Journal of Business Strategies, Vol.13, No.2, 2019, pp 01–20 *DOI:10.29270/JBS.13.2(19).01*

NEXUS BETWEEN RISK MANAGEMENT AND PROJECT SUCCESS: AN EMPIRICAL EVIDENCE FROM ENGINEERING SECTOR OF PAKISTAN

Asad Ashfaq Lodhi, Dr. Rafique Ahmed Khan, and Dr. Sayma Zia

ABSTRACT

This paper aims at identifying various risk management techniques being adopted by the engineering consultancy sector of Pakistan and to examine their impact on project success. Five risk management(RM) practices including, risk identification, risk assessment, risk controlling, risk reporting and risk monitoring were chosen. Adopting the deductive approach, hypotheses were developed and a questionnaire survey was undertaken to record responses of the employees working in the engineering consultancy sector. The primary data were collected from 110 engineers and managerial level employees of the selected firms which were further analyzed through appropriate statistical tools with the help of software 'Statistical Package for Social Sciences (SPSS), version 23. As a result of the analysis, it was found that the impact of risk controlling, risk monitoring and risk reporting was significantly positive on project success. However, the impact of risk identification and risk assessment was not significant. This paper is likely to help engineering consultancy firms in understanding the impact of existing RM factors on project success and enable them to take remedial measures for improving the overall risk management system. Other organizations and academia may also benefit from the findings of this study.

Keywords: *Risk Management, Project Success, Risk identification, Risk assessment Risk controlling, Risk reporting &Risk monitoring*

INTRODUCTION

This paper focuses on various risk management techniques being practised in engineering consultancy sector of Pakistan and examines their impact on successful completion of projects. Risks are undoubtedly very

rapidly if not timely addressed. In the context of business organizations, risk management is an essential part of the managers' job. In today's fast-paced dynamic business environment, risk-taking and risk management have gained focused attention of the managers (Ahan, M., &Zwikael, O., 2011). Effective risk management is essential for the success of every project as it protects much-needed resources. Uncertain market conditions such as varying interest rate revised regulations and volatile socio-economic environment and most importantly rising turnover rate of managers are some of the salient risk factors. If they are not given due consideration at the beginning of a project, it leads to project failure (Coskun, 2012). A study by Park, Cha & Hyun, (2016)mentions that only 32% of the projects meet their objectives as far as cost, quality and schedule are concerned; the main cause for this low success rate is the absence of effective risk management framework. Although the issue of risk management has remained the focus of many researchers, there is still an extensive gap in the literature as well as the practical implementation of risk management is concerned. In the case of Pakistani firm, this gap is more prominent since risk management is not given due attention which leads to failure of projects and spoils image of the organization as well. An effective risk management system is therefore needed which allows an organization to recover its investment and profit without obstructing progress. Investors and lenders are more confident and are encouraged to spend an organization that has an effective risk management system in place(Junior & Carvalho, 2013).

Although project risk cannot be avoided, appropriate preparation to deal with risks by putting into practice risk management principles can significantly reduce losses and delays. As such, a proper structure to implement risk management practices can shield the organization from any threat that can hit during the project life cycle (Raz, Shenhar, & Dvir, 2002). Therefore, Risk management plays a crucial role in the effectiveness of an organization by recognizing, evaluating and forecasting the impact of risk; this allows minimizing the risk to get positive outcomes. Although it is evident that risk management is a significant and essential tool in project success, not enough has been done in this regard (Junior et al., 2014). The success of any project is usually estimated in terms of timely completion, low cost and meeting quality standards as per specifications (Mirzaa, M.N., *et al*. 2013). Hence minimizing wastages and re-work during a project cycle lead to timely and economically completion of a project which make the topic worth investigating.

In engineering consultancy sector, managing risk involves a wide area which requires heavy investment. Moreover, the rate of risk in this sector is comparatively higher than other sectors. Risk management in the engineering sector is implemented proactively to comprehend the possible future risks rather than being reactive. Engineering firms that are not properly dealing with risk management techniques are not getting project success because of risks that hit them during the project life cycle. When companies are not implementing appropriate RM practices, their projects get exposed to problems and are likely to get delayed and may also suffer in terms of high cost(Elkhalek, 2011). Che, X., and A. P. Liebenberg. (2017) have argued that although risk management is quite essential for successful completion of any project, it does require a heavy investment which may pose a real challenge to the project manager.

LITERATURE REVIEW

Significance of Project Success

Every project starts with some worthy idea coupled with a strong commitment to achieving intended outcomes through heavy investment and consistent efforts. In general, cost, schedule, quality, project specification and customer satisfaction are considered primary factors that may impact the overall success of the project (Mirzaa, Pourzolfaghar, & Shahnazari, 2013). Project success can be segregated based on short term and long term criteria. Short term criteria are based on delivering the project on time, within the desired cost and as per quality standards; these are estimated before the project ends. Long term criteria for project success are based on providing both noticeable and intangible benefits; these are estimated after the completion of the project (Sauter, 2009). Success can be estimated by finding out whether the project is completed as per specifications. Cost is also a successful element of the rare project success criteria which is very vital in overall project success (Mirzaa, M.N., *et al*. 2013). However, projects have often enough been delivered within time, cost, and quality still considered as failed projects (Ika, L. 2009). According to Ai, J., V. Bajtelsmit, and T. Wang. (2018), effective risk management leads to the completion of the project according to customer requirement and employee satisfaction.

Success is required in every part of life including investment areas and projects. Considering the high rate of projects that fail to meet project goals or desired outcomes, the factors that facilitate in achieving project

success are of great significance. These factors relate to positive outcomes by taking proactive measures to handle the effects of events that may cause project failure (Elkhalek, 2011). The elements that influence project success have to be recognized in the early phase of project however projects environment is dynamic therefore prompting factors to vary with their level of impact concerning time and situation. To cope up with these elements, stable and regular monitoring of these elements is required in an organization and wherever essential the project manager should empower and encourage concerned persons to raise the likelihood of achieving success criteria (Beleiu, *Crisan*, &Nistor 2015). Another important factor to ensure project success is maintaining a certain level of raw material and inventory for ensuring smooth supply of required items required for project completion. This is essential when a vendor is located at longer distance and delays are probable, reliability of timely delivery is low (Lukinskiy and Panova, 2017).

Risk Management

Risk is referred to as the possibility of something happening and the extent of occurrence of loss as a result of it, and loss may be felt directly or indirectly. Risk Management is the execution of a proactive approach to planning, lead, organize, and handle the wide variety of risks that are rushed into the dynamics of an organization. According to Ruchi Agarwal, Lev Virine (2019), a firm handling project is supposed to ensure risk management not only at the project (miro) level but at the corporate (macro) level as well. However, dynamics and complexity at either of the two levels may vary drastically. While specific operational risks are to be given priority at the micro-level project, risk must be aggregated to provide a holistic view at the macro level. As per findings of the research by Carvalho et al., (2013), management of risk comprises of the method to manage the probable risks through identification and analysis. The method leads to a decline in harmful effects and thereby creates an opportunity for the project team to add more value. Effective risk management approaches permit companies to recognize the project's strengths, weaknesses, opportunities and threats. Risk management encompasses clear consideration of risks in all decision-making methods with risk assessment fundamental to this by providing evidence-based data, this helps accomplish project goals. Risk assessment is intended to make decisions credible utilizing all available information (Fletcher, 2014). Although risk management is one of the main needs in project

management, it is identified that little has been done in this respect (Junior & Carvalho, 2013). Every project is different and includes some degree of improbability. Still, many organizations assume that all their projects will succeed, and usually fail to consider and examine likely project risks(Raz et al., 2002). To escalate the chances of proposed project success, it is necessary for the organization to have ample knowledge of potential risks, to analytically and quantitatively evaluate these risks, expect likely causes and effects, and then choose suitable methods of handling them (Kishk&Ukaga 2008). While business risks exist in large number, their consequences can be damaging; there are methods to protect against them, to avoid them and to reduce their damage when they hit. For effective RM, hiring a risk management consultant may be a viable cautious step (Davis, 2015).

Risk management plays a significant role in the accomplishment of project objectives, leading to overall project success (Khan & Ahmed, 2001). Risk management permits a balance to hit between taking risks and reducing them. Effective risk management can complement value to any organization. Specifically, companies working in the investment industry depend heavily on risk management as the base that permits them to withstand market crashes (Lamont, 2015). Following five components are considered essential for risk management framework:

- Risk identification
- Risk assessment
- Risk controlling
- Risk reporting
- Risk monitoring

Risk Identification

Risk identification approach determines risks which can avert the organization from attaining its objectives. It comprises of documenting and conveying the concern. Risk identification is the initial and most crucial step in the risk management process. The primary aim of risk identification is timely and continuous recognition of events that may occur during the project life cycle and cause undesired impacts on the team's capability to attain quality objectives (Mitre, 2007). Identification of risk is the initial phase of risk management as it creates the foundation for the next phases that are evaluation and risk control. Precise risk identification guarantees effectiveness in risk management. In case risk

management fails to identify all probable risks that challenge the success of the organization, then unidentified risks will become difficult to control. The lack of ability to identify risks that may give positive outcome is as inappropriate as unidentified risks that cause loss (Tchankova, 2002).

Risk identification is a correlative process. The team that looks after the project has to involve it in the risk identification process to create and retain the sense of ownership and responsibility for risk and its corrective actions. The risk identification procedure generally leads to qualitative risk analysis method. Sometimes only identification of risks recommends action to counter it and these should be documented for further evaluation and application in later stages of risk management (Ritter, 2013). Risk identification is also elaborated as a process which determines what might happen and when will it happen (Garrido, Cassia, Ruotolol, Miguel, Ribeiro & Naked, 2011). Arranging a risk identification session timely in a project, as part of the front end growth process will advance the project teams likelihoods of having a successful project (Schroeder, Alkemade & Lawrence, 2011).

Risk Assessment

The responsibility to assess and evaluate a wide area of risk-related information is usually the responsibility of many individuals and various functions throughout the organization. Risk assessment performs risk evaluation as part of a process and determines the level of risk and its implications. The risk assessment strategy is discussed in several national and international standards including ISO 31000 series. It states that risk assessment is a process which determines the risk, evaluates it and suggests suitable action. The initial step in risk assessment is usually to recognize the possible impacts, covering instant consequences to long term impacts. Although risks of low likelihood with a high consequence are quantitatively identical to the risks of high likelihood with the low consequence, latter risks are easier to handle and therefore our self-assurance in these risk forecast is mostly higher as we involve in these events (Gibbs &Browman, 2015).

Risk assessment is an element of decision analysis which reflects and analyzes uncertainties and risks. Outcomes of these analyses provide a recommendation to decision-makers (risk managers), who also reflect other information (Peterman, 2004). Risk assessment is the method of recognizing and ranking risks considering project objectives. The

assessment is vital as without an assessment, worthy policies and strategies cannot be designed which are the organization's critical assets. Risk assessment needs individuals either working class or management to take responsibility for the risk-management method (Gregg, 2005).

Risk Controlling

The modern approach to risk controlling is vital to handle and manage risks. The intuition behind is to transfer the allocation from risky assets to the financial market during unstable market eras and vice versa. This creates a statement of a negative correlation between the return and instability of equity markets, i.e. very unstable periods are more often related to negative returns (Fuss, Grabellus, Mager& 2012). Risk controlling also encompasses planning, mitigation, and monitoring of risk. Risk management plans must be created for each highlighted risk so that proactive action can be taken to handle it. Employing risk mitigation and risk controlling techniques, strategies are developed to minimize the chances or severity of a risk. Proper risk controlling leads to a situation where risks are either evaded or suitably resolved (Gibbs et al., 2015).

Risk avoidance is used when there is a severe possibility of loss in case a risk event occurs; the project team chooses to avoid the risk by taking alternate path or team chooses not to create a particular product or provide some specific feature that may cause high risk. In Risk protection, firm purchases insurance to overcome a financial loss that results in case of risk event occurs. Risk controlling and risk mitigation activities are often accompanied by a high cost. Project managers should thoroughly evaluate the possible risks to ensure that cost incurred in controlling risks does not exceed the benefits achieved by the measures taken to manage the risks (Williams, 2014).

Risk Reporting

In the last few years, interest in risk reporting has raised internationally. Increase in corporate crises contributes to the demand for risk reporting to provide investors with timely caution of possible negative events. Normally, risk reports notify about the consequences and opportunities of risks that may hit a firm's future economic position. National and international regulators and standards-setter organizations report on their risk. There is ever-rising need for risk reporting and organizations are now expected to report possible risks likely to develop in their projects as well as those risks surrounding them (Mellet& Mokhtar, 2013).

Risk reporting can be considered a source of information that plays a vital role in decision making. Risk management defines risk reporting in two major ways. First, the risk management system offers relevant data for external reporting. Shortfalls in identification and evaluation phase directly damage the content of risk reporting. Furthermore, dynamic corporate risk handling has to be considered because it alters the concerning distribution. As risk management is a constant process, all stages of corporate risk management are at least indirectly interconnected to risk reporting. Second, risk reporting is utilized as an approach to handle risk (Dobler, 2005). Timely reporting of the possible risks leads to enhanced risk management practices and also reflects the effectiveness of the project managers in risk handling (Marzouk, 2016). The most significant potential advantage is a decrease in the cost of capital that is, if risks are revealed through risk reporting, sponsors of capital may take out a part of the premium that is invested to cover for uncertainty concerning the organization's risk position (Linsley& Shrives, 2006). According to Alexander Bohnert, Nadine Gatzert, Robert E. Hoyt & Philipp Lechner (2018), firms with a highly developed RM tend to be larger and exhibit lower financial leverage as compared to the companies with a less developed risk management system. The study further states that risk reporting is an important segment of risk management, without which project success remains questionable.

Risk Monitoring

Risk monitoring involves integrated and on-site monitoring of source records; these are complementary actions through which certain quality and reliability in information can be achieved. Risk monitoring offers a few practices that play a vital role in meeting quality objectives (Mitchel, 2013). The critical monitoring which is considered key to the success of risk-based monitoring constantly recognizes problems right from the beginning and offers a basis for a prompt response to evolving matters. This type of monitoring is so consistent that participants of the project team apply several checks every day (Rosenberg, 2014).

All possible risks should be periodically reviewed and critically evaluated by the project team to determine whether changing the environment shall be matched with the RM measures. At every periodic evaluation, all new likely risks should be added in the existing list and the ones no more likely may be excluded. This shall help in setting priority to manage risks after every interval and keep the risks up to date. This shall

also help in a reprioritization of risk handling. Indeed, risk monitoring is a continuous, on-going process initiated by the project teams during various stages of life-cycle of a project. Project team participants and stakeholders are always cautious in observing risk indicators (Balakian, 2010).

Theoretical Framework

The theoretical framework has been developed based on identified variables as depicted in figure-1.

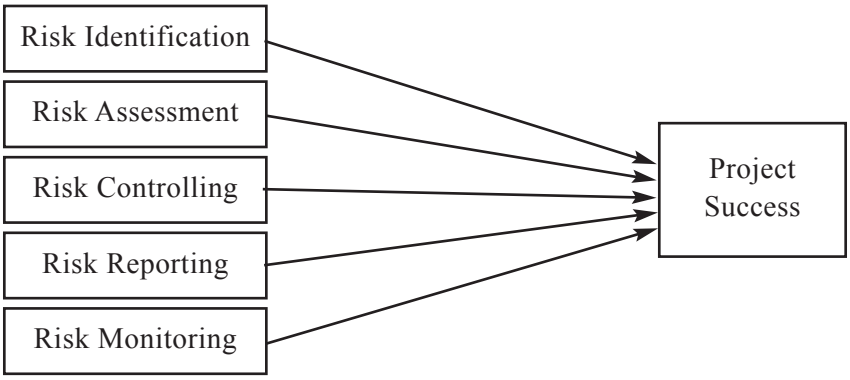

Figure-1: Theoretical Framework

Research Hypotheses

Based on research variables, the following five hypotheses were formulated for later testing through statistical tools:

H_1: Risk identification has a positive impact on project success.
H_2: Risk assessment has a positive impact on project success.
H_3: Risk control has a positive impact on project success.
H_4: Risk reporting has a positive impact on project success.
H_5: Risk monitoring has a positive impact on project success.

METHODOLOGY

The study is explanatory, based on primary quantitative data. Following a deductive approach, hypotheses were formulated based on research variables. The unit of analysis for the study refers to the engineering consultancy firms. The study population included 310 engineers of different disciplines of two engineering firms (EnarPetrotech and Descon). A sample of 110 engineers and managerial level employees of the two firms was approached through a convenience sampling technique for data collection.

Research instrument for the study was a self-developed questionnaire whose validity was checked through pilot testing. For developing a questionnaire, a step by step approach was adopted, keeping in mind the kind of information to be collected and type of questions for seeking such information. Length of the questionnaire was restricted according to the questions and protection of respondents' privacy was ensured. The questionnaire was developed (Likert scale of 1-5; 1 denoting strongly disagree and 5 denoting strongly agree) which was distributed to 20 managers for pilot testing and results were quite encouraging (Saunders, Lewis & Thornhill, 2012). Few minor changes were made in the questionnaire as a result of feedback through pilot testing. Data were treated through statistical toolRegression on SPSS V-23 software.

ANALYSIS

Respondents' Profile

Basic information about the respondents is projected in table 1 to 6.

Table 1. Gender-based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Female	15	13.2	13.4	13.4
	Male	94	86.1	86.6	100.0
	Total	109	99.3	100.0	
Missing		1	.9		
Total		110	100.0		

As given in Table 1, the total number of respondents who participated in the survey was 110, out of which 94 were male employees whereas only 15 were females. Hence, overall a good number of both genders took part in the survey.

Table 2. Organization based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Enar Petrotech	50	45.5	46.7	46.7
	Descon	57	51.8	53.3	100.0
	Total	107	97.3	100.0	
Missing		3	2.7		
Total		110	100.0		

As depicted in table 2, a total number of respondents who took part in the survey was 110 out of which 50 were from EnarPetrotech and 57 were from Descon while 3 respondents didn't mention their working organization.

Table 3. Age-based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	**20- 30**	72	65.5	65.5	65.5
	30- 40	32	29.1	29.1	94.5
	>40	6	5.5	5.5	100.0
	Total	110	100.0	100.0	

As mentioned in table 3, among 110 respondents that participated in the survey belonging to various age groups, 72 respondents fall in the age of 20-30 years whereas 32 belonged to age group 30-40. Moreover, six respondents are having more than 40 years of age. It shows that the responses for the study were gathered form a mature age group of respondents and are supposed to have a healthy contribution.

Table 4. Education-based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	**Undergraduate**	4	3.6	3.7	3.7
	Graduate	64	58.2	58.7	62.4
	Master	38	34.5	34.9	97.2
	PhD.	3	2.7	2.8	100.0
	Total	109	99.1	100.0	
Missing		1	.9		
Total		110	100.0		

Table 4 shows that in among 110 respondents, the maximum of the respondents were graduates and master's degree holders. This level of education in Pakistan is considered to be highly regarded and well-matured level of education. People having this level of education usually easily understand and interpret English as a language therefore the responses received from them are supposed to have more validity.

Table 5. Tenure based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	**1-10**	88	80.0	80.7	80.7
	11-15	17	15.5	15.6	96.3
	16-20	2	1.8	1.8	98.2
	21-25	1	.9	.9	99.1
	26-30	1	.9	.9	100.0
	Total	109	99.1	100.0	
Missing		1	.9		
Total		110	100.0		

As mentioned in table 5, the majority of respondents were having one to fifteen years of work experience with the same organization and were well informed about the practices of risk management used in that organization. The question about tenure is inquired as respondents having practical work experience are in a better position to highlight the actual situation in the engineering firm.

Table 6. Number of projects based statistics

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	**Below 3**	42	38.2	38.8	38.8
	3 -5	37	33.6	34.3	73.1
	5 -10	19	17.3	17.6	90.7
	Above 10	10	9.1	9.3	100.0
	Total	108	98.2	100.0	
Missing		2	1.8		
Total		110	100.0		

Table 6indicates average number of projects respondents are exposed to. Maximum numbers of respondents in engineering firms handle up to five number of project annually.

Test of Reliability

Reliability of scales in this research study is examined using reliability test Cronbach's Alpha. The details for the test of reliability 'Cronbach's Alpha' are mentioned in the tables below:

Table 7. Reliability of Scales

Variable	Cronbach's Alpha	No. of Items
Risk Identification	0.863	4
Risk Assessment	0.839	4
Risk Controlling	0.769	4
Risk Reporting	0.837	4
Risk Monitoring	0.859	3
Project Success	0.905	5

Reliability of constructs was checked using Cronbach's alpha. Values of Cronbach's alpha are depicted in table 7. Generally, the reliability is acceptable when the value of the alpha is 0.7 and above (Sekaran, 2003). In the current case, all the values are above the essential limit which means data is highly reliable.

Regression Analysis

Regression analysis is a process for measuring the effect of independent variables on the dependent variable.

Values of this analysis are displayed in Table 8 (model summary) and table 9 (Coefficients).

Table 8. Model Summary

Regression Analysis				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.912[a]	.832	.824	.31778

a. Predictors: (Constant), RM, RI, RR, RA, RC

The value of R Square in Table 8 is 0.832; it indicates the estimates of the proportion of variance in the project success as accounted for by the five independent variables namely, Risk Identification, Risk Assessment, Risk Controlling, Risk Monitoring and Risk Reporting. We can say that five independent variables explain 83% variation in the project success.

Table 9. Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.196	.165		1.186	.238
RI	.007	.060	.008	.117	.907
RA	.055	.076	.060	.732	.466
RC	.396	.092	.386	4.321	.000
RR	.239	.082	.247	2.903	.005
RM	.253	.066	.283	3.830	.000

a. Dependent Variable: PS

Looking at the beta values and their significance values in table 9, it is evident that the most important factor influencing project success is risk controlling (beta = 0.396, Sig = 0.000) followed by risk monitoring (beta = 0.253, Sig = 0.000) and risk reporting (beta = 0.239, Sig = 0.005).These three factors contribute positively and significantly towards project success in engineering firms of Pakistan. Whereas the other two factors i.e.risk identification (beta = 0.007, Sig = 0.907) and risk assessment (beta = 0.055, Sig = 0.466) are not significant since sig value is > .000.

In the light of the regression results, it is evident that hypothesis 3, 4 and 5 are accepted by the statistical analysis whereas hypothesis 1 and 2 have been rejected.

DISCUSSION

The values of the first two independent variables, i.e. risk

identification, risk assessment indicate that although the impact of these two variables is positive on project success but the same is not significant. Hence, hypothesis 1 & 2 stand rejected. However, remaining three variables i.e. Risk Controlling, Risk Reporting and Risk Monitoring, have a positive significant impact on project success; hence hypotheses 3, 4 & 5 are accepted. Findings of this paper indicate that risk identification and risk assessment are not contributing to project success despite being very salient factors. Therefore it is necessary for organizations to further identify the reasons for this anomaly. As far as remaining three factors are concerned, although their contribution towards project success is quite significant but beta values are not so encouraging and there is a need to seriously look into the reasons for low scores. Organizational culture could be a contributing factor in below-expected results. If organizational culture is such that all likely risks are reported, documented and monitored, there would be a tendency to cause less harm to project goals. Risk monitoring and risk reporting provide a healthy contribution to project success as it is a good source of proactive strategy that needs to be initiated to handle risks. The findings of this paper support similar empirical findings from previous researches of Schroeder and Kishk (2011). Thus the research findings attained are coherent with the existing literature, tested over a wide range of industrial sector and in varying contexts. Findings of the study are important for the engineering consultancy firms since these help in ascertaining the effectiveness of the risk management practices and also indicated areas where further improvements are required. The engineering firms may continuously monitor the effectiveness of existing risk management practices for ensuring that desired results in terms of time, cost and quality standards are reaped.

CONCLUSION

The main focus of this paper was to identify various risk management techniques considered essential to ensure project success, in the context of engineering sector of Pakistan and then examining their impact of project success. Five factors considered quite common to risk management include, risk identification, risk assessment, risk reporting, risk monitoring and risk controlling. Out of these, risk controlling, risk reporting and risk monitoring have been found contributing to the project success significantly whereas, risk identification, risk assessment is not contributing towards project success. As such, there is a need to find out reasons for weak risk management practices in the engineering sector. For

consistent success in all projects, continuous monitoring at all stages of the project would be required by the expert engineers to make ensure that implementation of risk management practices is done as per standard laid down procedure. The study has added value in the existing literature, especially in the context of Pakistani engineering firms.

RECOMMENDATIONS

Based on findings, some measures are recommended to the engineering sector intending to further improve the existing risk management system:

- Risk identification needs to be paid special attention to find out the reasons for its weak application in the engineering sector.
- Risk assessment should also be suitably addressed to ensure that it is properly done to ensure project success.
- During each phase of the project life cycle, employees should be encouraged to report any risk they may be facing and also to provide management sincere feedback.
- Employees should be provided with training sessions and workshop related to risk management for enhancing their skills to identify and counter risks.
- Regular meetings shall be conducted among management and employees to discuss ongoing risks and strategies to handle them.

SUGGESTIONS FOR FUTURE RESEARCH

This paper has identified only five risk management factors and examined their impact on successful completion of a project. Moreover, this study has merely focused on engineering sector of Pakistan and it has not separately focused on risk management practices during each phase of the project. As such, any future research may be undertaken to evaluate the mechanisms in greater depth and formulate necessary principles for developing and implementing risk management techniques in each phase of the project. Future researchers may also study the impact of an organizational culture of risk management success. A comparative study may also be undertaken to examine the effectiveness of risk management practices among local and foreign engineering sectors. Future scholars may conduct similar research on other industries of Pakistan.

REFERENCES

Ahan, M., &Zwikael, O. (2011). The Effectiveness of Risk Management: An Analysis of Project Risk Planning Across Industries and Countries. *Publication of society of risk analysis*, 25-37. DOI:10.1111/j.1539-6924.2010.01470

Alexander Bohnert, Nadine Gatzert, Robert E. Hoyt & Philipp Lechner (2018). The drivers and value of enterprise risk management: evidence from ERM ratings, *25(3)*, 10-11

Ai, J., V. Bajtelsmit, and T. Wang. 2018. The Combined Effect of Enterprise Risk Management and Diversification on Property and Casualty Insurer Performance, *Journal of Risk and Insurance 85(2)*, 513–543.

Balakian, W. (2010). Applying the Risk Monitoring and Control Process. Retrieved from http://project- management.truesolutions.com/2010/09/21/applying-the-risk-monitoring-and-control-process/

Beleiu, I., *Crisan*, E., &Nistor, R. (2015). Main factors influencing project success. *Interdisciplinary Management Research, 11*, 59-72.

Berry-Stoelzle, T. R., and J. Xu. (2018). Enterprise Risk Management and the Cost of Capital, *Journal of Risk and Insuranc*e *85(1)*, 159–201.

Bohnert, A., N. Gatzert, R. E. Hoyt, and P. Lechner (2017). The Relationship between Enterprise Risk Management, Value and Firm Characteristics Based on the Literature.*Zeitschriftfür die GesamteVersicherungswissenschaft,106(4)*, 311–324.

Carvalho, M.M., & Junior, R.R. (2014). Impact of risk management on project performance: the importance of soft skills. *International Journal of Production Research, 53 (2)*, 321-340.

Che, X., and A. P. Liebenberg (2017). Effects of Business Diversification on Asset Risk-Taking: Evidence from the U.S. Property-Liability Insurance Industry, *Journal of Banking and Finance77*, 122–136

Davis, M. (2015). Identifying and Managing Business Risks. Retrieved fromhttp://www. investopedia. com/articles/financial-theory/09/risk-management-business.asp

Dobler, M. (2005). How Informative is Risk Reporting? - A Review of Disclosure Models *Munich Business Research* Working Paper No. 2005-01. DOI: 10.2139/ssrn.640522

Elkhalek, A.A. (2011). *Critical Factors of effective information systems risk management*. (Masters Thesis, Mälardalen University, Sweden). Retrieved from https://www.diva-portal.org/smash/get/diva2:432358/fulltext01.pdf

Fletcher, W.J. (2014). Review and refinement of an existing qualitative risk assessment method for application within an ecosystem-based management framework. *ICES Journal of Marine Science,72 (3)*, 1043-1056.

Fuss, R., Grabellus, M., Mager, F. (2012). Risk Control Strategies. Retrieved fromhttps://www.stoxx.com/document/Research/Expert-speak-articles/article_roland_201211.pdf

Garrido, M.C., Cassia, M., Ruotolol, A., Miguel, F., Ribeiro, L., & Naked, H.A. (2011). Risk identification techniques knowledge and application in Brazilian construction. *Journal of Civil Engineering and Construction Technology 2(11)*,242-252.

Gibbs, M.T., &Browman. H.I. (2015). Risk assessment and risk management: a primer for marine scientists. ICES Journal of Marine Science, *72 (3)*, 992-996.

Gregg, M. (2005). CISSP Security-Management Practices. *CISSP Exam Cram 2*. Retrieved from http://www.pearsonitcertification.com/articles/article.aspx?p=418007&seqNum=4

Ika, L. (2009). Project Success as a Topic in Project Management Journals. *Project Management Journal, 40(4)*, 6 – 19. DOI: 10.1002/pmj.20137

Investopedia. (2015). *Risk Management Framework (RMF):An Overview.* Retrieved from http://www.investopedia.com/articles/professionals/021915/risk-management-framework-rmf-overview.asp

Junior, R.R., & Carvalho, M.M. (2013). Understanding the Impact of Project Risk Management on Project Performance: an

Empirical Study. *Journal of technology and management innovation*, *8*, 64-78.

Khan, T., & Ahmed, H. (2001). Risk Management an analysis of issues in Islamic financial industry, (Paper No.5). Retrieved from www.sbp.org.pk/departments/ibd/Risk_Management.pdf

Kishk, M., Ukaga, C. (2008). The impact of effective risk management on project success. *Annual ARCOM Conference, UK Association of Researchers in Construction Management*, 799-808. London: ARCOM

Lamont, J. (2015). Risk Management: Reputation is everything. *KM world, 24*(3). Retrieved from http://www.kmworld.com/Articles/Editorial/Features/Risk-management-Reputation-is-everything-102169.aspx

Linsley, M.P., & Shrives, J. P. (2006). Risk reporting: A study of risk disclosures in the annual reports of UK companies *The British Accounting Review*, *38,*387–404. DOI: 10.1016/j.bar.2006.05.002

Lukinskiy, V.S. and Panova, Y. (2017), Simulation modelling of inventory management strategies, [Simulation and complex modelling in marine engineering and marine transport systems], Materials of IV International Scientific Conference, St Petersburg, June 28, 71-75.

Mellet, H., & Mokhtar, E.S. (2013). Competition, corporate governance, ownership structure and risk reporting. *Managerial Auditing Journal*, *28 (9)*, 838-865. DOI: 10.1108/MAJ-11-2012-0776

Marzouk, M. (2016) Risk reporting during a crisis: evidence from the Egyptian capital market. *Journal of Applied Accounting Research, 17(4)*,378-396. DOI: 10.1108/JAAR-02-2015-0012

Mirzaa, M.N., Pourzolfaghar, Z., &Shahnazari, M. (2013). Significance of Scope in Project Success. *Procedia Technology*, 9, 722-729. Retrieved from https://www.researchgate.net/publication/275539061_Significance_of_Scope_in_Project_Success

Mitchel, J. T. (2013). Explore Your Resources to Learn More About RBM. *Applied Clinical Trials, 22,* 2. Retrieved from http://edc-

connection.ebscohost.com/c/articles/89943469/explore-your-resources-learn-more-about-rbm

MITRE Systems Engineering (SE) Competency Model (2007), *The MITRE Institute*. 1, 40-41. Retrieved fromhttps://www.mitre.org/sites/default/files/publications/10_0678_presentation.pdf

Peterman, M.R. (2004). Possible solutions to some challenges facing fisheries scientists and managers. *ICES Journal of Marine Science*, *61* (8) 1331-1343. DOI: 10.1016/j.icesjms.2004.08.017

Raz, T., Shenhar, A. J., &Dvir,D. (2002). Risk management, project success and technological uncertainty. *R&D Management Journal, 32(2)*, 101-109.

Ritter; D. (2013). *Identifying Risks in Your Project*. Retrieved from https://certifedpmp. wordpress.com/2008/10/13/identifying-risks-in-your-project/

Rosenberg, M.J. (2014). Key Considerations in the Transition to Risk-Based Monitoring. Therapeutic *Innovation & Regulatory Science*, *48,* 428-435. DOI: 10.1177/2168479013519631

Ruchi Agarwal, Lev Virine (2019). Integration Stages of Project Risk Management (PRM) into Enterprise Risk Management (ERM) (2019), International Journal of Risk and Contingency Management Volume 8(1), 13-14 (DOI: 10.4018/IJRCM.2019010102)

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students*. 6th ed. Harlow:Pearson Education Limited.

Sauter,V. (2009). *Project Management: A tool for Project Success. IS 6840- Information Systems Analysis*. Retrieved fromhttp://www.umsl.edu/ ~sauterv/analysis/6840_f09_papers/Tongwan/

SBP. (2003). Risk Management Guidelines for Commercial Banks & DFIs, State Bank of Pakistan. Retrieved fromhttp://www.sbp.org.pk/about/riskmgm.pdf

Schroeder, B., Alkemade. J., & Lawrence, G. (2011). Risk Management-A key requirement of project success. *The official magazine of*

ISPEPharmaceutical Engineering , (31). Retrieved from www.ap-learning.net/dmdocuments/2011-01-01-Pharmaceutical-Engineering-Risk.pdf

Sekaran, U. (2003). *Research methods for business: A skill building approach* (4th ed.). Hoboken, NJ: John Wiley and Sons.

Tchankova, L. (2002). Risk identification basic stage in risk management, *Environmental Management and Health,13,* 290 – 297. DOI: 10.1108/09566160210431088

Williams, L. (2014). Risk Management. Retrieved from www.agile.csc.ncsu.edu/SEMaterials/ Risk Management.pdf