Value Engineering & Value Management Evaluation of Civil Engineering Construction of Community Hub Multi-Functional Single Facility Project

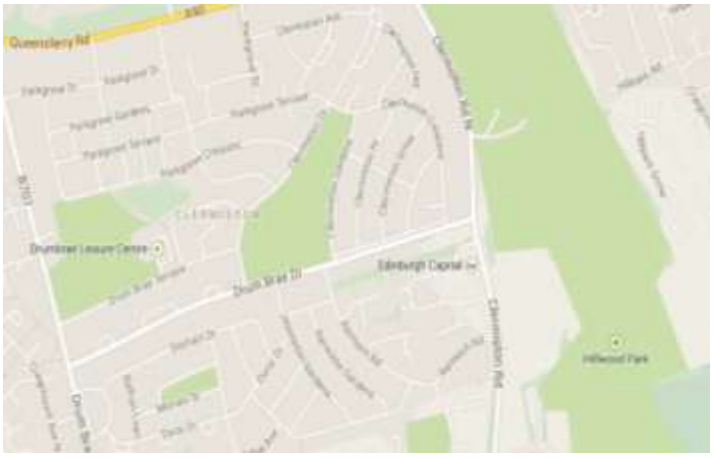
Saleh M. A., Ashiru M. Ashiru, Sanni. J. Enewo, Alabi J. Oricha & Aliyu M. A.
Department of Civil Engineering Technology,
P.M.B 001,
The Federal Polytechnic Nasarawa,
NIGERIA (Zip code 962101)
salehtawa@yahoo.com

Abstract
Civil engineering project are usually complex to deal with. However, through effective VRM approach, and by following the basic principles of VM and VE analysis, several internal and external risks and uncertainties are identified and are dealt with within the project phases, but it cannot be ignored. Consequentially, when these risks are ignored, it will however compromise the quality of work, client satisfaction will be lacking, increased in budgetary allocation, profit reduction, insolvency and stakeholder's reputation will be jeopardised. VM deals with functional rewards to justify investment for a project i.e. its business driven and technically oriented. While VE is a derivative of VM that deals with the sequential execution of technically oriented project through its life cycle for optimum performance and set objectives. Similarly, VM and VE were used to evaluate this project through RIBA PoW 2013, and had identified 6 major stakeholders in this project, and their interest were prioritized by NAO and CABE Value Drivers.

Keywords: *Project; Stakeholders; Value Drivers; Value Engineering; Value Management; and Risk Management*

1.0 Introduction

The proposed community hub project is located at EH47PU Edinburgh (Corstorphine district) Scotland the United Kingdom, with a plot size of 13000m^2. It's intended to provide the local community residence with social welfare services to improve on their wellbeing, and to foster unity among the local resident and its environs. This community hub project will be analyzed with the technical competence of VRM principal through the roughs of VM and VE investigation, to undertaking and to ensure that the client get the best for their investment and are able to meet all client requirements and set objectives of the project in relation to time, cost and quality delivery of the project, for sustainability development and to satisfy end user's needs. However, identifying and managing risk is top priority in this project and others. As risk is known to be the possible outcomes of uncertainty with either positive or negative impact within this



project, and by ensuring effective measure for the best value over the lifespan of this project (OGC, 2003).

2.0 Research Aim

This research aimed at undertaking VRM analysis, to outline the importance, worth or the usefulness of this project through VM and VE evaluation.

3.0 Research Objective

The major objective of undertaking this VRM analysis is to outline:

- The Value drivers of this project;
- Apply VM and VE of three (3) and two (2) days sturdy, to identify most effective method of attaining the client's business needs & wants, and an effective means of executing technically oriented project, through its life cycle for optimum performance and set objectives, to reducing cost of construction;
- The functional logic diagram depicting the functional elements of this project development; and
- To adopt an effective Risk Management structure to dealing with identified and recorded risks, from the project Risk register.

4.0 Research Methodology

The method adopted in this analytical research is in accordance with the Royal Institute of British Architects (RIBA) Plan of Work (PoW) 2013, beginning at project strategic definition, through project design concept and to terminates at the project construction stage.

5.0 Results and Discursions

5.1 Value Management (VM): This is a process that defines functional rewards to justify investment for a project i.e. its business driven and technically oriented. **Value Engineering (VE):** It's a derivative from value management that deals with the sequential execution of technically oriented project through its life cycle for optimum performance and set objectives to meeting client's satisfaction.

5.2 Major Stakeholders within the community hub project:

The Stakeholders in this local community hub project are those groups, organization or an individual(s) that are connected to the success or may have interest in this project, these includes;

- The local government authority (client);
- The local community;
- The environmentalist;
- The facilities management team;
- The design team; and
- The construction manager;

However, the above stakeholders have in mind various intents and degree of satisfactions which are oriented driven and divides them by a great bordered line of four quadrants which must be symbiotically satisfied within this project through; strategic needs, technical needs, technical wants and strategic wants respectively as in *table 1* below.

Table 1: Needs and Wants of the stakeholders in this project

Strategic needs		**Technical needs**
Improve on the community quality of living		Provide for comfort and delights
Provide for access to social services		Establish for general needs
Provide for sustainable development		Ensure for community comfort
Provide for local council presence		Provide for attractive environment
Ensure for flexibility		Ensure for staff conformability
Strategic wants		**Technical wants**
Provide for esteem value		Design programmer
Provide for local employment ability		Improve on programmer and activities
Priorities concept in the environment		Effective financial management
Provide for funding and logistics		Provide for increased innovation
		Provide esteem for environment

Hence, all the above stake holders must be carried along in this project, and to ensures their interest are well protected at every project stage. A major cause for delay and alteration to this project will be, because of neglect to involve a stakeholder at certain brief stage (s). Therefore, care must be taking to avert this scenario in the lifetime of this project.

6.0 Client Value System (CABE) within this Community Hub Project.

A. CAPEX								
A	**B.** OPEX							
A	B	**C.** Time						
D	D	D	**D.** P/C/P.					
E	E	E	E	**E.** EIA				
A	B	F	D	E	**F.** Exchange			
G	G	G	G	G	G	**G.** Flexibility		
H	B	H	D	E	H	G	**H.** Esteem	
J	J	J	J	E	J	G	J	**J.** Comfort

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	
3	**3**	**0**	**5**	**7**	**1**	**8**	**3**	**6**	**Total value**

*P/C/P = Politics/Community/Popularity

6.1 Client Value Driver (NAO) within this Community Hub Project.

A. Maximize business effectiveness

A					**B.** Ensuring effective project management and delivery
A	B				**C.** Achieve the required financial performance
D	D	D			**D.** impact positively on the locality
A	E	E	E		**E.** Minimise building operation, maintenance cost, envirt.
A	B	C	F	E	**F.** comply with third party requirement

A	**B**	**C**	**D**	**E**	**F**	
4	**2**	**1**	**3**	**4**	**1**	**Total value**

6.2 The client value system (CABE)

The client value has (9) different ordinal measures four (4) of which are having the higher-ranking value for the client, these are:

- Flexibility = total value of Eight (8)
- EIA = total value of seven (7)
- Comfort = total value of six (6)
- Politics/popularity/community total value of five (5)

While those with the law ranking values are;

- Capital cost – OPEX = total of three (3)
- Through life cost – OPEX = total of three (3)
- Esteem = total of three (3)
- Exchange = total of one (1) and
- Time = total of Zero (0).

Hence, Time is zero, this is because time frame is not allocated to the project life cycle by the client it has a lower value. This means, the PM will allocated time for this project, while, greater attention must be given to the project Flexibility, EIA, Project Comfortability, and to take into cognizant the interplay of P/C/P. that this project will gain, now and in the future.

6.3 The client value driver (NAO)

The client value system identifies four (4) different ordinal measures that have higher-ranking value for the client, these are:

- Max. business effectiveness & Min. building operation, maintenance, cost = 4
- Impact positively on the locality = 3
- Ensuring effective project management and delivery = 2

- Achieving the required financial perform. & comply with third party requirement = 1

However, to satisfy the client's needs and wants, this project should Maximize business effectiveness while Minimizing Building Operation, Maintenance Cost, and to ensure the project impact positively within the environment. Its' the responsibility of the PM and PE to justify these.

6.3.1 Flexibility: This is important in the community hub project and as the client value to ensure that the structure when built, it must be flexible to accommodate the required components, facilities and services and to allow for future expansion to accommodate other facilities and services.

6.3.2 Environmental Impact: The environment is one of top priority to this project as it must meet with all environmental regulation and requirement such as waste disposal and management, aesthetic architectural design to blend with the environment in terms of green building design with little or not having any negative impact to the environment for a sustainable development to utilizing cheap and available locally resourced material for the project development.

6.3.3 Politics/popularity/community: The local government authority should involve the use of politics and dialogue by either partnering with NGO's and other stakeholders to enlighten and encourage the local community to judicially utilize the use of the structure for community meetings programme and ceremonial gathering in other to foster unity and love among local community residence.

6.3.4 Comfort: This community project should provide for maximum comfort to allow the local community residence to maximize the use of all available functional spaces and facilities for optimum satisfaction and time spending within structural envelope and its surroundings. Therefore, the client value system clearly identifies that the community suburb project must have facilities and different functional spaces that are flexible to utilize, which must conform with all the necessary environmental standards for sustainable development such as BREEAM, CEEQUAL, BS code for building and environment standards etc. to satisfying the needs of the local community as well as ensuring that the local community drive the maximum comfort for value and to consider politics, popularity and the local community needs.

7.0 Generic Value Drivers:

Based on the outcome which defines client values, can fit appropriately into the below value drivers to providing matrixes that will add value for the project by improving end users' needs and to build greater links between capital and financial income to priorities for the most viable aspect and components of the suburb project.

7.1 Linked Client Value Drivers (NAO) and Client Value System (CABE)

Table 1: Stakeholders value driver within the community hub project comparison

S/N	Value Drive (NAO)	Value Driver (CABE)	Description	Metrics
1	Maximize business effectiveness	**1.**Exchange value **2.**Impact value	Provide for effective business transaction for all end users and employees, the building is suitable for the purpose for which its design and intended for.	Evaluate the cost of operation of the project per employee and visitors, and priorities between numbers of employees to the numbers of visitors.
2	Minimize building operation, maintenance cost, and environmental impact.	Environmental value	Involves sanity and operation during active phase of the structure, balancing environmental impact as well as minimize maintenances to avert disruption for progress on activities	Requires BREEAM and CEEQUAL certification for sustainable development & by making comparison to income spent on operation and maintenances to the total project income generation per annum.
3	Impact positively on the locality	Social value	The project should be authentically okay, in conformity with the entire site development and its enclosed area as well as to project the image of the projects and the local community at large.	It should be registered for necessary design award which will ultimately provide for high design standards, conduct survey within local community to find out their feelings regarding the project existence.
4	Achieving finance performance	Social value	This project development should remain within £9. 5m budget allocation after completion and handing over the project, it should be functional for the realization of revenue to reclaim capital used for its construction & operational process.	It should be able to evaluate cost of creation over its whole life value and equating between available functional space which provides income over the nonfunctional space which does not generation much income except for social ceremony
5	Achieving effective project management and delivery	1.Exchange value 2.Image value	This should be related to management process with perfect selection of in-cooperated team working, and in accordance to effective planning and required procedures.	The building should comply by ensuring it meet up to the perfected targets and incompliance to construction industry required standards & OGC best practice for required guideline standard.
6	Complying with third party needs	Social value	Statutory & requirement to provide planning strategies to ensure health and safety at all construction phases & to maintain government guidance.	A public survey should be conducted, to ensure for proper planning and approval for meeting KPI's to reducing accident rate and to establish health statistics.

7.2 Client and End user's objectives as functional spaces within the project
This community project is required to be an investment that will provide for both esteem and comfort with the view to have flexible functional spaces such as;

Local authority council unit/office: This unit is to provide the local community in the suburb project, by providing some of the social facilities required such as; education, libraries, waste management, trading standards, council tax collection, housing and planning applications.

Community hall: A flexible envelops that will allow for the promotion of social events to take place for the benefit of the residence and for revenue generation.

Health and fitness unit: A befitting section with adequate facilities with an attendant to provide the local community with physical fitness exercises, mental and social fitness.

A Unit dispensary: This section will provide both the elderly persons, disabled ones, less privileged and the rest of the community with immediate health care and first aid at times when required.

Museum and cultural heritage unit: This will conserve and showcase the cultural and tradition of the local community to promote for history and research.

Food and drinks (e.g. coffee, snacks etc.): This unit will be in-cooperated in the suburb community project to provide for immediate needs for satisfaction as well as during social gathering.

Landscaped and seat out surrounding: This is to provide open spaces and garden to promote social events and groups) or individual relaxation for cordial harmony.

Parking Lots: This is required to services local residence and visitors during social gathering for safety of vehicle.

Indoor games unit (mini sport complex): This section is important as it will provide sporting facilities for; table tennis, snooker, badminton racket, scrabble, lawn tennis, basketball, volley ball etc. with the aim to foster mental and physical fitness, competition and to generate revenue during rentals.

7.3 Project constraints:
This community hub project may have constraints which will may occur as an external factor that will constitute limitation to the design and construction phases. These limitations (constraints) are namely:

- Local community understanding towards the project
- Local authority council
- Economic factor
- Project budget
- Time Constraints
- Environmental choice.

Local community understanding towards the project: This can be one of the limitation to the project if some or majority of the community members fail to understand the importance of the project to the community, they may object for its presence within their immediate community. And unless they are enlightened and are ready to accept the project otherwise the project may not see light in the community.

Local authority council: There is the need that those forming most of the council members supporting for the inception of this project remains in power, otherwise new government may decide not to continue with the project for their own political reasons.

Environmental choice: This can also affect or constitute another limitation if the side selection for the building does not comply with the intended building design, which ultimately must be relocated to another site.

Economic factor: This can affect the funding and market strategies of the project such as in the case of price during tendering for the project varying heavily in relation to demand and supply chain.

Project budget: The sum of £9.5m was allocated for this project may not be sufficient because of the functional spaces that may be necessary and most importantly, for the sustainable development of this project which apparently may require additional funding before the objective of this project is achieved.

Time constraints: Even tough time has not been allocated to this project by the client, ultimately the project manager allocates time for the completion of this project, suddenly for a political or other factor where the client requested for the speedy completion of this project before the initial set targeted time, this may result to complete change of execution plan and strategies which may not conforms to other standards of design.

8.0 VM and VE Studies within selected RIBA PoW project

8.1 Stakeholder participating in the three (3) days VM studies are:

- the client representative
- the local community representative
- the environmental representative
- the design team and
- the construction managers representative

The VM will put together all details of the outcome at the end of the meeting to have a standard brief document of this project, following an agenda being proposed to be issued to all participants attending the workshop, a week to the workshop study, which will provide the opportunity to read and have a better knowledge of the task to be undertaken as well making enough preparation for a viable input to provide for effective output.

8.2 The workshop stage:

This is discussion phase where concrete views of individuals can be used to evaluate the possible outcome regarding the project. And the venue can be proposed to have good privacy and secured with enhanced facilities and equipment to provide for proper communications

during the workshop. And as it can be seen, a three days' workshop agenda has been proposed and prepared for the workshop implementation.

8.3 The Implementation Stage:

This stage of the VM study is the last section which will compile formal plans at the end of the workshop. While functional participants and stakeholders are informed prior to the workshop commencement date.

8.4 Tools/Techniques to be used for the study

- **Documents analysis:** This will be used at the early stage of the VM study to evaluate aims and objectives of the project that are contained in the documents so that the value manager knows regarding recent facts about the project which will also contain information needed for the workshop progress.
- **Authority Consult Inform and Do (ACID) Test:** This technique will be employed during diagnostic and Orientation stages to selecting the viable participants to participate in the VM workshop.
- **presentations:** This will be conducted through the workshop stage to permit individual participant relate their opinions regarding the project.

9.0 Three (3) days agenda for VM study with five participants

The VM study participants include:

- the value manager
- the project manager
- the representative of the local authority council
- Representative of the local community and
- Service engineers

Table 2: Monday day one (1) VM study

Time	Activities	Required Outcomes
9:00	Participants arrival at venue	Vehicle are pack at the parking lot
9:30-9:50	Welcome and introduction of participant	Self-introduction of name and role to undertake in the project
9:50-0: 20	Discussion and coffee tea	Participant brainstorming about their possible roles & the site characteristics, concurrently followed with refreshment
10:20-1: 00	Introduction of project and the days agenda	Providing and over view of the project to the participant and the future events to come.
11:00-3: 00	project site reconnaissance	Participant visit the site for familiarizing them self with whole scenarios regarding its physical feasibility study.
13:00-13:00	Lunch Break	Mutual interactions
14:00-4:30	Interactive session	Discussion on the related site reconnaissance with positive thinking
14:30-15:00	Solution to outlined options of business effectiveness by individual group	Evaluating business effectiveness to drive profit and future investment.
15:00-16:00	Individual groups representation out-comes	All groups, one at a time present their evaluation techniques and results.
16:00-7:00	Question and answer session	Question are raised in all presentation with the best form of solutions are noted.
17:00	End of day one study	Participants take their leave.

Table 3: Tuesday Day Two (2) VM study

Time	Activities	Required outcome
9:00 - 9:30	Coffee and tea	Refreshment and setting for the days agenda
9:30 - 9:50	Introduction of day two (2) agenda	Agenda for the day's activities is introduced.
9:50 - 10:50	Agree to the day 1 findings	Groups deliberate on stakeholder's needs and wants, and the way forward.
10:50-11:50	Defining and adoption of project objectives	Taking the best practice options for the community hub project development and consideration of innovative ideas generated.
11:50-13:00	Prioritizing issues	Fine turning proposed project
13:00-13:30	Lunch Break	Project priorities for the best project options
13:30-14:30	Individual group presentation	Each group present its proposed finding to the house
14:30-16:00	Question and answer session	Questions are raised to provide clarifications, suggestions & the best options
16:00	End of day two (2) study	Participants returned to their destinations.

Table 4: Wednesday Day three (3) VM study

Time	Activities	Required outcomes
9:00 - 9:30	Coffee, tea and open discussion	Refreshment and getting prepared for the day's activities
9:30 - 10:00	Reading of the days agenda	The day's activities are outlined for effective consideration.
10:00-11:00	Adopting day two outcome and must recommendations to be considered	Outcome provides that the community project is most essential and realistic, findings of the stakeholder's opinion.
11:00-13:00	Fine tuning design to optimize value and remove any possible wastes.	Reviewing the use of high cost material and replace with viable sustainable locally sourced Materia for profit maximization in the project.
13:00-13:30	Lunch Break	Mutual interactive
13:00-15:30	Change for added value	The design undergoes set of changes by groups and are provided with the most effective measures to add value for the project
15:00-16:30	Question and answer session	Set of questions are asked to provide for clarification with an effective solution.
16:30-17:00	Summary of achievements made	Conclusion is reached with a viable recommendations offered and are adopted.
17:00	End of 3 days VM study	Participants depart to their various destinations

10.0 Two (2) days agenda for VE study with five participants

The VE study participants include:

- the facilitator (VRM consultant)
- the project manager
- the services engineer
- the contractor and
- the structural engineer

These participants with their vast experience shall use the workshop to concentrate on key element of the community hub project to ensuring well execution of the construction, these elements are as follows:

- the corrected/solution of the final design (working drawing);
- Esteem finishing;
- The entire life cycle expenditure for the project which comprises of maintenance as well as operation phases; and
- Capable to be used in the future (flexible) and allows for expanded when required.

Table 5: Thursday Day One (1) VE study

Time	Activities	Required out comes
8:00 - 9:00	Arrival of participants at the venue	Participants vehicles are parked at the parking lot.
9:00 - 11:00	Introduction of participant, and over view of the project task.	Participant briefly introduce themselves, reading of the agenda for the day and outlining the project requirements
11:00 - 11:20	Introducing Value Engineering process regarding the project	Value engineering process of the life cycle of the project is evaluated.
11:20 - 13:00	Presentation of the project designer	The project designer present rationales for the design choice
13:00 - 14:00	Lunch Break	Mutual interactions
14:00 - 16:00	Site reconnaissance concurrently with questions and answers	Participants visits the site to familiarize with site condition, brainstorming to provide viable & effective understanding of the case
16:00 - 7:00	Functional analysis	Evaluating different functional components regarding the proposed community project
17:00	Departure	Participants lake their leaves

Table 6: Friday Day Two (2) VE study

Time	Activities	Required outcomes
8:00 - 9:00	Arrival of participants	Vehicles are packed in the parking lot for safety
9:00 - 11:00	Evaluation of functional analysis continues in the 2nd day	Different functional components are re-evaluated for the second time
11:00 - 13:00	Creativity of idea generations	Technical understanding of the project scenario
13:00 - 13:30	Lunch Break	Mutual interactions
13:30 - 14:30	Idea evaluations	Reviewing of selected ideas and identifying any constraints for effective improvements
14:30 - 16:30	Developmental Value Engineering recommendations	Developed concepts on VE are discussed for implementation
16:30 - 17:00	Present VE recommendations	Submissions of VE recommendation to the participants for ratifications
17:00	End of session for VE study	Final departure of participants

11.0 Function Logic Diagram

Through Function Logic Diagram *figure 1* below, will provide the stakeholders of this project the thinking ability regarding the problem objective and to identifying the scope of the community Hub project by showing logical relationship between variable functions. Similarly, it will also enable the participants in this project to have creativity thought process which will support communications between the respective stakeholders and the individuals with technical supports and focus towards chance of success and the set target, for accomplishing this project within the allocated time and resources.

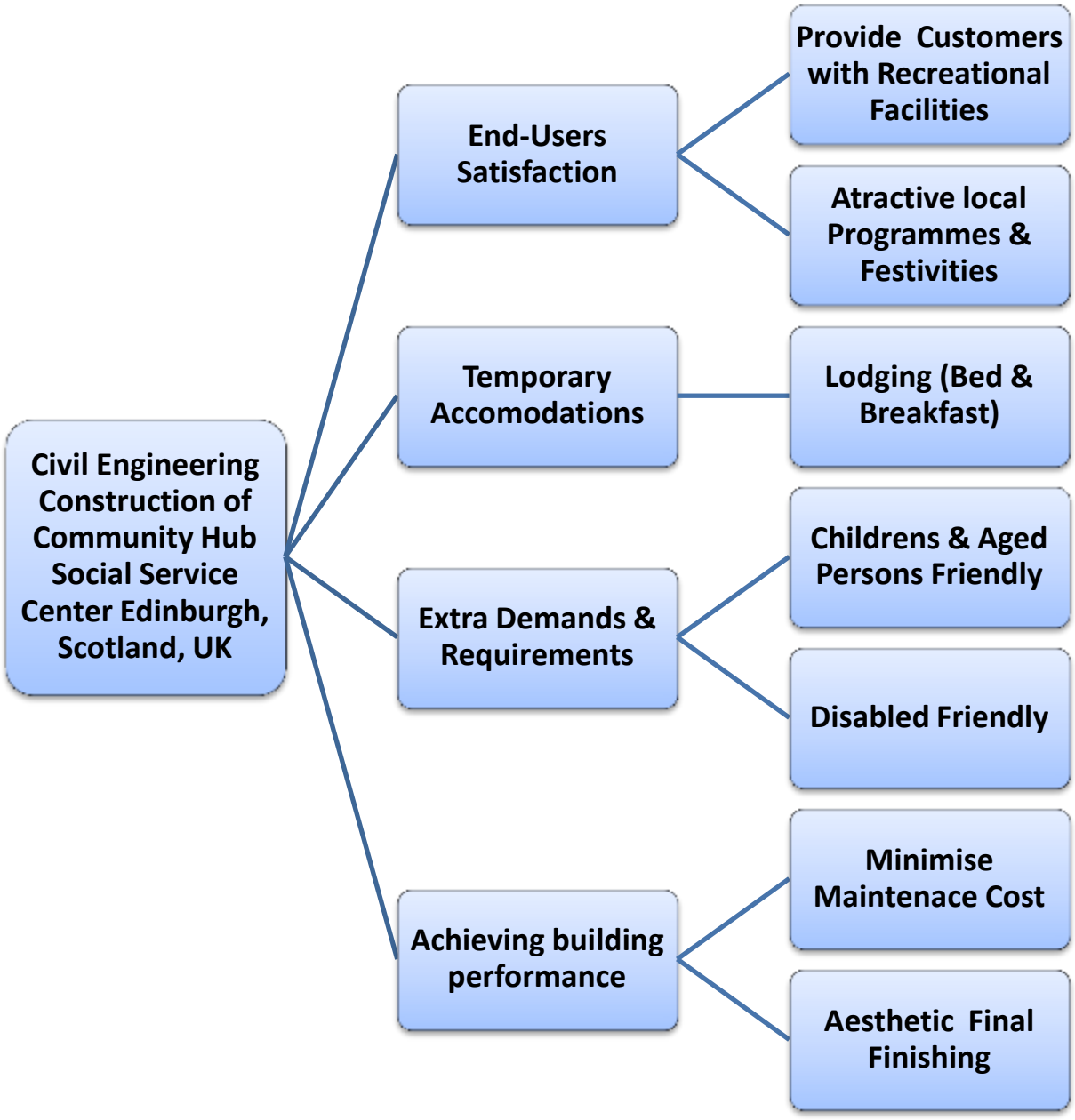


Fig. 1: Function Logic Diagram (Community Hub Project)

12.0 Risk assessment and Management

It is utmost desirable to examine and to identifying the likelihood and the occurrence for the possible risks within this project, at the earliest project descriptive stage through its construction stage. These will be conceived during both VM and VE examination of three (3) and two (2) days sturdies in the above systematic processes. Similarly, with the aim to come up with mitigation measure to reducing the negative impacts they are likely to have on this project as in *fig. 2* below.

However, it's eminent that physical projects cost, quality and time are the significant factors that are prompt to risk and uncertainty. Hence, in most cases physical projects do fails to adhere to meeting the designated handing over dates, while the projects always fallout of expected project budget. Therefore, within this project, there are basically five (5) fundamental risks that had been assessed, and needed to be effectively managed through risk register by the responsible parties involved.

12.1Risk Register

Risk register is a construction document used in this project to document the records of identified risks and their likelihood of occurring, impacts and the mitigation measures to be taken in minimizing or eliminate the envisage risks within this project. However, using RIBA PoW stage 1 (Preparation and briefing stage), the major risks within this project were identified to be five (5) in numbers, namely:

- The temporally closure and maintenances of several utility services, having proximity with the proposed developmental project and the city Centre;
- The need for the provision of several diversions during the physical site construction activities;
- Potential damage and or contamination/pollution of land during work process;
- Gross alteration of the ecological environment (plantation agriculture and any other ancient monument) in existence; and
- The presence of several Tower Cranes in operation, during site works. Note. Proximity of proposed site surrounded by major roads.

Hence, from the above risk register, the five (5) identified risks within this project should be assessed and effectively managed by the client. This is in line with the chosen project construction management procurement route. Similarly, it is vested on the client, with close monitoring to allocate responsibilities to other parties within this project to effectively manage these risks, through risk assessment to risk management *fig. 1* below.

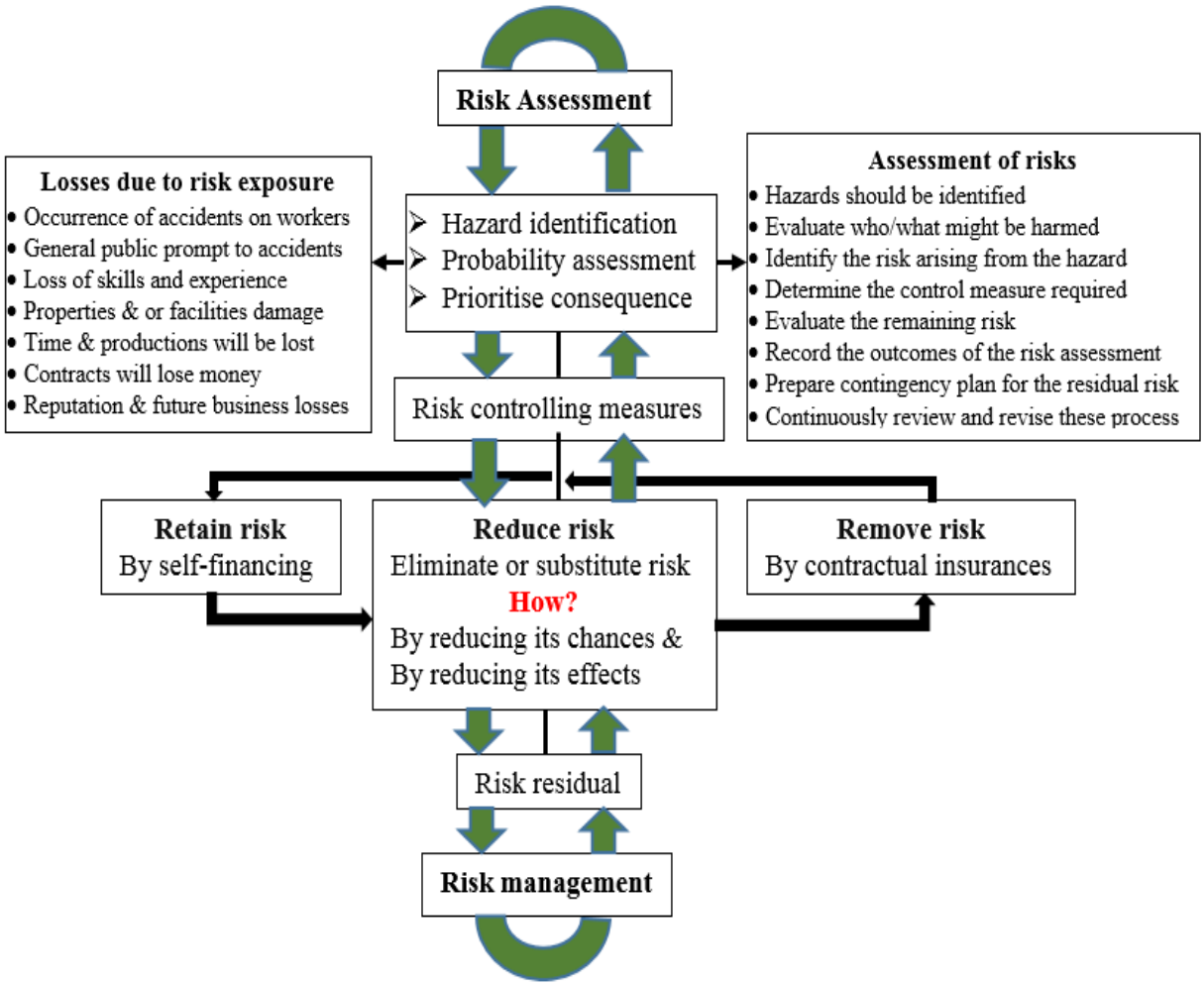


Fig. 2 Risk assessment and Management Process

12.2 Risk Management Integration

RM process can effective be implemented at several stages of this Community Hub project, through embarking on extensive and vigorous RM sturdy as in the below construction project phases, namely:

- RIBA PoW Stage1, Business justification stage
- RIBA PoW Stage 1. Identifying most effective procurement route;
- RIBA PoW Stage 2, 3 and 4. The design process stages; and
- RIBA PoW Stage 5. The physical project construction stage.

The associated risks in this project in terms of cost, time and quality, are however foreseeable and generally preventable for the most parts of this project. This is backed by VM and VE sturdy earlier undertaking. Similarly, it will provide for effective preventive and mitigation measures prior and on appearing within the project scope, while having little or no adverse damage to any construction phase of this project.

13.0 Conclusion:

This analysis is evident that maximum value for money has been achieved on this community hub project, through early introduction of VM and VE. The used of expertise professionals in different process of workshop sessions will help foster creative design and the removal of dormant feature that are sighted within the process this will translate to reduction of

unnecessary capital spending to the detriment of a necessary item within the design solution for the project. Similarly, an efficient study had provided early planning strategy to ensuring that all the six (6) stakeholders' in this project have total understanding of the project and are carried along in the life cycle of the project to ensure participation for effectiveness and successful completion of this project to meeting their strategic needs, technical needs, technical wants and strategic wants respectively.

Similarly, through function logic diagram the stakeholders are provided with the thinking ability regarding the problem objective and had identified the scope of this project by showing logical relationship between variable functions, with greater participation and creativity that supported communications with technical focus towards chance of success and the set target, for accomplishing this project within the allocated time and resources. However, this is only possible with the adoption of six (6) oriented RM process steps enumerated in *fig. 2* above, as there is no project that is termed risk free.

14.0 Recommendations

In line with VRM analysis of civil engineering constructions and projects, its highly recommended that the followings should be considered, namely:

- EIA should be conducted prior to any physical construction work to conform with current BPEO and for sustainability;
- VM and VE should be conducted to outline possible variation within any physical project and schedules;
- Risk sturdy should be undertaking prior to the commencement of any physical Civil engineering projects;
- It's also recommended that PM and PE should use effective tools such as value drivers to analyze projects, to depict the project characteristics; and
- Sensitive projects should always utilize the services of PM and PE to provide for effective planning and design to maintain and or minimize project cost (proposed project budget) without acquiring excessive cost; but to adhere to design standard, quality and timely completion / handing over completed projects.:

15.0 Nomenclature

Acronyms	Descriptions
BPEO	Best Practice Environmental Options.
BREEAM	Building Research Establishment Environmental Assessment Method
BS	British Standard
CEEQUAL	Civil Engineering Environmental Quality and Assessment Scheme
EIA	Environmental Impact Assessment
KPI's	Key Performance Indicators
NAO	National Audit Office
NGO's	Non-Governmental Organizations
OGC	Office of Government Commerce
PE	Project Engineer
PoW	Plan of Work
PM	Project Manager
RIBA	Royal Institute of British Architects
RM	Risk management
VE	Value Engineering
VM	Value Management
VRM	Value and Risk Management

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