INTERNATIONAL JOURNAL OF PURE AND APPLIED SCIENCES AND TECHNOLOGY

Vol. 16, No.2, June 2013

Int. J. Pure Appl. Sci. Technol. Vol. 16, No. 2, June 2013

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Int. J. Pure Appl. Sci. Technol., 1(1) (2010), pp. xx-xx
International Journal of Pure and Applied Sciences and Technology
ISSN 2229 - 6107
Available online at ***www.ijopaasat.in***
Research Paper for submission

Assessment of Risk Management Practices in Nigerian Construction Industry: Toward Establishing Risk Management Index.

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(Received: ; Accepted:)

Abstract: *The construction industry requires continuous evaluation and formulation of risk management index, but Nigeria is yet to introduce a risk rating tool for the industry. This paper therefore assessed risk management practice in Nigeria construction industry and establishes Risk Management Index (RMI). Structural questionnaire were administered to the industry stakeholders, Data collected were analysed and ranked using Relative Importance Index (RII) which was to establish the Risk management Index (RMI). Modelled (RMI) was put to validity test using collated data with the RMI result being 0.53 which is indicative that the Nigeria construction industry is exposed to 53.04% risk thereby resulting to high failure rate of construction projects. RMI opts to assist investors in the industry to making strategic decisions and to serve as a tool for financial and insurance institutions to carry out feasibility and viability studies on prospective project for risk investigation. The industry shareholders should therefore adopt a pragmatic approach to risk control on construction projects by implementing RIM in the industry*

Keywords: Risk Management, Construction Industry, Risk Management Index (RMI).

1.0 Introduction:

1.1 background of the study

Construction industry development is a goal of many development policies in different counties to stop companies from sudden collapse. (Berke & Conroy, 2002; Chan & Lee, 2008). Development of the construction industry also requires knowledge of risk management policies. It is a well establish fact that every stage of the construction process, from initial investment appraisal through to construction and use of the built facility, is subject to risk for all the parties involved. Indeed, compared to other industries, the Nigeria construction industry has a particularly poor record in this regard with high number of construction related risks occurring each year (Ojo, 2010 & Windapo, *et al* 2010). In recent times, the nature, incident and impact of risk in construction have become a topic of interest because of the effects on quality, time and cost of construction projects (Ojo 2010; Windapo, *et al* 2010 & Joshua 2010).

Risk is important to contractors as well as clients and consultants within the construction industry; however, the problems of risk assessment are complex and poorly understood in practice (Shou, et al, 2004). In a related development Ashworth & Hogg (2002) pointed out that construction activities are full of risk which include those that may relate to external, commercial, design, construction and operation. However, they have to be considered for effective management in order to retain the initial objective of the project.

Risk is defined as the probability that an unfavourable outcome will occur (PMI, 1996). ''Risk is uncertainty and the result of the uncertainty or is lack of predictability about structure, outcome or consequences in a planning or decision situation''

(www.leadershipeditors.com, 2012). According to Edward & Bowen (1998), risk is the probability that an adverse event occurs during a stated period of time.

Ashworth and Hogg (2002) Shou *et al* (2004) and Florence *et al* (2006) stated that ''projects have life cycles or a sequence of stages and activities from origin to completion and there is always a degree of risk associated with each stage''. Odeyinka (2000); Tar & Carr (2000) & Odeyinka, Nasir *et al* (2003) Lowa & Kaka (2008) pointed out that too often this risk is not dealt with satisfactorily which has resulted into poorly performed projects in the industry. They submit that to solve this problems, we need to integrates risk management practice into the estimation of construction projects cost and time, as this will help considerably to avoid excessive overrun.

Construction project risk management is the processes of identifying, analyzing, and responding to construction project risk (Project Management Institute, PMI, 2003). It involved the maximization of positive results (opportunities) and the minimizing of negative results and its consequences (treats). According to www.antive.net (2012), project risks management involves conducting risk management planning, engaging in risk identification, completing risk analysis, creating a risk response action plan, and monitoring and controlling risk on a project. Project risk management is a continuous process to be engaged in throughout the entire project. The purpose of construction project risk management is to increase the likelihood and impact of positive events and on projects and to decrease the probability and impact of negative events like cost and time overrun of construction projects. The six major processes involved in project risk management as stated by PMI, (2003) are; risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning and risk monitoring and control.

Many approaches have been suggested for the classification of risks. However, all of them pointed to the identifying the primary source of risk central to construction activities which triggered the risk. Perry & Hayes (1985) identified physical, design, environmental, logistics, financial, legal, political , construction and operational risk while Edward and Bowen (1998) classified risks into natural and human risks and the subdivided of each of these classification were also listed. Nasir *et al* (2003) classified construction project risk into labour resources, material risk, labour, owner, political, environmental, design, geotechnical, area condition and contractors risk. For the purpose of this study, The classifications of construction projects risk are therefore combined into physical, political, environmental, management, legal, technical and market risk. Track record of successful construction projects would have been greatly improved if more companies had included such risk as an integrated part of the project control and quality system. The study is therefore necessary to identify risk on construction projects and to formulate a Risk Management Index (RMI) to address the issue of risk on construction projects.

1.2 Statement of Problem

According to Nasir *et al* (2003), the concept of risk management is relatively new to Nigeria public as projects carried out in the past decades did not meet the essential criteria of risk management. Construction projects are been abandoned in Nigeria, but Dada and Jagboro (2007), Odeyinka, Lowa & Kaka (2008) and Ojo (2010) stressed that required attention to risk management will reduce project time overrun, cost overrun and in other cases abandonment of projects. Also, The Nigeria construction industry does not use formal risk analysis and management techniques which is important to construction projects to minimize time and cost of projects and enhance profitability due to lack of knowledge (Ojo, 2010; Windapo et al., 2001 and Joshua, 2010).

The use of quantitative analytical techniques for managing risk not been used regularly due to limited experience and understanding of the stakeholders in the construction industry (www.scribd.com, 2012). In view of this, Prashant & Chris 2001; Osama & Slmam (2003) and Seung (2004), suggests the application of risk management model of project characteristic to manage the risks inherent in construction project.

Risk management of construction projects gives the most emphasis to environmental, economic and social issues. Construction itself is prone to a variety of risks, such as financial, management, environmental and technical related risks, mainly because of the materials used, nature of design, , locations and layout, physical structure and the use to which buildings are put(www.fsa.ulaval.com, 2013). In the Nigeria construction industry, risk management index has not been developed that shareholders could rely on when decisions are to be taken. Based on this, the study set out to develop a risk management index that can be used by all shareholders to determine the impact of risk on a given project based on the risk factors identified in the projects.

1.3 Conceptual Framework for Assessing Risk Management.

Fig. 1 shows a conceptual frame work for assessing risk management in the construction industry. As shown in the figure, the research concept adopted commenced with the identification of various type of risks affecting the construction projects and their indicators on a specific project. The risk factors were identified from literature on risk management and from discussions with construction clients and their representatives. The next stage is to determine the significant of project risk. The risk factors can be accessed from diverse project grouping, such as client type, project types, procurement types and project duration. For each of the classified project grouping, the variance between the forecast and actual project risk were determined. The validity and predictability of the model will them be tested using a Risk Management Index (RMI).

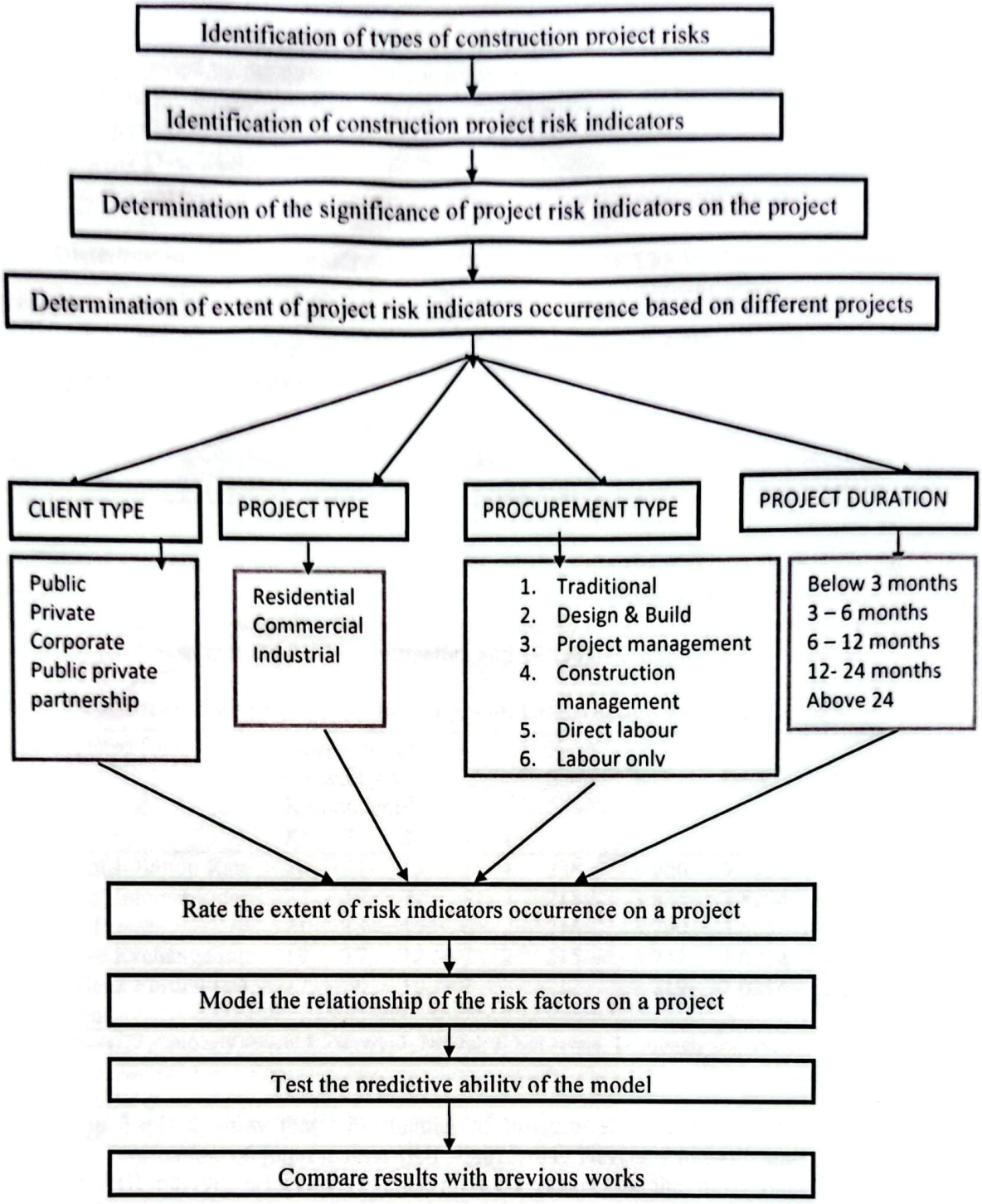

Fig 1: Conceptual Framework for evaluation of Risk Management Practice in the Construction Industry (Authors idea)

2. Research Method:

Data for the study were collated through a survey questionnaire administered to participants on building construction shareholders in Abuja, Port-Harcourt, Kaduna and Lagos state. These places where selected because of frequent construction activities that is carried out in these regions. The population for the study comprised of clients/developers, contractors and consultants who are involved in construction risk management. A total of 70 questionnaires

were distributed but 57 (81.43%) of the data were retrieved using Inductive research approach. data provided by the questionnaire were analysed using severity index (RII) which was them use to build the compressive risk management index (RMI).
Main text paragraphs.

3. Results and Discussion:

The result of the analysis of the participants on building construction projects are prepared below:

Table 1. Distribution of Questionnaires to the Shareholders In The Various States

Shareholders in the construction industry	Questionnaire Distributed in the various States				Total
	Abuja	Lagos	Kaduna	Port-Harcourt	
consultants	7	6	7	4	24(42.1%)
Contractors	6	5	3	3	17(29.8%)
Clients/Developers	4	5	3	4	16(28.1%)
Total	17(29.8%)	16(28.1%)	13(22.8%)	11(19.3%)	57(100%)

Table 1 shows the result of the questionnaire retrieved from the shareholders from different States. 29.8% of the questionnaires were retrieved from Abuja, 28.1% from Lagos and 22.8% from Kaduna state. Also according to the shareholders; 42.1% of the questionnaires were answered by the Consultant, 29.8% by Contractors and 28.1% by the Clients/ Developers.

Table 2. Assessment of Financial Risk Indicators on Construction Projects

Financial related Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	**4**	**3**	**2**	**1**				
Fluctuation of Inflation Rate	20	21	13	2	1	228	4.000	9.5551	1st
Fluctuation of Interest Rate	22	17	7	8	3	218	3.825	7.8294	2nd
Rise in Fuel Prices	21	13	15	6	2	216	3.790	7.5033	3rd
Fluctuation of Exchange rate	19	17	12	7	2	215	3.772	7.0214	4th
Change in Bank Formalities & Regulations	17	20	10	7	3	212	3.719	7.0214	5th

Note: [a]5 – Strongly severe; 4 – severe; 3- Neutral; 2- Not severe; 1- Strongly not severe

The result in Table 2 show that ''Fluctuation of Inflation Rate (RII =4.000, ST. Dev. =9.5551)'', ''Fluctuation of Interest Rate (RII =3.825, ST. Dev. = 7.8294)'' and ''Rise in Fuel Prices (RII =3.790, ST. Dev. =7.5033)'' were ranked as the most financial risk indicators affecting the construction industry. The mean Financial Index is ($\bar{\alpha}$ RII_F = 3.8212). Nigeria inflation rate is high 12.3% compared to many (BRICS) countries like Brazil, Russia, India, China and South Africa with inflation index of (7.4 -7.9%) in 2012 (BRICS forum website, 2013). Also the government of Nigeria in January (2012), increases the pump prices of fuel by 53% which in no small way has increased inflation rate in the country. The interest rate in Nigeria also vary from (12% - 22%), which is high compare to other developing counties which makes borrowing for construction projects very difficult. It is therefore clear that the construction industry which invest mostly in long term investment is faced with a lot of financial challenges and this requires aids from government to formulate beneficial economic policies. This could be achieved by strengthening of the existing financial policies and regulatory framework.

Table 3. Assessment of Management Risk Indicators on Construction Projects

Management Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Improper planning & budgeting	22	20	8	5	2	226	3.965	9.0443	1st
Poor communication	27	13	7	6	4	224	3.930	9.3434	2nd
Improper project feasibility studies	16	17	14	6	4	216	3.790	5.9833	3rd
Improper project organization-structure	19	17	11	6	4	212	3.719	6.5803	4th
Internal management problems	24	16	12	4	1	209	3.667	9.2628	5th
Absence of team work	17	16	15	8	1	203	3.651	6.8044	6th
Change of top management	17	15	16	6	3	198	3.474	6.4265	7th

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 3 show that '' Improper Planning & Budgeting (RII =3.965, ST. Dev. =9.0443)'', ''Poor Communication (RII =3.930, ST. Dev. = 9.3434)'' and ''Improper Project Feasibility Studies (RII =3.790, ST. Dev. =5.9833)'' were ranked as the most management risk indicators affecting the construction industry. The mean management Index is ($\bar{\alpha}$ RII_{Mg} = 3.787). The companies should go into arrangements such as joint ventures, partnering and alliancing in order to form a better management base.

Table 4. Assessment of Market Risk Indicators on Construction Projects

Market Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Increase of labour cost	20	17	13	5	2	219	3.852	7.7007	1st
Increase of material cost	17	14	13	8	5	201	3.526	4.8270	2nd
Competition from other companies	17	14	13	7	6	200	3.509	4.7223	3rd
Inadequate forecast about market demand	14	15	13	12	3	196	3.439	4.8270	4th

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 4 show that '' Increase of labour cost (RII =3.852, ST. Dev. =7.7007)'', ''Increase of material cost (RII =3.526, ST. Dev. = 4.8270)'' and ''Competition from other companies (RII =3.509, ST. Dev. = 4.7223)'' were ranked as the most market risk indicators affecting the construction industry. The mean market Index is ($\bar{\alpha}$ RII_{Mk} = 3.5815). It is estimated by Achuenu and Ujene (2006) that Material constitutes (42% and 79%) of total cost of projects for private and public projects respectively. This implies that any increase in price of material, shortage or wastage of material have a high impact on the construction cost. The government should therefore regulate and monitor the prices of essential construction materials like (cement) and make it available and affordable to the users. This can be done by creating enabling environment conducive for the producers of building materials.

Table 5. Assessment of Technical Risk Indicators on Construction Projects

Technical Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Shortage of skilful workers	23	18	8	8	0	227	3.982	9.0995	1st
Material shortage & thief	18	17	14	6	2	214	3.754	7.0569	2nd
Unknown site condition	18	16	12	7	4	208	3.649	5.8992	3rd
Design changes	16	14	16	8	3	203	3.561	5.7271	4th
Poor quality of procured materials	14	17	15	8	3	202	3.544	5.7706	5th
Accidents on site	17	14	13	7	6	200	3.509	4.7223	6th

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 5 show that '' Shortage of Skilful Workers (RII =3.982, ST. Dev. =9.0995)'', ''Material Shortage & Thief (RII =3.754, ST. Dev. = 7.0569)'' and ''Unknown Site Condition (RII =3.649, ST. Dev. = 5.8992)'' were ranked as the most severe Technical risk indicators affecting the construction industry. The mean Technical Index is ($\bar{\alpha}$ RII_T = 3.6665). The construction industry usually employed worker periodically due to the nature of the work been carried out. This makes the industry suffers shortage of skilled workers and abundant of unskilled workers. Some contractors even abandon the project after mobilization for political reason while the staffs are left with no option than to quit. Also frequent in the construction industry is the issue of design change, cost overrun and time overrun due to inadequate specification at the commencement of the project (Adewuyi & Anigbogu, 2006). The construction industry should therefore involve the contractor during the appraisal stage of the project to reduce technical risk on the project.

Table 6. Assessment of Legal Risk Indicators on Construction Projects

Legal Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Breach of contract by project partners	19	17	12	7	2	215	3.772	7.0214	1st
Improper verification of contract document	16	14	17	8	2	205	3.597	6.4031	2nd
Law of arbitration clause in contract agreement	18	16	12	6	3	205	3.597	6.4031	3nd
Lack of enforcement of legal judgment	16	17	13	6	5	204	3.579	5.5946	4th
Dispute	15	14	13	9	6	199	3.491	3.7815	5th

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 6 show that '' Breach of Contract by Project Partners (RII =3.772, ST. Dev. = 7.0214)'', ''Improper Verification of Contract Document (RII =3.597, ST. Dev. = 6.4031)'' and ''Law of Arbitration Clause in Contract Agreement (RII = 3.597, ST. Dev. = 6.4031)'' were ranked as the most severe Legal risk indicators affecting the construction

industry. The mean Legal Index is ($\bar{\alpha}$ RII_L = 3.6072). Legal means of settling dispute in Nigeria constitute a lot of money and time and arbitration is really used. Most of the forms of awarding contracts in Nigeria should include arbitration clause that will resolve disputes from time and cost overrun, variation and fluctuation and minimize legal risk on projects.

Table 7. Assessment of Political Risk Indicators on Construction Projects

Political Risk Indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Change of government policies	18	17	14	6	2	214	3.754	7.0579	1st
Bureaucracy	18	16	12	6	3	205	3.597	6.4031	2nd
Corruption/ bribery	14	15	13	12	3	196	3.439	4.8270	3rd

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 7 show that '' Change of government policies (RII =3.754, ST. Dev. = 7.0579)'', ''Bureaucracy (RII =3.597, ST. Dev. = 6.4031)'' and ''Corruption/ Bribery (RII = 3.439, ST. Dev. = 4.8270)'' were ranked as the most severe political risk indicators affecting the construction industry. The mean legal Index is ($\bar{\alpha}$ RII_P = 3.5967). In Nigeria, if the government/party changes, the policy will therefore change and many of the construction projects will be abandoned. Abandonment of project by government is always present but varies from states to states. Some of the government officers deliberately delay the approval of interim valuation by the contractors to delay projects that are not beneficial to them. Continuation of policies and projects, of past government and transparency in the award of construction contracts should be encouraged in the construction industry.

Table 8. Assessment of Environmental Risk Indicators on Construction Projects

Environmental risk indicators	Degree of severity quoted by 57 Respondents[a]					% Score	R11	ST. DEV.	Rank
	5	4	3	2	1				
Change in climatic condition	17	20	10	7	3	212	3.719	7.0214	1st
Environmental Impact of the project	24	16	12	4	1	209	3.667	9.2628	2nd
Healthy working Environment for the workers	18	16	12	7	4	208	3.649	5.8992	3rd
Stiff environmental regulations	17	14	13	8	5	201	3.526	4.8270	4th

Note: [a]5 – very severe; 4 – severe; 3- neutral; 2- less severe; 1- not severe

The result in Table 8 show that '' Change in climatic condition (RII =3.719, ST. Dev. = 7.0214)'', ''Environmental Impact of the project (RII =3.667, ST. Dev. = 9.2628)'' and ''Healthy working Environment for the workers (RII = 3.649, ST. Dev. = 5.8992)'' were ranked as the most severe environmental risk indicators affecting the construction industry. The mean environmental Index is ($\bar{\alpha}$ RII_E = 3.6403). Environmental factors that affect construction projects include season, nature of the soil and topography of the soil. Contractors are supposed to put in place measures that will enhance the health and safety of their workers in order to reduce accidents on site. The environmental impact assessment (EIA) of the project should also be assessed to reduce negative impact of projects on the environment. All this constitute environmental risk to the company.

Table 9. Weighted Values of the Various Risk Types in the Construction Industry.

Risk type	Mean index ($\bar{\alpha}$ RII)	ranks	Weighted value(W)
Financial risk(F)	3.8212	1	7
Management risk (Mg)	3.7870	2	6
Technical risk(T)	3.6665	3	5
Environmental risk (E)	3.6403	4	4
Legal risk (L)	3.6072	5	3
Political risk (P)	3.5965	6	2
Market risk (Mk)	3.5816	7	1

Table 9. shows the summary of the mean index and the weighted values of all the risk affecting construction industry. From the result of the research, financial risk was ranked first, followed by management risk. This work is in agreement with the study by Ojo (2010) Windapo, et al. (2010); Joshua (2010) & Abu, Khor & Rahmawaty (2011) which all agreed that risk is not properly managed in the construction industry in Nigeria. The application of Risk Management Index (RMI) will therefore enhance performance of construction projects in Nigeria.

Establishing of the Risk Management Index (RMI)

Indices are widely used in performance evaluation and have proven useful in locating weaknesses in overall design systems (Bell & Morse, 1999). The index is generally a number derived from the collection of a broad range of individually generated values or indicators that are used to characterize or evaluate specific aspects of the system (Gray & Carton-Kenny, 2004).

The risk indices comprised of 34 indicators categorized by site, design, construction and social factors. The criteria used in the selection of risk indicators included: policy relevance, simplicity, validity, reality, adequate scope and openness. The overall score of the risk index on a construction project is calculated by using the proposed formula below:

$$RMI = \frac{\sum \bar{\alpha}RII_n \times W_n}{N(\sum W)}$$

Where C***RMI*** is the comprehensive risk management index
$\bar{\alpha}$RII is the mean severity index of the various risk types
W is the weighted value attribute to the indicator of the risk type
And **n** is numerical indicator for each of the risk type. Therefore,

$$RMI = \frac{\bar{\alpha}RII_F W_F + \bar{\alpha}RII_{Mg} W_{Mg} + \bar{\alpha}RII_T W_T + \bar{\alpha}RII_E W_E + \bar{\alpha}RII_L W_L + \bar{\alpha}RII_P W_P + \bar{\alpha}RII_{Mk} W_{Mk}}{N(\sum W)}$$

Where $\bar{\alpha}RII_F$ represent mean Financial risk, $\bar{\alpha}RII_{Mg}$ represent Management risk,
$\bar{\alpha}RII_T$ represent Technology risk, $\bar{\alpha}RII_E$ represent Environmental risk,
$\bar{\alpha}RII_L$ represent Legal risk, $\bar{\alpha}RII_P$ represent Political risk and
$\bar{\alpha}RII_{Mk}$ represent Market risk of construction projects.

The RMI according to the research survey is calculated as;

$$RMI = \frac{3.821(7) + 3.787(6) + 3.667(5) + 3.640(4) + 3.607(3) + 3.597(2) + 3.581(1)}{7(7+6+5+4+3+2+1)}$$

$$RMI = \frac{26.7484+22.722+18.335+14.560+10.821+7.194+3.581}{7(28)}$$

$$RMI = \frac{103.961}{7(28)} = \frac{3.71289}{7} = \mathbf{0.5304}$$

The result of (RMI) is 0.5304 which indicated that construction industry is exposed to 53.04% risk. This is the result of all the risk factors put together

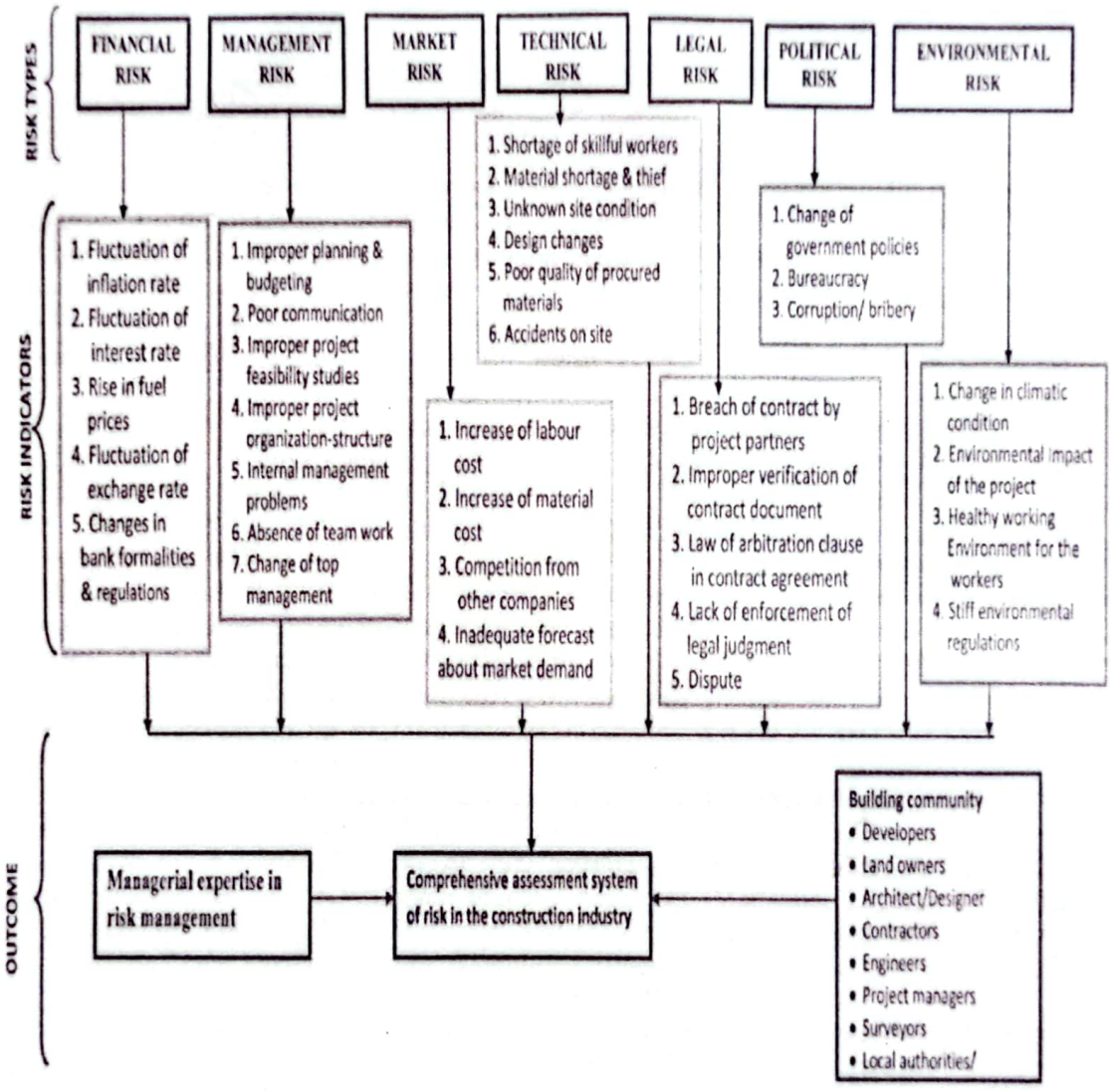

Fig 2. **Conceptual Frameworks for Risk Management Index (RMI) (Authors idea)**

3. Conclusion:

This study evaluates the procedures, practices and the policy issues involved in risk management and the establishment of Risk Management Index (RMI in the Nigeria construction industry. a framework was developed to rate construction projects risk by taking into account all the risk types in the industry. Data for the study were collated through a

survey questionnaire administered to participants on building construction shareholders in Abuja, Port-Harcourt, Kaduna and Lagos state. The data were analysed using Relative Important Index (RII) to calculate the mean index and the weighted average which is them use to generate (RII). The result of the weighted average indicated that risks are not properly managed in the construction industry in Nigeria. The result of (RMI) is 0.5304 which indicated that construction industry is exposed to 53.04% risk.

In conclusion the (RMI) will reduce cost and time overrun and improves the quality of construction project. The risk index will also help government at all levels to develop a strategy to reduce risk on construction projects, will assist construction investors and developers to make decisions on their project and will enable banks to carry out feasibility and viability analysis on the project before they engage their service. In addition, the insurance companies will also rate construction risk using the (RMI) to determine the risk index of the project. From the analysis above, it becomes imperative that efficient in risk management will have positive effect on the Nigeria construction industry and the economy at large.

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