LIFECYCLE RISK ANALYSIS OF BUILDING PROCUREMENT ROUTES

ABSTRACT

Risk management today is an integral part of project management. The risks and opportunities within the scope of a project are managed through by Project Management with the allocation of functional responsibilities to members of the project team. Ultimately, the responsibility of the effectiveness of risk management lies within project management, since the project manager is responsible for the achievement of goals of project management.

There is a direct correlation between effective Risk Management and project success.

Risk management is a tool for managing projects effectively throughout their life cycles.

This paper is to contribute to the body of knowledge on Risk Management in Building Procurement Routes and help Project Managers to adopt / recommend the appropriate route based on clients' goals after diligent risk analysis and measurement and follow through to a successful outcome.

KEYWORDS - Building lifecycle, Risk, Risk Management, Procurement,

OBJECTIVES OF STUDY

This study is to contribute to the body of knowledge of Risk Management in Project Management and to provide an informed reasoning template for practitioners in advising on procurement system and achieving the goals of a client and overall project success.

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1. INTRODUCTION

Risk management today is an integral part of project management. The risks and opportunities within the scope of a project are managed through by Project Management with the allocation of functional responsibilities to members of the project team. Ultimately, the responsibility of the effectiveness of risk management lies within project management, since the project manager is responsible for the achievement of goals of project management. (Olsson (2007) [1].

There is a direct correlation between effective Risk Management and project success. (Olsson (2007) (op cit)

Risk management is a tool for managing projects effectively throughout their life cycles.

1.1 KEYWORDS - Building lifecycle, Risk, Risk Management, Procurement,

1.1.1 Building lifecycle –

Building lifecycle represents the cumulative phases of development process. It spans from the conceptual stage to the decommissioning stage.

Building whole lifecycle can be broadly classified as follows:

1. Conception
2. Design
3. Construction
4. Commission
5. Use and maintenance including future reconfigurations
6. Decommission

1.1.2 Risk –

Every Endeavour in life is fraught with risk which needs to be managed either by avoidance, allocation or mitigation.

Hillson D (2004) [2] as quoted by Olsson (2007) (op cit) defines Risk as ***"any uncertainty that, if it occurs, would affect one or more project objectives."***
Sometimes Risk and Uncertainty are used interchangeably, however, Risk is measurable and has negative impacts on projects, if it does occur, uncertainty, on the other hand is an un-measurable genuine occurrence that may have positive or negative effect on a project. This was further confirmed by Smith, Nigel (2002) [3] in his contribution to **Best Value in Construction**
Willet A.H. (1901) as quoted by Webb [4] defined Risk as ***'the objectified uncertainty regarding the occurrence of an undesirable event'***
The above definition contains four elements: viz;

i) That the risk event is 'objectified' that is, not merely of the mind (subjective) but a de facto reality
ii) That uncertainty about it exists
iii) That it can occur, and
iv) That the result is undesirable.

Association for Project Management Body of Knowledge 5th edition defines Risk as "an uncertain event or set of circumstances, that should it occur, will have an effect on achievement of one or more project objectives" APM Body of Knowledge 5th ed. S2.5 [5]

1.1.3 Risk Management

Risk Management is not about prediction but the purpose is to provide information to enable the Project Manager make informed and better decision based on the measurement and analysis of likely and identified risks at any time throughout the lifecycle of a project. Smith N. (2002) (op cit) identified 2 factors that made the understanding of Risk Management difficult; viz

i) a lack of clarity of the purpose of risk management and

ii) That risk management is an iterative process reflecting the dynamic nature of risk within the project lifecycle.

Risk management was defined functionally by Thevendran V. and Mawdesley M.J. (2003) [6] as ***" a continuously monitored integrated formal process for defining objectives, identifying sources of uncertainties, analyzing these uncertainties and formulating managerial responses, to produce an acceptable balance between risk and opportunities."***

APM Body of Knowledge (op cit) explains risk management as "… a structured process that allows individual risk events and overall project risk to be understood and managed proactively, optimizing project success by minimizing threats and maximizing opportunities."

1.1.4 Procurement -

Procurement is the process of acquiring new services or products and includes contract strategy, contract documentation and contractor selection. It extends to all members of the supply chain, including those responsible for operation and maintenance. Bower, D (2003) [7]. The APM Body of knowledge 5th ed. (op cit) states that ***"The procurement strategy should include potential sources of supply, terms and types of contract/procurement, conditions of contract, the type of pricing and method of supplier selection."***

A procurement strategy identifies the best way of achieving the objectives of the project. The aim of a procurement strategy is to achieve the optimum balance of risk, innovation, control and funding for a particular project. *www.dpws.nsw.gov.au*

2.0 RISK MANAGEMENT PROCESS

The key principles of risk management as outlined in the APM PRAM Guide 2nd edition are:

- initiate: here the scope, objectives and context for the Risk Management process are set

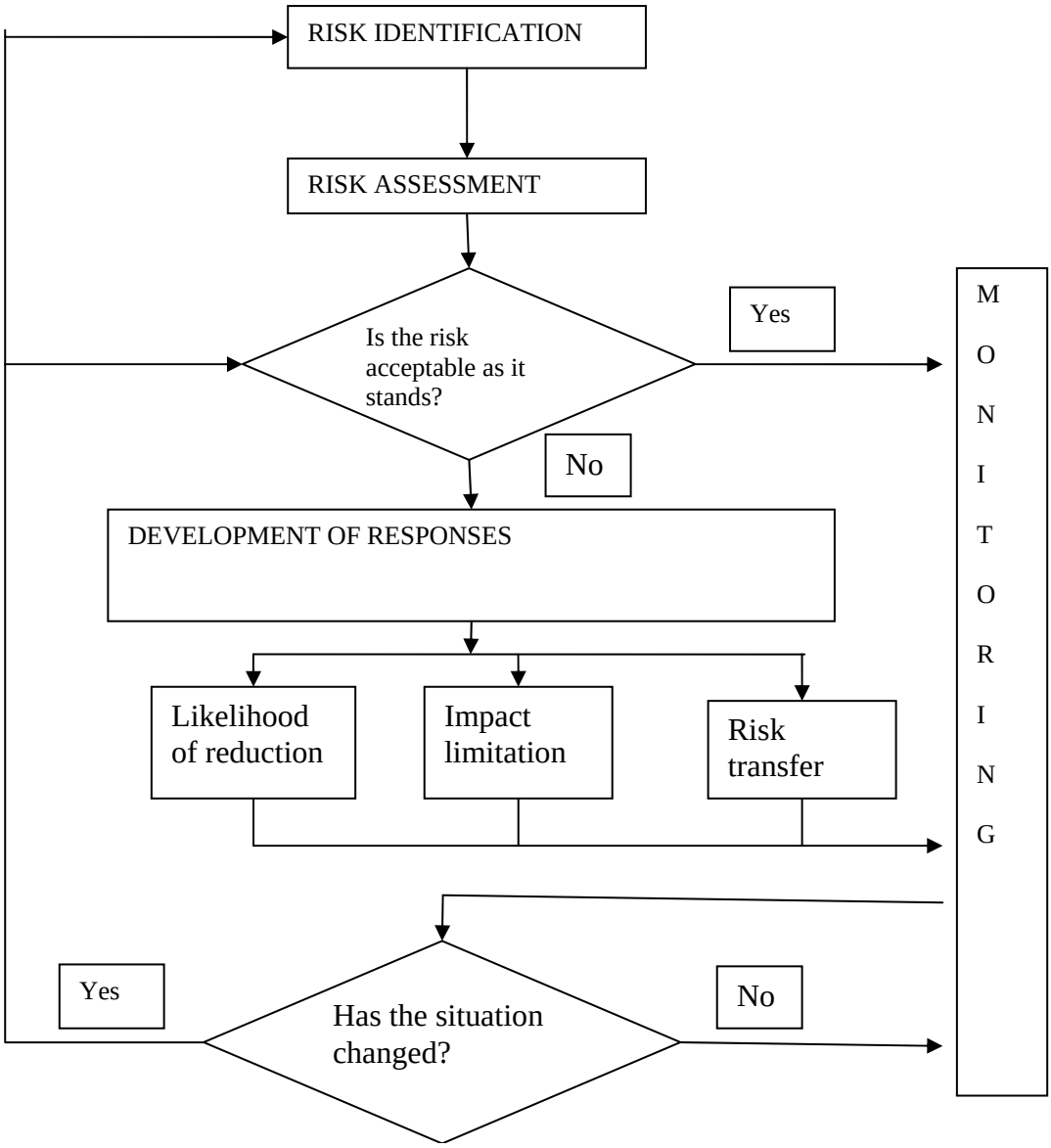
- identify: enable risk events relevant to a project to be identified
- assess: increase level of understanding of identified risk event for appropriate action to be taken
- plan: develop an effective plan which incorporates the result from earlier risk manage net phases
- manage / implement responses: ensure effective action is taken to implement risk responses targeting individual risk events and actions affecting the overall strategic planning and direction of the project.[8]

There is a general consensus in current literature of Risk Management which identifies 4 core steps in the process of Risk Management as follows:

- Risk Identification
- Risk Analysis
- Risk Response
- Risk Monitoring

There is a continuing research effort in the development of various risk identification,

2.1 RISK MANAGEMENT PROCESS ILLUSTRATION



The generalized risk management process – adapted from Alan Webb (2003) [op cit]

There is a continuing research effort in the development of various risk identification, Analysis and response techniques, in order to ease decision - making regarding a project's future.

2.2 EFFECTIVE RISK MANAGEMENT

Effective Risk Management seeks to allocate risks to those better able to manage them

2.2.1 Risk Identification:

Redmill [9] (2002) as quoted by Ghosh, et al [10] explained that the purpose of identifying the source of risk is to prevent the events that can go wrong and lead to loss. Shen [11] went further to state that the purpose of risk identification should go beyond preparing a list of like factors but also to identify the importance of those risk factors. Chapman and Ward [12] while agreeing called for creativity and imagination in Risk identification. Various approaches ranging from directed - thinking approach, questionnaire, brainstorming and using checklists were recommended.

2.2.2 Risk Analysis

On identification of risk factors, the factors are analyzed within the context of the project objectives, environmental and economic conditions, political conditions, human factors and customs, etc to attach the necessary importance. A couple of scientific techniques such as Monte Carlo simulation, Bayesian analysis, Delphi methods, Utility theory, value at risk theory, Sensitivity Analysis etc are used to quantitatively assess the impact of the Risk factors on project outcomes.

2.2.3 Risk Response

Identifying and assessing risks may be relatively easier, the most crucial stage of risk management process is the plan on how to respond, since the effectiveness of responses will directly determine whether risk exposure increases or decreases on the project.

David Hillson (1999) [13] identified a number of important criteria that Risk Response must meet in order to be effective.

2.2.3.1 Appropriate – the correct level of response must be determined based on the "size" of the risk. This ranges from a crisis response where the project cannot proceed without the risk being addressed through to a 'do nothing' response for minor risk.

2.2.3.2 Affordable – the responses must be cost effective and each risk response should have an agreed budget. All risk responses carry cost and the cost depends on gravity and likely project outcome impact.

2.2.3.3 Timely - appropriate timeliness depending on the degree of the risk should be determined. Some risks require immediate action while others can safely be left until later.

2.2.3.4 Achievable – risk responses must be realistically achievable, must be technically feasible and within the scope of the respondents capability and responsibility.

2.2.3.5 Effective – all proposed responses must be capable of dealing effectively with the Risks. A post response risk assessment of the size of the risk assuming effective implementation of the response will help to determine this.

2.2.3.6 Agreed – the responses must by agreeable to all stakeholders, who will have a part to play in the responses.

2.2.3.7 Owned – each response should be assigned and accepted by a party to ensure a single point of responsibility and accountability for implementing the response.

2.3 Strategies for Planning Risk Responses

Hillson (1999) (supra) classified the strategies into 4 groups

2.3.1 Avoid - seeking to eliminate the uncertainty

2.3.2 Transfer – Passing ownership and /or liability to a third party

2.3.3 Mitigate – reducing the size of the risk exposure below an acceptable threshold

2.3.4 Accept – recognizing residual risks and devising responses to control and monitor them.

In determining an appropriate strategy, first step is to ensure that responses are aiming for the same goal.

Each risk should be considered on its own merit and the principle of allocating risks to those better able to manage them should help in the strategic planning.

Risk responses within each strategic group may include;

Avoidance –

(i) Direct –

This may be able to deal with risks arising from

a) lack of knowledge and for which acquisition of knowledge and expertise, through research, recruitment, training etc. will suffice
b) Where the cause of the risk is identifiable, the source may be removed or the causal chain broken to make it impossible for the risk to occur.

(ii) Indirect

This involves doing the project in a different way, to eliminate the uncertainty or making the impact irrelevant to the project. This may include:

- changing the scope of the project to exclude risky elements
- Adopting a familiar approach instead of an innovative one
- Using proved technology and methodology instead of a leading edge.
- Building redundancy into the project design.

Transfer.

Under this strategy financial losses can be insured with a third party and expertise can be outsourced to enhance quality and performance. Lost time may not be recovered but can be nearly quantified financially for transfer.

Risk transfer can include use of insurance, performance bonds, warranties and guarantees or use of appropriate form of contract e.g. cost - plus, fixed - cost, liquidated damages, target-cost incentivisation, partnership et.c.

Mitigation.

It is not all risks that can be addressed by avoiding or transfer responses, hence mitigation and or acceptance may be the strategies to employ.

The purpose of risk mitigation is to reduce the 'size' of the risk exposure to below a threshold of risk acceptability. For effective Risk response performance measurement, the threshold of Risk acceptability should be clearly defined before embarking on any mitigation. Acceptable risk can be determined in terms of risk severity (high/medium/low) or using a probability-impact ranking system (p-1 scores).

Risk can be mitigated by tackling either its probability to make it less likely, or its impact to make it less severe or both. Preventative responses tackle the causes of the risk, seeking to reduce the chance of the risk occurring. Similarly, impact drivers which determine the extent of severity of the risk may be addressed.

Early action to protect against the worst effect of a risk can make it more acceptable, than a curative response

Acceptance.

Residual risks, remaining after adopting the above strategies and these include minor risk where any other response is not likely to be cost effective in comparison to the possible cost of bearing the risk impact.

These must also be proactively managed and the project must recognize and accept these risks while adopting responses to protect against their occurrence.

Common approaches to Risk Acceptance response include;

- Contingency planning – in terms of time, money or resource to account for both known and currently unknown risks.
- Development of a risk-aware culture in the project and organization.
- Incorporating Risk Management into routine project processes, with regular risk reviews, reports and updates.
- Taking account of identified risks and agreed responses in project strategy, including appropriate activities in the project plan and budget.

Where risks with high potential impact must be accepted, fallback plans should be developed to be implemented in the case of the risk occurring.

2.3 Risk Monitoring

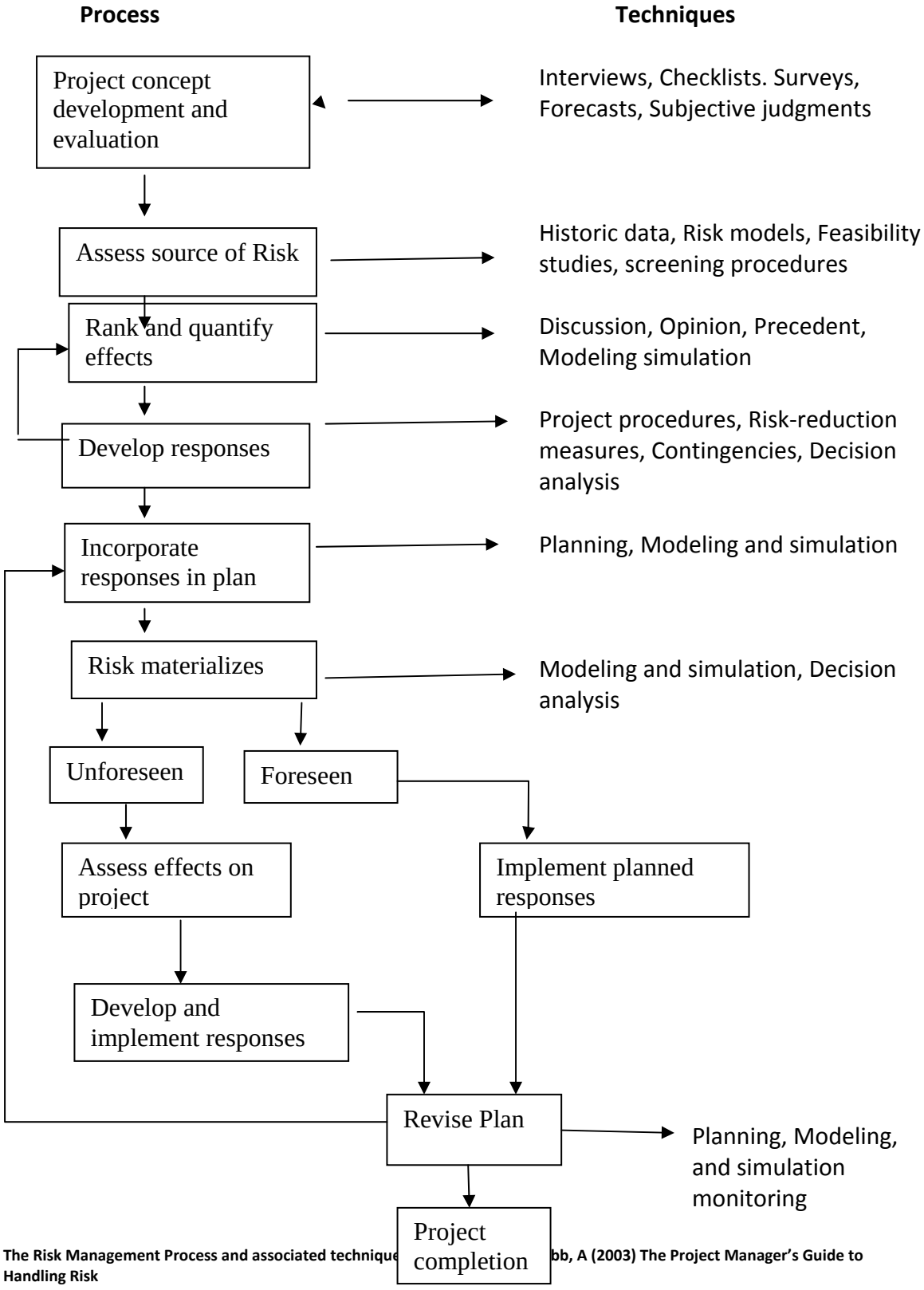
A regular review of the probability of occurrence of the identified risk pre and post contract should be undertaken.

Each risk with the response strategy adopted as well as how effectively the risk-owner is bearing it should be monitored.

This information should be documented in the Project Handbook and a Risk register opened in the course of the project to document the information. Patterson, F & Neaily, K (2002) [14]

A Risk Register is an extremely effective tool to enable everyone involved in a project to consciously evaluate and manage risks as part of the decision making process. It is useful for today and tomorrow's Risk Management process.

2.4 The Risk Management Process and Techniques



The Risk Management Process and associated techniques, Adapted from Chapman, C and Cooper, D and Chapman, P and Webb, A (2003) The Project Manager's Guide to Handling Risk

3.0 PROCUREMENT ROUTE (SYSTEM)

Franks J. in Building Procurement Systems (1998) [15] describes procurement systems in development as the amalgam of activities undertaken to obtain a building:

3.1 TYPES OF PROCUREMENT SYSTEMS

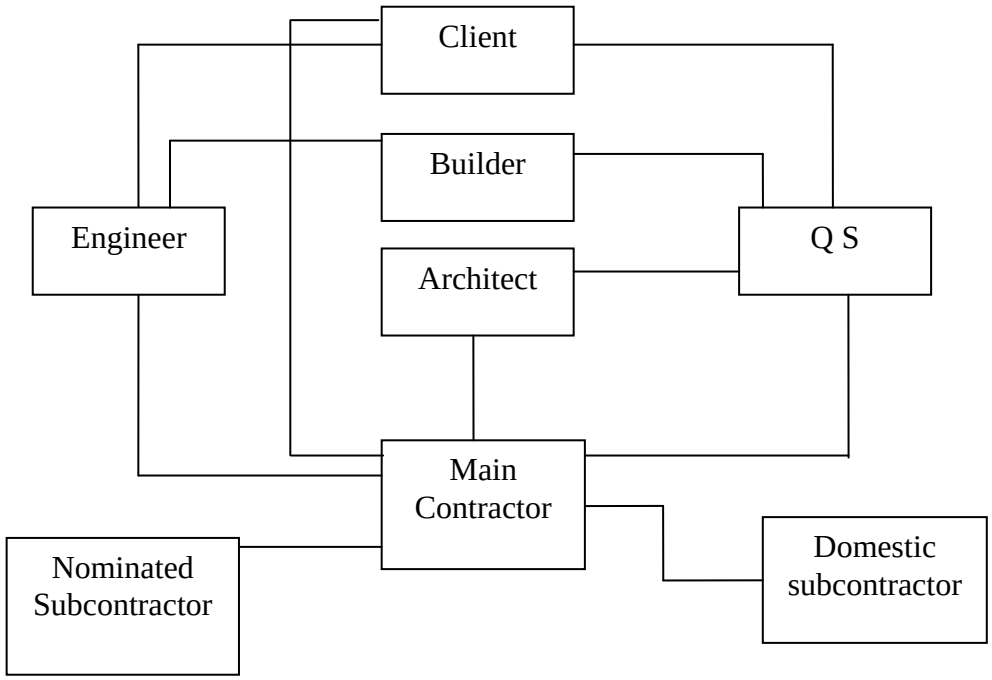
The majority of procurement systems came within four main types;

- 3.1.1 Traditional – usually designer led with competitive tendering
- 3.1.2 Design and Build (D & B) usually contractor led
- 3.1.3 Management Contracting (MC) usually designer led for a fixed fee
- 3.1.4 Construction Management (CM) usually designer led for a fixed fee

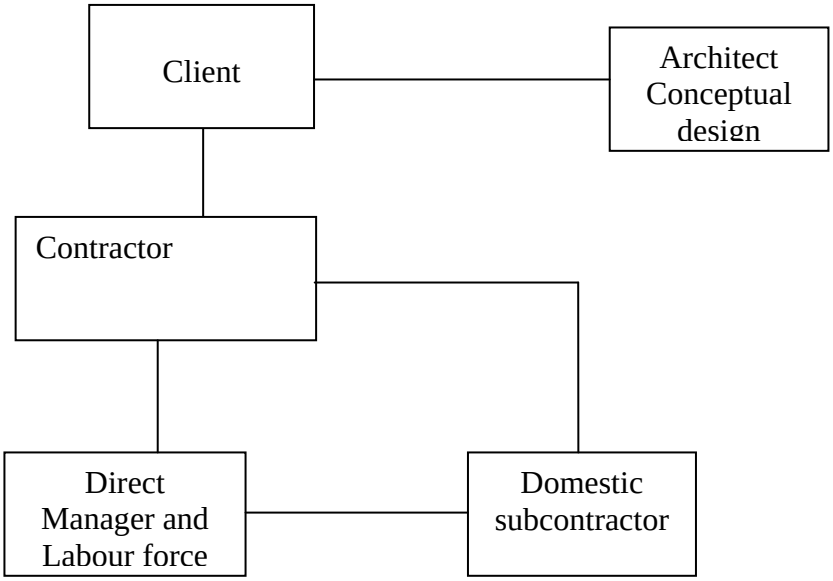
An addition that became fashionable in the 1990's is partnering. Partnering is not strictly a procurement system, but a culture and a mental attitude of win-win.

According to the guide 'Trusting the Team', produced by the Reading Construction Forum, [16] partnering is a management approach used by two or more organizations to achieve specific business objectives by maximizing the effectiveness of each participant's resources.

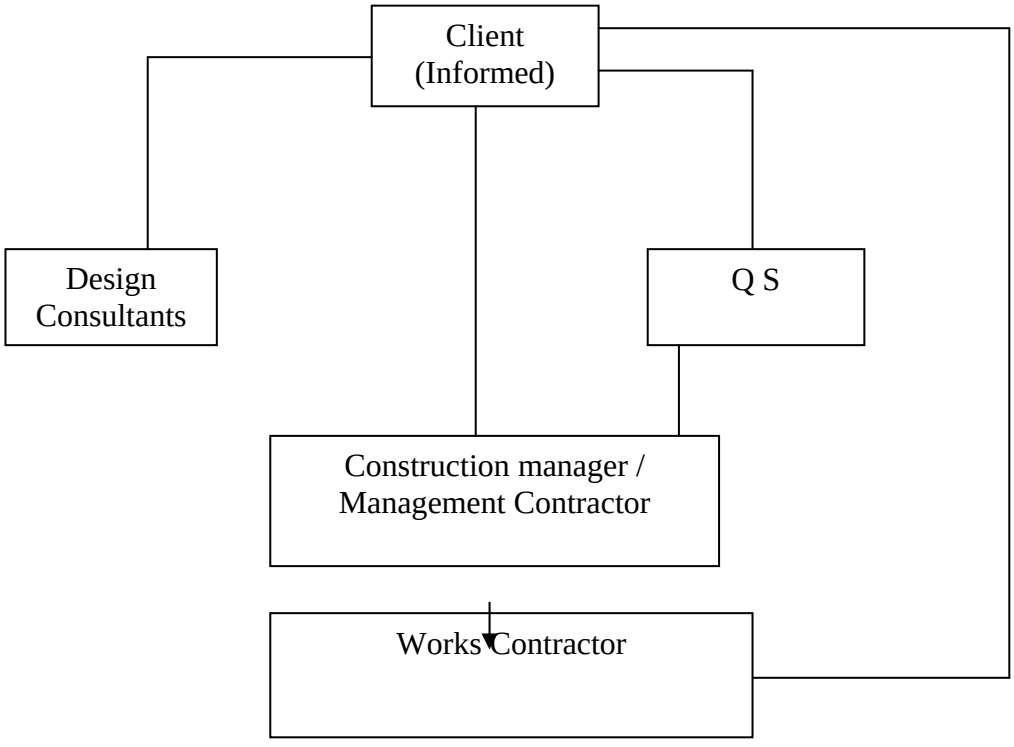
3.1.1 Traditional Procurement Structure



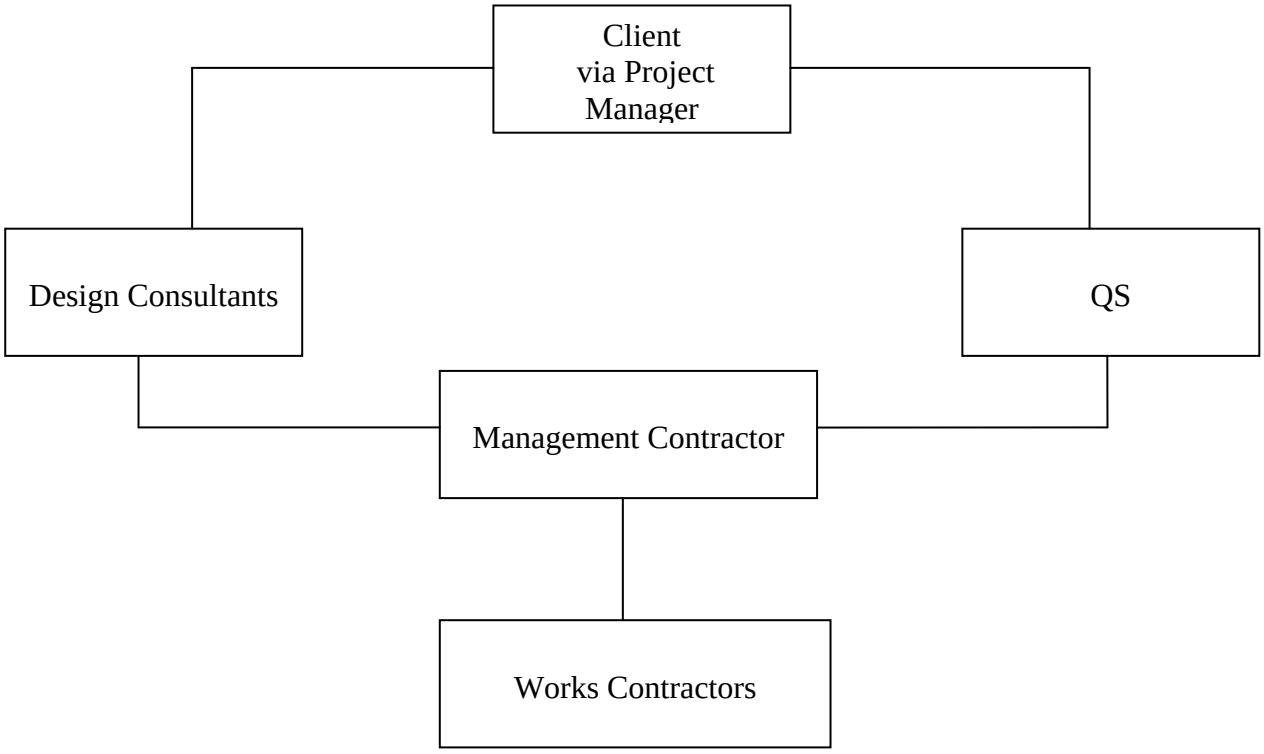
3.1.2 Design and Build Structure



3.1.3 Contract Management



3.1.4 Management Contracting



3.2 COMPARING PROCUREMENT STRATEGIES' CHARACTERISTICS

The various contract procurement systems are suitable for different client preferences, circumstances and objectives. The primary goal of a contract strategy should be to achieve the client's objectives, as observed by Bower, D (2003) (op cit) and this should incorporate the following:

- Client involvement
- Allowing for changes
- Motivation of contractors
- Best risk allocation
- Cash flow of the client and the contractor

4.0 IDEAL GOAL OF PROJECT MANAGEMENT

The ideal goal of Project Management is to deliver a project to specification within time and cost budgets

4.1 Procurement Systems and the ideal goal of Project Management

A comparison of the systems against the ideal goal of Project Management is as follows:

Procurement system	**time**	**cost**	**specification**
Traditional	weak	weak	strong
Design and Build	strong	strong	weak
Contract Management	Strong/weak	strong	strong
Management Contract	strong/weak	weak	strong

4.2 Procurement Matrix chart

Client's objectives		**Appropriateness of Procurement Systems**			
Aspect	**Objective**	**traditional**	**Design & build**	**Construction management**	**Management contracting**
Timing	early completion	No	Yes	Yes	Yes
Cost	Price certainty before Construction start	yes	yes	No	No
Quality	Prestige level in design and construction	Yes	No	Yes	Yes
Variations	Avoid prohibitive Costs of change	Yes	No	Yes	Yes
Complexity	Technically advanced				

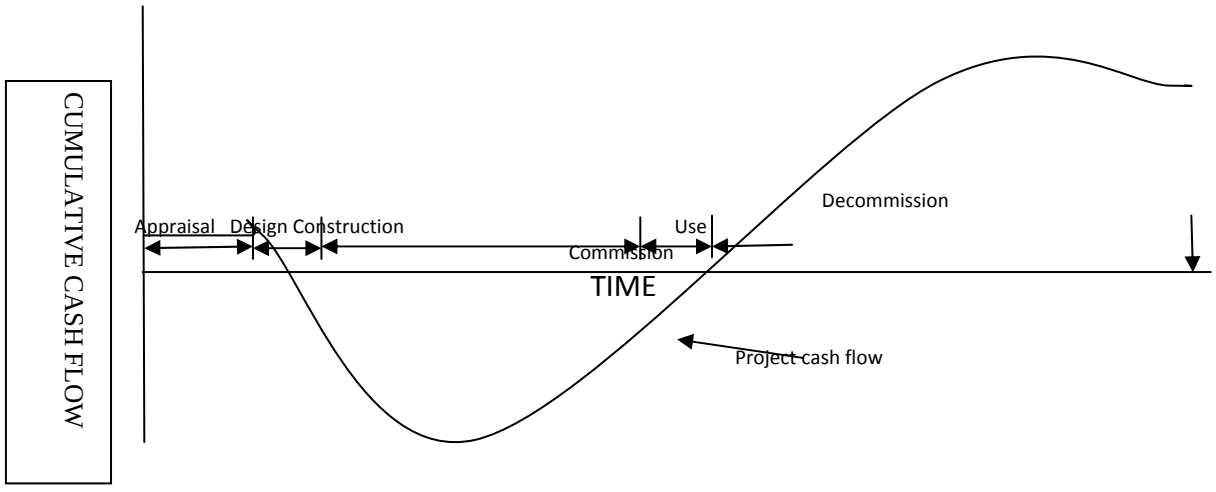
	Or highly complex Building	Yes	Yes	Yes	Yes
Responsibility	Single contractual Link for project Execution	No	Yes	No	No
Risk Avoidance	Desire to transfer Complete risk	No	Yes	No	No
Damage recovery	Ability to recover Costs direct from Contractor	yes	Yes	No	yes

Adapted from CEM Notes on DSP [17]

5.0 LIFECYCLE RISK ANALYSIS OF PROCUREMENT SYSTEMS.

This analysis will be undertaken against the ideal goal of Project Management.

The ideal goal of Project Management is to deliver a project to time and cost budgets as well as agreed specifications. Any negative deviation is a financial loss to the sponsor. Olawore, A (2000) [18]



Relationship between project cash flow and project cycle – Adapted from N Smith (Risk Management) [op cit] p101 Best value in construction

5.1 Risk Analysis and Management Methods.

Having identified and classified risks, the analysis of the various risks and their impact on the project framework can be carried out with a number of methods but the following suggested methods (Webb, A 2003) (op cit) will considered here

5.1.1 Impact and probability

Impact and probability as a method of Risk Analysis, seeks to establish the place of individual risks in a project framework based on a ranking established through an Impact-Probability scoring grid.

5.1.2 Robust Projects

A Robust project has a response plan or programme incorporated that addresses many of the broad spectrum of risks earlier identified, with a view to neutralizing their effects.

Such a plan will adequately plan for ownership of risks and allow for adequate compensation for accepting such risk.

5.2 RISK ANALYSIS OF PROCUREMENT ROUTES

5.2.1 SCORING LEGEND

		Impact	Probability	
Rating		**Score**	**Score**	**Performance**
Very high	V.HI	1.0	1.0	significant failure or major setback
High	HI	0.8	0.8	failure that involves significant modification
Medium	Med	0.5	0.5	failure that causes additional work but containable
Low	Lo	0.1	0.2	impact has some effect causing rework but minor
Very Low	V.Lo	0.01	0.1	little impact, minor inconvenience, easily remedied

A. Boussabaine & R. Kirkham (2004) [19] identifies 4 stages in the project design processes for the purposes of whole lifecycle risk identification thus;

- Inception / feasibility
- Scheme design
- Detailed design
- Pre construction

At all phases, the identified risks can be categorized as follows, for ease of analysis:

- WLC estimate risk
- Technical risk
- Financial and economic risk
- Market risk
- Organizational risk
- Operation risk
- Schedule risk
- Political risk.

A typical spreadsheet for Risk Analysis, Assessment and Response for the Inception Stage of a Project, using data obtained in preliminary studies within the Nigerian construction industry will be as follows.

It is however, important to note that Risk Assessment is subjective, based on the client's objectives.

CLIENT'S OBJECTIVE - OPTIMUM RETURNS								
PHASE	STAGE	RISK ID	IMP ACT	PROBA BILITY	SCORE	RANK ING	RESPONSE	
Inceptio	Design/ Feasibilty	**inadequate project formulation, investigations and technical specifications**	0.8	0.4	0.32	5	consider making use of audit experts	
		Lack of proper financial appraisal of the project	0.8	0.8	0.64	1	review assumptions and use economic performance indicators. Validate analysis results	
		Incomplete feasibilty studies	0.8	0.3	0.24	7	Define scope of feasibility studies	
		difficulty in understanding and setting project objectives	0.8	0.2	0.16	9	**make sure that whole objectives are quantified and explained to clients**	
		wholelife parameters not identified at outset	0.8	0.7	0.56	2	make sure that WLC parameters are part of feasibility studies	
		Ill defined project quality parameters	0.9	0.3	0.27	6	make sure that quality parameters are included in the feasibility studies	
		responsibilities between stakeholders ill defined	0.8	0.6	0.48	4	All participants to be part of decision making process with unity of purpose	

		responsibilities between stakeholders ill defined	0.8	0.6	0.48	4	All participants to be part of decision making process with unity of purpose	
		team composition is inadequate and unbalanced	0.8	0.3	0.24	7	make sure that expert skills are identified at early stage	
		inadequate review and preparation of planning and environmental application	0.9	0.6	0.54	3	prepare and submit all necessary documents and feasibility study report in a timely manner to government departments for approval	

Each procurement system will be subjected to the above analysis and decision as to the most appropriate route to achieve the client's objective will be made based primarily on the ranking and response to the identified risks and secondarily on other intangible human factors.

6.0 CONCLUSION

In conclusion, Risk Identification and measurement is a subjective exercise that depends on the circumstances and objectives of a client, however, empirical Risk Analysis of individual project is required by every Project Manager for project success.

There is no single size fits all but a list of possible risks in the lifecycle of a building can be put together through the various risk identification techniques, already mentioned.

Thank you

Akin Olawore

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