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Regression Modeling of Risk Factors and its Impact on Progress of Activities in Infrastructure Projects

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Abstract- *The purpose of this paper is to evaluate the ten components of risk management on delay in progress Time of project by incorporating perception of Project managers, Assistant engineers and Supervisors. In total, 30 factors that might cause delays of Infrastructure projects were defined through a detailed literature review. The researchers collected 118 questionnaires from the project managers, Contractors, Engineers and Supervisors. This research examines the influence of Risk factors on type of funding projects and the results of this study indicate that there is a significant difference exists between companies Approaches on varies project activities . The results were identified through questionnaire survey for collecting data from respondents. The main scope of this study would help and can benefit the concern to establish suitable policies relating to risk management in infrastructure projects.*

Key Words: *Infrastructure, Progress, Activities, Policies, Approaches*

1. INTRODUCTION

All projects and businesses are subject to the effects of uncertainty, arising from a variety of sources, including technical, management, financial, commercial etc. The Infrastructure industry is a key activity in any economy, it influences and is influenced by the gross domestic product of any country. Infrastructure developments play a vital role in influencing the economic viability and social welfare of every country. The difficulty and dynamics of the decision making in infrastructure development and management has steadily increased over recent years. Risks have a significant impact on a construction project's Delay in progress time. The main objective this study is to identify the factors which highly influencing the Progress of the project in both government and private funding projects.

To meet the growing demand for public services, many governments have solicited private investments for public infrastructure projects by adopt the proposal of privatization, which grants the private sector the right to design ,finance , and construct a specific infrastructure and operate it for a concession period. The BOT approach has been considered the best way to reduce independent loans and improve a government's credit rating. The participation of private companies in a BOT project defines that the project risks and the financial and administrative burden are transferred from the public sector to the private sector (Namhun Lee and John E.Schaufelberger -2014).

The main root causes of risk are owner, contractor and clients. Under the complex risk category from the contractor's perspective, relates to the loss and expense which often may not be reimbursable (Jasper Mbachuand Samuel Taylor -2014). Under the consideration of owner any loss and expense claims which could be transferred in to contractor, except if it could be proven that the foundation variations were beyond the expectations of any experienced and diligent contractor at the time of tender. These are the risks that could restrict the ability of the contractor to achieve the anticipated time margin on a project.

The creation of risk research model would help to identify the severity of risks on project time and also need help benefit the concern to establish suitable policies relating to risk management in infrastructure projects. The financial oriented risk management is very crucial to achieve the project objective with in time.

1.1 Literature Review

Jasper Mbachuand Samuel Taylor (2014) discus about the most risky factors under the broad categories comprise, respectively, unforeseen site conditions, poor project management, inexperience or incompetent estimating team, work overload arising from taking on too many contracts at the same time, shortage of skilled labour and clients unreasonable expectations.

Vitor Sousaet al (2015) examines that the risks involved are mostly individual and depend on the nature

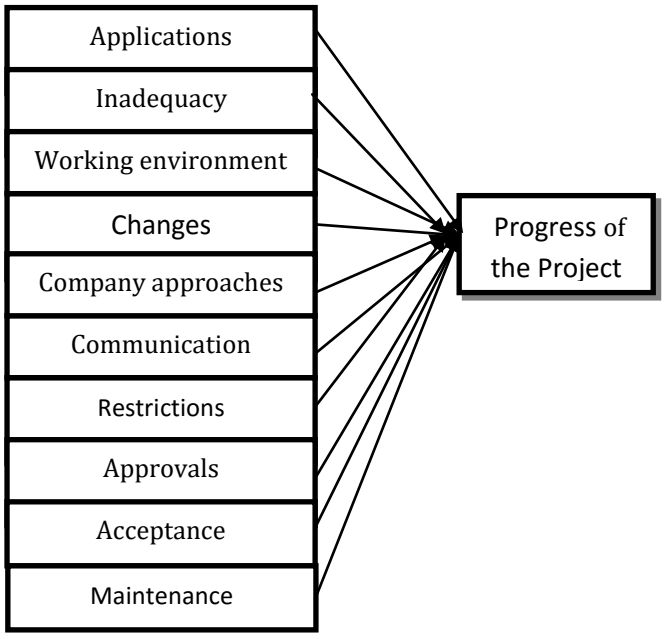
and conditions in which the tasks or activities are performed. The risk profile of the activities can be defined and the maximum quantity of resources to reduce the risk can then be identified.

Rasheed A Salawua and FadhlinAbdullahb (2014) determines the development levels of individual construction organisations on each attributes help to identify their areas of strengths and weaknesses on risk management capability.

Ana I. Irimia-Diegueza et al (2014) focused on the risk identification and is to set up the state of the art in risk management in megaprojects. This paper identifies the most important risks tackled in the literature and gives confirmation that more research is necessary in risk management.

Patel Ankit Mahendra et al (2013) proposes to apply the risk management technique which includes well - documented procedures for the one stop solution all types of hazards most likely to occur during any construction project Lifecycle.

1.2 Proposed Research Model



1.3 Objectives

- To identify the various dimensions of risk management practices in Infrastructure developers.
- To examine the impact of various Risk factors on Progress of the project.

1.4 Proposed Hypothesis

H_{01}: Applications will have no significant impact on Progress of the project.
H_{02}: Inadequacy will have no significant impact on Progress of the project.
H_{03}: work Environment will have no significant impact on Progress of the project.
H_{04}: Changes will have no significant impact on Progress of the project
H_{05}: Approaches will have no significant impact on Progress of the project.
H_{06}: Communication will have no significant impact on Progress of the project.
H_{07}: Restrictions will have no significant impact on Progress of the project.
H_{08}: Approvals will have no significant impact on Progress of the project.
H_{09}: Acceptance will have no significant impact on Progress of the project.
H_{10}: Maintenance will have no significant impact on Progress of the project.

1.5 Need for Study

- Identify the major impacts and the role of major risks in construction works.
- Risk is inbuilt everywhere especially in construction projects. The activity that are present in the construction industries could result in financial disasters, fatal injuries, disruption and delayed operation.

1.6 Period of study

The study was conducted during the period of May 2015 to February 2016.

1.7 Method of Surveying

The general methodology of the study relies largely on the survey, questionnaire which will be distributed and collected from the local building contractors of different sizes by mail or by employee meeting. A systematic literature review was initially conducted to identify the risk factors that affect the performance of construction industry as a whole.

2 DATA ANALYSIS

2.1 Reliability Analysis

The coefficient alpha scores were calculated for assessing reliability of the Risk management which are listed dimension wise in Table I. the coefficient alpha values for variables are well above the criterion as recommended by Nunnaly(1978) for assessing reliability of the scale.

Table 1 Reliability Statistics

Cronbach's Alpha	0.880
No. of Items	30

2.2 Factor analysis

A principal component factor analysis with varimax rotation was established on 30 variables that assessed the real Risk management process in Infrastructure development industries. The statistical test result (KMO=0.735, Bartlett's test of sphericity=435.00, significance=0.000) revealed that the factor analysis method was appropriate. The ten dimensions and the percentage of variance explained are listed in table 2.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.735
Approx. Chi-Square		1432.604
Bartlett's Test of Sphericity	Df	435
	Sig.	0.000

Factor 1, which was categorized as Applications, was composed of five variables and accounted for 24.322 per cent variance. Factor 2 comprised of six variables that relate to the Inadequacy in provision of materials and payments it accounts for 7.914 per cent of the variance. Factor 3 was labelled as Working Environment that includes four variables. It accounts for additional 6.871 per cent of variance. Factor 4 was Changes that contained one variable accounted for additional 5.243 per cent. Factor 5 was Company Approaches and comprised of two variables. It accounted for an additional 4.901 per cent of variance. Factor 6 was labelled as worker ability. It consists of three variables and accounted for 4.306 per cent of variance. Factor 7 was named as Restrictions that composed of two variables. It accounted for an additional 4.236 per cent of variance. Factor 8 was labelled as Getting Approvals. Factor 9 and 10 mentioned as Acceptance and Maintenance which consists of variables as three and one.

Table 3 Risk Process on Delays in Progress Time of Project

Sl.No.	Risk process	No. of variables including	Eigen value	Percentage of variance explained	Cumulative percentage of variance explained
1	Applications	5	24.322	13.065	13.065
2	Inadequacy	6	7.914	8.317	21.383
3	Working Environment	4	6.871	7.151	28.534
4	Changes	1	5.243	6.999	35.533
5	Company Approaches	3	4.635	6.573	42.106
6	Communication	2	4.306	5.893	47.949
7	Restrictions	2	4.236	5.839	53.788
8	Approvals	2	3.966	5.736	59.524
9	Acceptance	3	3.788	4.778	64.302
10	Maintenance	1	3.352	9,322	68.634

2.3 Multiple regression analysis

The present study has made an attempt to examine the influence of Risk factors on project progress of each activity, multiple regressions was administered. The regression model is,

$Y=a+\beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6+ \beta_7X_7+ \beta_8X_8+ \beta_9X_9+ \beta_{10}X_{10}+e$

Where, y is the mean score on Progressof the Project
a=intercept,
X_1= Mean score on Applications,
X_2= Mean score on Inadequacy,
X_3= Mean score on Working Environment,
X_4= Mean score on Changes,
X_5= Mean score on Company Approaches,

X_6= Mean score on Communication,
X_7= Mean score on Restrictions,
X_8= Mean score on Approvals,
X_9= Mean score on Acceptance,
X_{10}= Mean score on Maintenance.
β_1 to β_{10} = slope coefficient of all the above factors.
e=error rate.

The impact of Risk factors among the respondents on their overall impact has been measured among Government Funding Projects, Private Funding Projects and also for the pooled data separately. The results are given in the table 4.

Table 4 Influence of Risk Factors on Progress of the Project

Sl. no	Independent variables	Government Funding Projects		Private Funding Projects		Pooled Data	
		Beta	Sig.	Beta	Sig.	Beta	Sig.
1	Applications	0.484	0.007*	-0.406	0.310	0.076	0.537
2	Inadequacy	-0.472	0.015	-0.095	0.571	-0.246	0.053
3	Working Environment	-0.198	0.203	-0.147	0.298	-0.169	0.103
4	Changes	0.073	0.726	0.259	0.238	0.148	0.335
5	Company Approaches	0.262	0.056	0.379	0.009*	0.273	0.005*
6	Communication	0.274	0.089	0.093	0.507	0.124	0.229
7	Restrictions	-0.286	0.052	0.102	0.451	-0.097	0.320
8	Approvals	0.223	0.118	0.032	0.810	0.103	0.282
9	Acceptance	0.045	0.841	0.174	0.422	0.073	0.635
10	Maintenance	0.087	0.547	0.118	0.427	0.115	0.257
	R^2	0.385		0.267		0.187	
	Adjusted R^2	0.248		0.123		0.111	
	F statistics	2.817		1.857		2.468	

**significant at 5 per cent level*

Among the Government Funding Projects, the significantly and positively influencing progress time is Application of new techniques. A unit increase in the perception of the above said factors results in to delays in Progress by 0.48 units. Among the Private Funding Projects, the variable Company Approaches since their regression coefficient is significant at 5 per cent level. A unit increase in the above said risk factors results in to 0.379units of delay in progress of the project activities. Among the pooled data the significantly and positively influencing risk factors on progress is Company Approaches, since their respective regression coefficient is significant at 5 per cent level.

2.4 Testing of hypothesis

The results of the testing of the hypothesis in the context of Risk management criteria with ten factors are detailed in table 5.

Table 5 Testing of Hypothesis

S.No.	Hypothesis	T value	Beta	Results
1	Applications will have no significant impact on the Progress of the project	0.619	0.537	Not Confirmed
2	Inadequacy will have no significant impact on the Progress of the project	-1.928	0.053	Not Conformed
3	Working Environment have no significant impact on the Progress of the project	-1.647	0.103	Not Confirmed
4	Changes will have no significant impact on the Progress of the project	0.968	0.335	Not Confirmed
5	Company Approaches will have no significant impact on the Progress of the project	2.872	0.005*	Confirmed
6	Communication will have no significant impact on the Progress of the project	1.210	0.229	Not Confirmed
7	Restrictions will have no significant impact on Progress of the project	0.999	0.320	Not Confirmed
8	Approvals will have no significant impact on Progress of the project	1.081	0.282	Not Confirmed
9	Acceptance will have no significant impact on the Progress of the project	0.477	0.635	Not Confirmed
10	Maintenance will have no significant impact on the Progress of the project	1.139	0.257	Not Confirmed

3. CONCLUSION

This study has mainly focused to identify project uncertainty factors and its effects on two type of funding projects. The impact of risk factors on project time is identified by using ten Independent variables such as

Applications, Inadequacy, Working Environment, Changes, Company Approaches, Communication, Restrictions, Approvals, Acceptance and Maintenance. This study also examine that the significant relation between the company approaches and progress time and also express the impact values of Government Funding Projects, Private Funding Projects and also the pooled data. The Progress of each activity is important for every company to achieve project objective with in stipulated time period if it is getting delay, effects the profit. This study relates only the risk factors with one dependent variable similar studies could be conducted with different dependent variables and also it has only conducted in project fund related factors which mainly affect the projects.

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