowledge-Based risk repository) to develop risk Analysis in IT projects. Risk management in IT projects one-step further, and paving the path for future studies.

One practical view point of Project risk management is that all undesirable consequences belong to knowledge itself, which is close to the Project risk management principal. In the project risk Analysis, elements considered are time, cost, scope, quality and other functional. Therefore, these risks challenge directly our ability to represent Identification, Examination, Sharing and repository of knowledge to convey risk Analysis with IT project. Consequently, the estimation to quantify a conceivable schedule slippage if certain risk Analysis emerges into issues. Furthermore, Knowledge-Based risk Process currently gets more considerations because of it will generally support IT projects project Managers to take suitable decisions by using the knowledge in risk analysis, which includes the document that contains the results of various risk management processes, and that is often displayed as a table.

CONCLUSION

Risk significance in the business environment is becoming more and more competitive and unpredictable. This need has raised the incorporation of risk in KM. This paper attempted to identify and assess the risk Analysis through Knowledge-Based risk Processes and Knowledge-Based risk Repository. This paper pointed toward to improve performance and robustness of business process management by enabling a strong collaboration between Knowledge and risk process. Investigations and literature analysis conducted described and revealed a more valid process to identify how organization deals with risk. It has been concluded that Knowledge-Based risk Process (Identification and Sharing) and Knowledge-Based risk repository would give the broadest analysis to risk analysis.

This addition to the framework contributes to the current research and practice. Previous research that studied risk in KM did not specify such an approach about Knowledge-Based risk Process and Knowledge-Based risk repository as an integrated model to improve risk analysis that is appropriate to in any corporations.

Therefore, the paper provides coherent model key factors of the Knowledge-Based risk Processes and Knowledge-Based risk Repository analysis and the implications for applying Risk Analysis. Future research will apply the context first in organizations that have before carried out risk analysis through Knowledge-Based risk Processes and Knowledge-Based risk Repository to other different environment and the research model should be extended to other factors.

REFERENCES

Alavi, M., & Leidner, D. E. (2001). Review: knowledge management andknowledge management systems: conceptual foundations and research issues. *Management Information Systems Quarterly*, *25*(1), 107–136. doi:10.2307/3250961

Alhawari, S., Al-Jarrah, M., & Hadi, W. M. (2017). Implementing Risk Management processes into a Cloud Computing environment. *International Journal of Web Portals*, *9*(1), 1–12. doi:10.4018/IJWP.2017010101

Alhawari, S., Karadsheh, L., & Talet, A. (2012). Knowledge-Based Risk Management Framework for Information Technology Project. *International Journal of Information Management*, *32*(1), 50–65. doi:10.1016/j.ijinfomgt.2011.07.002

Anderson, E. W., & Mittal, V. (2000). Strengthening the satisfaction-profit chain. *Journal of Service Research*, *3*(2), 107–120. doi:10.1177/109467050032001

Au, C. H., & Fung, W. S. L. (2019). Integrating Knowledge Management into Information Security: From Audit to Practice. *International Journal of Knowledge Management*, *15*(1), 37–52. doi:10.4018/IJKM.2019010103

Aven, T., & Kristensen, V. (2019). How the distinction between general knowledge and specific knowledge can improve the foundation and practice of risk assessment and risk-informed decision-making. *Reliability Engineering and System Safety, 19*, 1-9. Advance online publication. doi:10.1016/j.ress.2019.106553

Bandyopadhyay, K., Myktyn, P., & Myktyn, K. (1999). A framework for integrated risk management in information technology. *Management Decision*, *37*(5), 437–444. doi:10.1108/00251749910274216

Chin, W. (2010). How to write up and report PLS analyses. In *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655–690). Springer. doi:10.1007/978-3-540-32827-8_29

Cornford, S. (1998). *Managing risk as a resource using the defect detection and prevention process.* Paper presented at the International Conference on Probabilistic Safety Assessment and Management, New York.

Del Cano, D., & Cruz, P. (2002). Integrated Methodology for Project Risk Management. *Journal of Construction Engineering and Management*, *128*(6), 473–485. doi:10.1061/(ASCE)0733-9364(2002)128:6(473)

Dey, P., Kinch, J., & Ogunlana, S. (2007). Managing Risks in Software Development Projects: A Case Study. *Journal of Industrial Management & Data Systems*, *107*(2), 284–303. doi:10.1108/02635570710723859

Dickinson, G. (2001). Enterprise Risk Management: Its Origins and Conceptual Foundation. *The Geneva Papers on Risk and Insurance*, *26*(3), 360–366. doi:10.1111/1468-0440.00121

Durst, S. (2019). How far have we come with the study of knowledge risks? *VINE Journal of Information and Knowledge Management Systems*, *49*(1), 21–34. doi:10.1108/VJIKMS-10-2018-0087

Durst, S., Hinteregger, C., & Zieba, M. (2019). The linkage between knowledge risk management and organizational performance. *Journal of Business Research*, *105*, 1–10. doi:10.1016/j.jbusres.2019.08.002

Durst, S., & Zieba, M. (2020). Knowledge risks inherent in business sustainability. *Journal of Cleaner Production*, *251*, 1-10. Advance online publication. doi:10.1016/j.jclepro.2019.119670

Falk, R. F., & Miller, N. B. (1992). *A Primer for Soft Modeling*. The University of Akron Press.

Farias, L., Travassos, G., & Rocha, A. (2003). Managing Organizational Risk Knowledge. *Journal of Universal Computer Science*, 103–110.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equations Models with Unobservable Variables and Measurement Error. *JMR, Journal of Marketing Research*, *18*(1), 39–50. doi:10.1177/002224378101800104

Gaur, A. S., & Gaur, S. S. (2006). *Statistical Methods for Practice and Research: A Guide to Data Analysis using SPSS* (1st ed.). Sage.

Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis* (6th ed.). Pearson Prentice Hall.

Higuera, P., & Haimes, Y. (1996). *Software Risk Management*. Carnegie Mellon University.

Hock-Doepgen, M., Clauss, T., Kraus, S., & Cheng, C.-F. (2020). Knowledge management capabilities and organizational risk-taking for business model innovation in SMEs. *Journal of Business Research*. Advance online publication. doi:10.1016/j.jbusres.2019.12.001

Holsapple, C. W., & Joshi, K. (2004). A formal knowledge management ontology: Conduct, activities, resources and influences. *Journal of the American Society for Information Science and Technology*, *55*(7), 593–612. doi:10.1002/asi.20007

Hubbard, D. (2009). *The Failure of Risk Management: Why It's Broken and How to Fix It*. John Wiley & Sons.

Ilvonen, I., Jussila, J. J., & Kärkkäinen, H. (2015). Towards a Business-Driven Process Model for Knowledge Security Risk Management: Making Sense of Knowledge Risks. *International Journal of Knowledge Management*, *11*(4), 1–18. doi:10.4018/IJKM.2015100101

Jennex, M. E. (2014). A Proposed Method for Assessing Knowledge Loss Risk with Departing Personnel. *VINE Journal of Information and Knowledge Management Systems*, *44*(2), 185–209.

Jennex, M. E., & Durcikova, A. (2014). Integrating IS Security with Knowledge Management: Are We Doing Enough? *International Journal of Knowledge Management*, *10*(2), 1–12. doi:10.4018/ijkm.2014040101

Jennex, M. E., & Durcikova, A. (2020). Knowledge Systems and Risk Management: Towards a Risk and Threat Assessment Framework. *Proceedings of the 53rd Hawaii International Conference on System Sciences*.

Jennex, M. E., & Olfman, L. (2005). Assessing Knowledge Management Success. *International Journal of Knowledge Management*, *1*(2), 33–39. doi:10.4018/jkm.2005040104

Karadsheh, L., Alhawari, S., El-Bathy, N., & Hadi, W. (2008). Incorporating knowledge management and risk management as a single process. *Proceedings of International Conference of the Global Business Development Institute (GBDI)*, 207–214.

Kasap, D., & Kaymak, M. (2007). *Risk identification step of the project risk management* Paper presented at the Portland International Center for Management of Engineering and Technology, Portland, OR. doi:10.1109/PICMET.2007.4349543

Kautz, K., & Mahnke, V. (2003). Value Creation Through IT-Supported Knowledge Management? The Utilisation of a Knowledge Management System in a Global Consulting Company. *Informing Science*, *6*, 75–88. doi:10.28945/515

Keen, P.G.W., & Tan, M. (2007). Knowledge fusion: a framework for extending the rigor and relevance of knowledge management. *International Journal of Knowledge Management, 3*(4), 1-17.

Lamine, E., Thabet, F., Thabet, A., Bork, D., Fontanili, F., & Pingaud, H. (2020). BPRIM: An integrated framework for business process management and risk management. *Computers in Industry*, *117*, 1-17. Advance online publication. doi:10.1016/j.compind.2020.103199

Lima, P. F., Crema, M., & Verbano, C. (2020). Risk management in SMEs: A systematic literature review and future directions. *European Management Journal*, *38*(1), 78–94. doi:10.1016/j.emj.2019.06.005

Mees, W. (2007). Risk Management in Coalition Networks. *Third International Symposium on Information Assurance and Security*, 329-336. doi:10.1109/IAS.2007.76

Neef, D. (2005). Managing corporate risk through better knowledge management. *Journal of the Learning Organization*, *12*(2), 112–124. doi:10.1108/09696470510583502

Nehari Talet, A., Karadsheh, L., Alhawari, S., & Hunaiti, H. (2018). Relationship between Knowledge-Based risk and Risk Identification. *South African Journal of Business Management*, *49*(1), 1–12. doi:10.4102/sajbm.v49i1.234

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory*. McGraw- Hill.

Padyab, A. M., Päivärinta, T., & Harnesk, D. (2014). Genre-Based Approach to Assessing Information and Knowledge Security Risks. *International Journal of Knowledge Management*, *10*(2), 13–27. doi:10.4018/ijkm.2014040102

Qazi, A., & Akhtar, B. (2020). Risk matrix driven supply chain risk management: Adapting risk matrix based tools to modelling interdependent risks and risk appetite. *Computers & Industrial Engineering*. *139*, 1-17. Advance online publication. doi:10.1016/j.cie.2018.08.002

Ringle, C. M., Wende, S., & Will, A. (2005). *Smart PLS 2.0 (beta).* SmartPLS. Available at: www.smartpls.de

Rodriguez, E., & Edwards, J. (2008). *Before and after modeling: Risk knowledge management is required*. Paper presented at the 6th Annual premier global event on ERM, Chicago, IL.

Rodriguez, E., & Edwards, J. (2014). Knowledge Management in Support of Enterprise Risk Management. *International Journal of Knowledge Management*, *10*(2), 43–61. doi:10.4018/ijkm.2014040104

Roy, G. G. (2004). A risk management framework for software engineering practice. *Paper presented at the Software Engineering Conference, 2004. Proceedings. 2004 Australian*. doi:10.1109/ASWEC.2004.1290458

Saundres, M., Lweis, P., & Thornhil, A. (2009). Research Methods for Business Student (6th ed.). Prentice Hall.

Schniederjan, D. J., Curado, C., & Khalajhedayati, M. (2020). Supply chain digitisation trends: An integration of knowledge management. *International Journal of Production Economics*, *220*, 1-11. Advance online publication. doi:10.1016/j.ijpe.2019.07.012

Schwalbe, K. (2007). *Information technology project management* (5th ed.). Course Technology, Thomson Learning.

Shaw, J. (2005). Managing All your Enterprise's Risk. *Risk Management*, *52*, 85–94.

Singh, R., Singh, A., & Mathiassen, L. (2018). Collaboration risk management in IT-enabled asymmetric partnerships: Evidence from telestroke networks. *Information and Organization*, *28*(4), 170–191. doi:10.1016/j.infoandorg.2018.10.001

Stoneburner, G., Goguen, A., & Feringa, A. (2007). *NIST Special Publication 800-30, Risk Management Guide for Information Technology Systems*. United States National Institute of Standards and Technology.

Suroso, J. S., & Fakhrozi, M. A. (2018). Assessment Of Information System Risk Management with Octave Allegro At Education Institution. *Procedia Computer Science*, *135*, 202–213. doi:10.1016/j.procs.2018.08.167

Teklemariam, M. A., & Mnkandla, E. (2017). Software project risk management practice in Ethiopia. *The Electronic Journal on Information Systems in Developing Countries*, *79*(1), 1–14. doi:10.1002/j.1681-4835.2017.tb00583.x

Thalmann, S., & Ilvonen, I. (2020). Why should we investigate knowledge risks incidents?Lessons from four cases. *Proceedings of the 53rd Hawaii International Conference on System Sciences*, 4940- 4949.

Zhang, Y., Liu, S., Tan, J., Jiang, G., & Zhu, Q. (2018). Effects of risks on the performance of business process outsourcing projects: The moderating roles of knowledge management capabilities. *International Journal of Project Management*, *36*(4), 627–639. doi:10.1016/j.ijproman.2018.02.002

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