

# Further Analysis on Risk Management and Solutions to Improve Productivity and Safety in Construction Sector - and Environment Protection Law in Construction Activities

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## Abstract

## Original Research Article

The improvement of construction and facilities management processes aims to increase efficiency, save costs and reduce environmental damages. This industry currently experiences injuries, death and diseases. The purpose of this study is to present FURTHER ANALYSIS ON RISK MANAGEMENT and SOLUTIONS TO IMPROVE PRODUCTIVITY AND SAFETY IN CONSTRUCTION SECTOR. **Methodology:** Authors use statistics, qualitative analysis including synthesis and inductive methods in this paper. Findings: we need to propose both risk reduction and risk prevention strategies as well as build various risk models. **Originality values:** Therefore It means that we need to reduce those risks to serve for development of projects in a safety concept. Last but not least, selecting qualified human resources and preparing good financial budget for each projects is among vital factors to improve productivity of these projects. The research boosts this vital sector – construction industry, raising productivity and enhancing construction performance through increasing efficiency deriving from the use of immersive technologies.

**Keywords:** Project development, risk management, construction projects, productivity improvement.

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## 1. INTRODUCTION

Risk management brings businesses attractive benefits such as:

Risks can happen to the project in a positive or negative direction. When situations arise, businesses will be more proactive in finding measures to increase opportunities and minimize negative factors.

Risk management helps to handle situations quickly, saving time and costs for businesses. Applying risk management to all aspects of the project such as time and personnel, the project plan will be more practical and applicable.

Risk management can help limit changes during project implementation. Strengthening governance helps ensure smooth and continuous operations, increasing values such as brand, finance, ..

Helping businesses operate sustainably and continuously enhance values such as finance, market share, brand...

Ho Anh Tuan (1977) in his essay /doctoral project used the term risk when referring to technical threats in engineering. Risks, according to Ho Anh Tuan, are mistakes or incidents. Risk management began to gain attention in the construction sector in Vietnam can be traced from 2007. At the time in 2007, Vietnam officially integrated into the world - The economy is open, free to compete and develop. Construction projects in progress- operates everywhere and has foreign elements: foreign investors, foreign consultants, foreign contractors,... That has had an impact on the construction industry on two aspects:

- The construction industry has been introduced to advanced construction technology and advanced learning.

- At the same time, the construction industry is also under pressure from the rapid development and massive amount of construction investment projects. Risks appear with frequency and intensity seriously affected.

Beside, Nguyen Lien Huong, in her doctoral thesis "Research on risk issues and risk management measures in production and business activities of construction enterprises" has studied risks, risk management of enterprises. The construction industry is placed in the context of a highly competitive market economy. The author approaches the problem from a general overview of risks in production and business.

**Next, The concept of environment and its importance.**

According to Clause 1, Article 3 of the Law on Environmental Protection in 2020, there are the following provisions:

"Environment includes natural and man-made material factors that are closely related to each other, surround

people, and affect people's life, economy, society, existence and development, creatures and nature."

Therefore, it can be understood that environmental protection is the synthesis of solutions and activities to prevent and limit adverse impacts on the environment; responding to environmental incidents; overcome pollution, environmental degradation, improve environmental quality; rational use of natural resources, biodiversity and response to climate change. Simply put, environmental protection is the activities that keep the environment clean and beautiful. Improve the environment, ensure ecological balance. Preventing and overcoming bad consequences caused by humans and nature to the environment. Exploit, rationally and economically use natural resources.

Hence author select this topic: "FURTHER DISCUSSION ON RISK MANAGEMENT IN CONSTRUCTION and REAL ESTATE INDUSTRY".

**2. PREVIOUS STUDIES**

We summarize in below table

**Table 1: Summary or related studies**

Authors	Year	Content, results
Marcelino-Sádaba <i>et al.</i> ,	2014	Project risk management provides a systematic process for identifying and taking action when risks arise, contributing to meeting project objectives, improving project control, increasing the chances of project success, improving communication between projects, facilitating decision making and prioritizing actions
PMI	2017	Project risk management is considered one of the complex areas, but when applied risk management techniques can lead to project success. Furthermore, according to the Project Management Institute (PMI), project risk management is one of the most important parts of the project operation process
Renuka <i>et al.</i> ,	2014	Proposed an easy systematic tool for every project task towards assessing hazards in an easy manner and also inspires the practitioners towards implementing risk analysis. This review concluded that risk identification and assessment during the bidding stage of the construction leads towards the better estimation of cost escalation and also time overrun. Therefore, for the completion of the project successfully, risk assessment need to be included in the budget and scheduling
Nasir B. Siraj <i>et al.</i> ,	2019	Recognized routine risks in the field of construction and in this research the highest risks which are identified are errors in design, variation in the rate of inflation, poor engineering, change in government laws & policies affecting outcomes of the project
Nguyen Thi Thuy	2020	Use Mobile integration technology: Construction team, supervision consultant are gradually using mobile devices to manage records, share information off-site, simply construction progress. The use of applications on mobile devices helps the parties stakeholders can respond immediately, helping to evaluate effective plans. Labour Technology helps visualize an off-site workflow, increasing job security construction quality assurance
Zhao	2023	Undertake a holistic review of global construction risk management (CRM) research published between 2000 and 2021 and identify the intellectual structure and emerging themes of the CRM research. A total of 2034 primary documents and 68727 secondary documents were collected from Web of Science core collection database. Document co-citation and bibliographic coupling techniques were adopted with qualitative discussion to show the intellectual structure of the CRM knowledge domain and emerging themes. The CRM knowledge domain consists of the key themes relating to CRM steps, RM in construction projects with specified characteristics, RM in international construction and management of particular risk categories. In addition, the emerging themes include advanced risk analysis techniques, information and communication technology-driven CRM, integration of CRM into other management functions, as well as human factors in CRM. This review study is more inclusive than any prior reviews on CRM and provides an in-depth understanding of the CRM research and benefits industry practitioners and researchers.

(Source: author synthesis)

Beside, studies conducted for better improving management structure of Vietnam businesses (Ha, T. T. H, 2019) and also for improving productivity (higher) (Saurav, A., & Ryan, K., 2020; Singh, A. P., 2017; N Nga, P Tuan, D Huy, D Huong., 2021; Javorcik, B. S, 2004; Chuong, P. H., & Bao, H. D, 2021; Boghean, C., & State, M, 2015) or promoting high technology in firms (TH Le *et al.*, 2021; P Van Tuan *et al.*, 2021; N D Trung *et al.*, 2021; Blomström, M., & Sjöholm, F, 1999; Blomström, M., & Sjöholm, F, 1990; Huy, D. T. N., Le, T. H., Hang, N. T., Gwoździewicz, S., Trung, N. D., & Van Tuan, P, 2021).

The IRM (2008) and ISO (2018) processes are common risk management processes. While the process of PMI (2017) and Larson and Gray (2021) emphasizes project risk management.

### 3. METHODOLOGY

Authors use statistics, qualitative analysis including synthesis and inductive methods in this paper. Then this study also use observations and dialectical methods.

### 4. MAIN FINDINGS AND DISCUSSION

#### 4.1 Types of risks in construction sector

Author here summarize in below figure.



**Fig 1: Type of risks**  
(Source: author analysis)

#### Risk Classification in The Project?

Considering external risks: Legal regulations, project implementation location, ..

Consider internal risks: Changes in scope, personnel, changes in schedule or budget, etc.

Consider technical risk: Change in technology or technical process.

Consider commercial risk: Terms in the contract, supplier, etc.

Considering the unforeseen risks coming from customers, the ability to cope, cultural changes, etc.

In addition, Based on the results, risks can be divided into

Business risk: The risk that results in profit or loss of the project;

Pure risk: The risk of loss (of people, property, ..)

In addition, risks stem from materials, costs, project scope, resources, customer satisfaction, etc.

Currently, risks are classified mainly as risks that may occur in the future. However, there is also a type of non-event risk. Accordingly, they include: Variability risk (risk of not being able to predict future changes), Ambiguity risk (Risk resulting from ignorance).

#### 4.2 Example of Quantitative model for risk assessment

We will take a look at macro factors impact on a type of financial risk of a real estate company in Vietnam (FLC) as following risk model measured with Eviews:

Fig 3 Regression model with a few variables:

Eviews generates below statistical results:

Dependent Variable: Y				
Method: Least Squares				
Date: 02/16/20 Time: 11:57				
Sample: 1 10				
Included observations: 10				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
G	-175.4329	147.9104	-1.186075	0.2804
CPI	-16.76092	55.79369	-0.300409	0.7740
R	-52.61925	110.0602	-0.478095	0.6495
C	23.58070	17.53801	1.344548	0.2274
R-squared	0.191709	Mean dependent var	6.705000	
Adjusted R-squared	-0.212437	S.D. dependent var	2.034487	
S.E. of regression	2.240188	Akaike info criterion	4.740171	
Sum squared resid	30.11066	Schwarz criterion	4.861205	
Log likelihood	-19.70086	F-statistic	0.474356	
Durbin-Watson stat	0.879552	Prob(F-statistic)	0.711465	

Hence,  $Y = -175 * G - 16.7 * CPI - 52.6 * R + 23.5$ ,  $R^2 = 0.19$ ,  $SER = 2.2$  (147.9) (55.7) (110)

The above regression equation shows us that FLC stock price (Y) has a negative correlation with GDP growth (G) and inflation (I) and lending rate (R). Lending interest rate decreases together with CPI decreases will lead to an increase in FLC stock price.

b. Scenario 2 - regression model with 5 macro variables:

Running Eviews gives us results:

Dependent Variable: Y				
Method: Least Squares				
Date: 02/16/20 Time: 11:58				
Sample: 1 10				
Included observations: 10				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
G	3.645953	171.5080	0.021258	0.9841
CPI	-0.039803	52.61216	-0.000757	0.9994
R	-92.09127	103.9924	-0.885558	0.4259
VNINDEX	-0.009347	0.006096	-1.533354	0.2000
RF	3.356442	64.06875	0.052388	0.9607
C	22.47229	17.57068	1.278966	0.2701
R-squared	0.541674	Mean dependent var	6.705000	
Adjusted R-squared	-0.031233	S.D. dependent var	2.034487	
S.E. of regression	2.066014	Akaike info criterion	4.572829	
Sum squared resid	17.07366	Schwarz criterion	4.754380	
Log likelihood	-16.86414	F-statistic	0.945484	
Durbin-Watson stat	1.310489	Prob(F-statistic)	0.536619	

Hence,  $Y = 3.6 * G - 0.03 * CPI - 92.1 * R - 0.009 * VNINDEX + 3.3 * Rf + 3.3$ ,  $R^2 = 0.54$ ,  $SER = 2.06$  (171.5) (52.6) (103.9) (0.006) (111.1)

Here we see impacts of 5 macro factors, with the new variable: risk free rate (Rf), the above equation shows that FLC stock price (Y) has negative correlation with inflation, VNIndex and lending rate, whereas it has positive correlation with GDP growth and Risk free rate. We also recognize that GDP growth and lending

rate have the highest impact on FLC stock price. When risk free rate declines, it will increase investment in stock market, then it will lead to an increase in FLC stock price.

### 4.3 Productivity improvement issue

Next, Nguyen Thi Thuy (2020) pointed that: Time progress greatly affects the related parties, especially construction contractors. Most risks often slow down the project schedule. The project entails that mobilizing resources, gathering supplies and materials to the construction site will be slow down. If the schedule of preparation time is just enough to do the work, there is no Redundant time, workload and associated factors will be stagnant. Progress - Backup time is absolutely necessary for every project. To set up the calculation schedule up to a fallback time requires the scheduling engineer to have the most requirements determine:

- Thorough understanding of project timelines.
- Understanding of work process, construction characteristics of each job.
- Understand information about human resources, supplies, materials, machinery, equipment, etc.
- Understanding of common RRs encountered by wards in urban road traffic projects At Hanoi.
- Experience in setting construction schedule

Finally, In construction projects we need to manage risks to improve productivity. For instance:

Safety Risk: Any risk or hazard at a construction site that can lead to worker accidents.

Financial risk: Factors that impact your financial flow, including revenue shortfalls, spikes in operating costs & competition with other companies.

Legal risks: There may be disputes in the performance of contracts with customers.

Project Risks: Project risks such as poor resource management, miscalculation of time, costs, or misinterpretation of the project's deliverables.

Environmental risks: Floods, earthquakes and other natural phenomena damage the construction site and make it difficult for construction to continue.

First, It means that we need to reduce those risks to serve for development of projects in a safety concept.

Second, Selecting qualified human resources and preparing good financial budget for each projects is among vital factors to improve productivity of these projects.

## 5. CONCLUSION

We propose some risk management solutions in construction industry as follows:

*We propose to study and apply McKinsey's risk reduction model as follows:*



### According to this model:

Step 1, we analyze types of risk according to client's business model according to risk appetite.

Effective risk identification requires more than creating high-level definitions and theoretical assessments of risk. It should include detailed, data-driven analytics on

the merchant's role in the payments value chain, the customer types and segments in the portfolio, business model and product offerings. them as well as their flow of transactions in terms of quantity and type. The analysis can then be used to establish risk appetite and associated tolerance thresholds, for continuous monitoring.

Step 2, classify customer groups and set up a risk measure. Segmentation allows for more targeted and differentiated risk management measures. Pursuing the goal of detecting and preventing banned transactions and bad actors often comes with high operational costs. Analyzing risks according to both construction projects and clients.

Step 3, establish an integrated risk control model. This approach can lead to better outcomes, as these risks are inherently linked.

Step 4, conduct ongoing validation and monitoring of the data along with applying a live monitoring model to assess the client's risk as well as each project risks throughout their lifecycle. An analytics-driven approach that draws on both dynamic data, such as transaction flows, and static data, such as customer segments and geographic risk ratings, to deliver high-risk customers better ro. Several companies are developing AI models that learn from historical surveys to segment and prioritize alerts.

Step 5, recommends increased monitoring (note) and transparency of the customer experience. Allowing a holistic view of controls and providing transparency to customers about their requirements and purposes is critical to ensuring a smooth customer experience.

Last but not least, risk management in construction projects should follow a process as follows:



**Fig 4: Risk handling**  
(Source: author synthesis)

Note: In step 5, we need to propose both risk reduction and risk preventions strategies. In step 4 we will build various risk models.

Also we can use below fig (chart) to evaluate risk level.

		Impact				
		Very Low	Low	Medium	High	Very High
Likelihood	Very High	Yellow	Yellow	Red	Red	Red
	High	Green	Yellow	Yellow	Red	Red
	Medium	Green	Yellow	Yellow	Red	Red
	Low	Green	Green	Yellow	Yellow	Red
	Very Low	Green	Green	Green	Green	Yellow

**Fig 5: Risk level**  
(Source: author synthesis)

Environmental protection in general or environmental protection in construction work in particular must ensure the principles or legal provisions on environmental protection, specifically as follows:

+ Environmental protection is the right, obligation and responsibility of all agencies, organizations, communities, households and individuals. As in the construction of works, it is very clear that the rights and obligations of the subjects involved in and related to the construction of works in the protection of the environment related to the construction process are very clear construction works.

Environmental protection is a central and prerequisite condition, foundation and factor for sustainable socio-economic development. Environmental protection activities must be linked with sustainable socio-economic development. Environmental protection activities must be linked with economic development and resource management and be considered and evaluated during the implementation of development activities. In the process of construction and construction, the environmental protection assessment factor is not only a factor to carry out inspection and acceptance of the work, but environmental protection during construction is also the protection of the environment protect the working environment of the workers involved in the construction of the works or other related subjects.

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