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Implementation Status of Value Management in Project Management Practice in Nepal

Anjay Kumar Mishra,

Visiting Faculty and Management
Consultant, Shanker Dev Campus,
TU, Nepal

ABSTRACT

Value Management practices is highly recommended practice for project and production operation management in developed country as an effective competitive tool also. The purpose of the research is to explore the existing attitudes and perceptions to the Value Management concept, to seek an understanding of clients and consulting engineers' opinions and to examine the factors that guide this opinion along the reason for not implementing Value Management in Project management practice of Nepal.

The understandings of the professionals from both clients and consultants involved in the design process and implementation phase of the project about Value Management were confusing. They feel that the conventional practices they are using in the design process of a project are best and no other techniques should be followed in the design process. The attitude of the professionals of consultants was found positive towards the factors of Value Management in construction projects but clients have negative to some factors.

There are different ranks for the factors for not implementing Value Management by the clients and consultant. Lack of guidelines gives main reason for not implementing VM by clients while consultants feel 'Lack of trained professionals on VM' as the main reason for not implementation. The ranks have weak positive relationship.

Highly qualified personnel should be prepared conducting several professional training programs, mandatory provision of Value Management in guidelines of public entities and all the construction projects should be appointed experienced Value Manager for best outcome from the project which saves scare resource of least developed country like Nepal. For the introduction of Value Management in construction project.

Keywords: Project Management, Cost Management, Water supply, Implementation of Value Management.

INTRODUCTION:

A project manager is a professional concerned with applying managerial, scientific knowledge, mathematics, and ingenuity to develop solutions for technical, societal and commercial problems with individuals own judgment to reduce the risk due to uncertainty in a project.

In developed and developing countries there are trends of reducing the higher project costs using Techniques which saves valuable resources which can be utilize to further project development. Value Management is a technique which reduces cost of the product without reducing the desired function and adding value to the product or adding value without increasing cost.

A Project design may have unnecessary costs as projects are usually formed and designed under pressure of meeting with the deadlines the designer will not be able to review it for unnecessary cost within this limited time. The unnecessary costs in a design are not a reflection on designer's abilities as professionals, but rather

management problems which reflects in the design of the project and may differ due to individual's judgment on the design. Poor and wrong decisions can be made under the competing pressures of time, budget and quality, due to which the projects are likely to include unnecessary costs. The challenge is to cut unnecessary costs or to keep at minimum level and provide the maximum user satisfaction. Without the implementation of Value Management studies, the unnecessary costs may not be identified and removed. Consequently, the cost of a Project will be high. Value Management is the tool to leave out these deficiencies from the project with maximum level of user's satisfaction.

Value Management is quite beneficial for a developing country like Nepal where people are suffering from project delay and cost overrun due to lack of key ideas and poor construction methods (Malla, 2013). VM and Life Cycle Costing (LCC) analysis of the project is important in context that cost recovery projects, the Life Cycle Cost of the project may be affected the sustainability and functionality of the project through design life cycle period of the project.

Rational of the Study:

Nepal is one of the Least Developed Countries in the World and the Government of Nepal (GoN) has set a target to reach the country in stats of Developing country till 2022. For this, large amount of budget should be provided in the development of infrastructure facilities of the country as without development of modern infrastructure facilities such as Road and Railways network, development of electricity and medium to high level water supply to fulfill the needs of the people etc.

To meet the government's target the budget allocated for capital expenditure is not enough, though optimum utilization of the budget can be done using various engineering techniques. Without any special management techniques, the entire allocated budget will be spent out in the definite capital expenditure but the use of Value Management techniques in all development projects could save significant amount of budget which can be utilized in further more development projects or get optimal utilization of the resource. In the management cost aspect, it would be fruitful in employment aspect also.

The role of the professionals is very important that they can use Value Management techniques in the right way for best outcomes. In general, experts do not believe in the formal techniques and they are pleased in the traditional way of doing and thinking. That is why the opinions of Value Management experts should be recognized and existing practices on Value Management application should be identified. For that a study should be done to know the ground condition of the professionals in Nepal.

Properly organized and executed Value Management practices in a project will help stakeholders to achieve value for their money by striking the desired balance between cost and functional performance. Thus it delivers the optimum solution for project stakeholders.

For effective VM all the stakeholders should be involved in the process of structured team thinking, so that the needs of the users can be accommodated wherever possible. VM primarily depends on the stakeholders that whether they can agree or not on the project objectives from the start.

Nowadays, the whole world is facing very tough economic challenges. It is more important now than ever before to work wisely with the resources we have and to optimize value for money and inputs.

Research Objectives:

The objective to explore the existing attitudes and perceptions to the Value Management concept, to seek an understanding of clients and consulting engineers' opinions and to examine the factors that guide these opinion along the reason for not implementing Value Management in project management practice of Nepal.

LITERATURE REVIEW:

Performance in Project Management:

Project performance is not satisfactory in terms of time in Nepal(Mishra and Bhandari, 2018). A good performance of any construction projects refers that it is free from defects, right things at right time and the continuous improvement of the project (Chilwal & Mishra, 2018). The study conducted by Maskey and Mishra (2018) showed that time spent by skilled and unskilled labors in productive work were 56.92% and 55.74% respectively. It means rest of their time still unused. So it needs to manage all level of workforce effectively for high performance of the industry. Mishra and Rai (2017) also compared the different types of building and found performance should improve. Value Management is solution for the issue performance.

Concept:

However, at the same time as Value Management has been widely practiced in countries like the USA, United Kingdom, Australia and Hong Kong, Nepal like Least Developed countries have not practiced it. Even there is some evidence of Value Management practices in Nepalese construction industries; it is still not so popular in Nepal due to the lack of knowledge and awareness of its existence and applications. Value management can be considered still to be at its infant stage in Nepal as only a small number of construction projects well known to apply Value Management.

Value Managementbegan in United States at General Electric Co. during World War Two being shortage of components and materials in the manufacturing sector. Lawrence Miles and Harry Erlicherof the G.E. Company were greatly responsible for the establishment of the technique in 1942 and since then the technique is very much accepted in various industries.

The concept of Value of product relies on the relationship between the user's satisfaction of many differing needs and the resources used to get the product (IVM, 2014). The fewer the resources used or the greater the satisfaction of needs, the greater the value of a product. Stakeholders, internal and external customers may all hold differing views of what represents value. The aim of Value Management is to reconcile these differences and enable an organization to achieve the greatest progress towards its stated goals with the use of minimum resources.

$$\text{Value} = \frac{\text{Satisfaction of Needs} \longrightarrow \text{What is necessary for a desired user?}}{\text{Use of Resources} \longrightarrow \text{Everything that is required to satisfy needs}}$$

Value can therefore be increased by either improving the function for increased users' satisfaction or reducing the cost for resources uses. For that a rational logic (a "how" - "why" questioning technique) and the analysis of function to identify relationships that increase value. In practice, a Project may deliver higher users satisfaction with least cost, but there is no means of measurement of certainty, there may be other better options of the projects. With the application of VM techniques the owner can assure the project as the best option. Lawrence Miles defined Value Management as "philosophy implemented by the used of the specific of techniques, a body of knowledge, and a group of learned skills". Later Dell I'sola (1982) simplified the definition as "the creative organized approach whose objective is to optimize and/or performance of a facility or system." (Che Mat, 2003) defined VM as a rigorous, systematic and innovative methodology with multi-disciplinary approach to achieve better value for projects, products, facilities and systems without sacrificing the required performance level. It is a creative way of working all parties together in achieving client and stakeholder's requirements and increasing users' satisfaction.

Value Management in a Project:

VM is a process by which project is evaluated and analyzed to obtain maximum value for money by following a certain methodology, the process being led by an experienced facilitator. VM programs commonly take the form of arranging a workshop in which the client, contractors, suppliers, manufacturers, specialists and other stakeholders involved take part and put forward suggestions for discussions and investigations (Harry et al., 2000) bringing all the parties in one place to direct all in one direction. If the clients' value system is not made open, consultants and designers may only focus on requirements that were not intended by the client. This will make the consultants and designers understand what a client will accept as the benchmark to measure the outcome of their investment (Leung et al., 2003). However, the VM workshop or session is different from the normal project meeting as the objectives of each are distinct.

The objective of VM is to deliver the best project for the client/owner as per their satisfaction from the project. In addition, the benefits reflect a 'win-win' scenario for the project and all the stakeholders involved, in emphasizing the importance of the micro and macro relationships within the project team (Daddow and Skitmore, 2005).

Various terms such as value engineering, value control and value analysis have been used to describe the principle of Value Management (Olanrewaju, 2013). However, all the terms are synonymous; the most common are value management and value engineering. VM is both problem solving and problem seeking processes. As a problem seeking system, it identified problems that might arise in future and develop or identified solution to the problem.

Value management is a proactive, problems solving management system that maximizes the functional value of a project by managing its development from concept stage to operation stage of a projects (Kelly and Male, 2001) through multidisciplinary Value Management team. It seeks to obtain the best functional balance

between cost, quality, reliability, safety and aesthetic of the project. The approach could be introduced at any stage in the projects' life cycle, but it is more beneficial if it is introduced from the initial pre-construction phase of the projects (Ahuja and Walsh, 1983) before any options of project design is introduced. Value Management identifies items of unnecessary costs in a project and develops alternative ways of achieving the same functions at the lowest possible cost, without impairing on the quality, aesthetic, image, safety and functional performances of the project and at the same time improves the project schedules.

VM addresses growing importance and demand on increased efficiency, effectiveness and value for money directly using a structured and organized process which involves multiple disciplines. It is an analytical process which seeks to achieve value for money by analyzing the functions of a project. The costs of a VM process rarely ever exceeds 1% of total project costs, at the same time as potential savings of 10 to 15% of total project costs are possible (Cotezee, 2009). It would be very beneficial in the context of our country; a least developing economy, it gives many advantages other than financial benefits and the costs that can be saved. It is quite beneficial for a developing country like Nepal where people are suffering from project delay and cost overrun due to lack of key ideas and poor construction methods (Malla, 2013).

Life Cycle Costing in a Project:

Life Cycle Costing (LCC) is also used as an analysis tool in designing a Project by a Value Management team to procure value for the money invested (Olanrewaju, 2013). LCC is the development of all significant cost of acquiring, owning and using an item, system or service over a specified length of time. LCC is a method used to compare and evaluate the total costs of competing options based on the anticipated life of the product to be acquired. In performing a Value Management (VM) study, LCC analysis is performed in the development phase of the VE job plan to determine the least costly alternative. The concept of economic analysis, which is used in LCC, requires that comparisons be made between things similar in nature.

The term life cycle costing has very broad scale of meanings. Many writers have their own interpretations about Life Cycle Costing. Here are some definitions listed below which are suitable to this dissertation.

According to Emblemsvag (2003), life cycle costing can be defined as: "the total costs that are incurred, or may be incurred, in all stages of the product life cycle".

According to Dhillon (2010), the life cycle cost of a system can be defined simply as the sum of all costs incurred during its lifespan.

Dell'Isola (Dell'Isola& Kirk, 2003) describes life cycle costing as an economic assessment of an item, system or facility over its lifespan, expressed in terms of equivalent cost using baselines identical to those used for initial cost. This method is used to compare various options by identifying and assessing economic impacts over the life of each option.

According to Barringer (2003), life cycle costing is the total cost of ownership of machinery and equipment, including its cost of acquisition, operation, maintenance and/or decommission. When using life cycle costing to compare different alternatives, one should be aware that not all cost categories are relevant to all projects (Kemps, 2012).

The exact time of the origin of LCC and the time it was first applied to the construction projects are not available, but it can be concluded that it preceded the VM techniques (Olanrewaju, 2013). LCC is a technique that is used to relate the initial cost with future based costs like running, operation, maintenance, replacement, alteration costs (Ahuja and Walsh, 1983). It can also be defined as the total cost of project measured over a period of financial interest of the clients (Flanagan and Jewell, 2005). LCC enables a realistic economic comparison of the alternatives, in terms of both the present and future costs. It is therefore the relationship of initial cost and other future based cost. The capital cost and operation and maintenance (O&M) costs of a Project should relate in term of present value for money invested for the sustainability of the project. Since the 1960s, studies have shown there are the needs to balance capital costs against the subsequent operation and maintenance costs of the project (Seeley, 1996).

Decision regarding the life cycle cost of a project has to be determined right from the project's conceptual stage as to whether to reduce the initial cost or the operation and maintenance cost (Olanrewaju, 2013). In addition to the initial construction costs which are foreseeable cost, other unforeseeable cost that should be considered are the operation cost, cost of energy usage, maintenance cost, disposal cost / salvage cost. Issues of LCC are more important to the end users than to the developer who only constructs the project, on completion or over a certain period of time end-users are left to bear the operation and maintenance costs.

LCC is a technique that is used by the client or team to procure value for money invested (Flanagan and Jewell, 2005). In other words, LCC enables managers to make informed decisions on how much to invest today for future economic benefits. While the LCC could be described as a strategy that provides answer to the question

"how do we do it efficiently", VM ask and provide answer to the question "why do we do it-why do we need the projects". This is achieved using the functional analytical procedure of the VM.

The total cost of project is not important, but what the cycle claimed is that, the value of projects does not end with the consideration of the cost alone. Many qualitative issues in actual fact are more important to the engineering issues in majority or all of the construction projects. There are the complexity of the body of knowledge capturing the range of contradictory assumptions and understanding on the theories and practices of VM and LCC (Olanrewaju, 2013). Based on extensive literature review, the finding was the life cycle costing techniques is a tool in the value management methodology, a basic finding from the connection is that both VM and LCC can be embedded into the wider context of project management.

In construction Industry, LCC is applied to quantifying costs of whole projects, systems, components and materials which can assist decision-making for investment projects (Flanagan et al., 1989). A LCC process usually includes steps such as planning of LCC analysis, selection and development of LCC model, application of LCC model, and documentation and review of LCC results (NSWT, 2004).

Eric Korpi and Timo Ala-Risku (2007) reviewed the published case studies about the LCC as there are no systematic analyses on actual implementations of LCC methods exist, despite existing LCC method descriptions and practicable suggestions for conducting LCC analyses. They found that most of the reported LCC applications were far from ideal compared to the methods suggested in the literature such as: (i) covered fewer parts of the whole life cycle, (ii) estimated the costs on a lower level of detail, (iii) used cost estimation methods based on expert opinion rather than statistical methods, and (iv) were content with deterministic estimates of life cycle costs instead of using sensitivity analyses.

Value Management and Life Cycle Costing Techniques:

Value Management uses a unique combination of concepts and methods to create sustainable value for both organizations and their stakeholders. Some tools and techniques are specific to Value Management and others are generic tools that many organizations and individuals use. Summary of some of the main tools and techniques are described below.

Table 1: Some techniques of Value Management

Tool	Description	Benefits
Brainstorming of Mind Showering	Idea generation that focuses on creation of ideas by volume (no judging)	Allows a large volume of ideas to be generated in a short period of time.
Cost Benefit Analysis	Used to analyze the to the benefits to be achieved.	Often used in VM on procedure or process type projects.
Criteria Weighting Technique	A tool used to assist in option selection.	Enables option selection and alternatives to be reviewed in order to support decisions being made.
Excursion/ Metaphors	A tool used to take delegates on an outward and return journey	Very effective in bringing creativity to the forefront.
(FAST)	Identification of functions of products, processes, projects or services.	Determines what functions are delivered i.e. what they do or must do, not what they are.
Objectives Hierarchy	Diagrammatic process for identifying objectives in a hierarchical manner.	Assists in focusing input where the key objectives are as the diagram is constructed in descending order.
Issues Generation and Analysis	A way of eliciting many issues connected with a problem or opportunity.	Voting of the top 10 important issues follows.
Pair Wise Comparison	Enables ranking of items by means of comparisons between all possible pairs of items.	Enables option selection and alternatives to be reviewed in order to support decisions being made.
Pareto Analysis	Aim to concentrate on the top 20% of items that often have impact.	Focuses on those items or activities that can achieve the optimum
Process Mapping	Uses flow charts to review steps in processes	Identifies processes in a diagrammatic format in a step by step manner.
Risk Analysis	A structured approach to identifying risks	Often used in parallel with Value Management as there are genuine links.
SCAMPER	Used as a checklist to develop ideas singly or together with others.	This could help with moving an idea from a creative thought to a more practical use.

Tool	Description	Benefits
Stakeholder Analysis	Identifies those key stakeholders with an influence or interest in a project.	Can assist in focusing attention where the priorities are require i.e. satisfaction of key stakeholder interests?
SWOT Analysis	Identifies strengths, weaknesses, opportunities and threats.	Assists in understanding strengths, weaknesses, opportunities and threats that can impact
Value Analysis	Structured team based approach to identifying functional requirements of projects.	Optimization and maximization or value to the client or customer.
5 W's & H	A technique for exploring problems which provokes further depth	Who, Why, What, When, Where and How questions.

Source: IVM, 2014

Value Management Procedure in Projects:

Value Management was pioneered by Lawrence D. Miles in the 1940's and 50's that developed the technique of Value Analysis (VA) as a method to improve value in existing products. Initially Value Analysis was used principally to identify and eliminate unnecessary costs. However it is equally effective in increasing performance and addressing resources other than cost. It is important to realize that Value may be improved by increasing the satisfaction of need even if the resources used in doing so increase, provided that the satisfaction of need.

Value management is defined as an organized set of procedures and processes that are introduced, purposely to enhance the function of a designs, services, facilities or systems at the lowest possible total cost of effective ownership, taken cognizance of the client's value system for quality, reliability, durability, conformance, durability, aesthetic, time, and cost (Olanrewaju and Khairuddin, 2007). Value Managementprogram is commonly carried out in the systematic stages of; feasibility, concept design, design development, construction and operations and occupancy phase of the projects (Table 2.2). The work activities are strategically carried out in the job plan.

Table 2: Value Management's Job Plan

No	Work Activities	Phases		What to do	Questions	Techniques
1	Pre-study	1A	Preparation	Select area to be studied, team briefing	What and why is to be studied?	Identify area of potential improvements
2	Value Study	2A	Information	Collect latest and correct information	What is it to be studied?	Request for fact from good sources
		2B	Functional analysis	To identify, classify and functions	What must it do?	Identify main functions, cost
		2C	Analytical	Generate alternate ideas	What else will perform the functions	Simplify and classified functions
		2D	Evaluate	Evaluate by comparison	What is the cost of the alternative?	Established standard for evaluation
		2E	Development	Developed evaluated alternatives	Will it works, and meet requirement	Collect facts, translate fact
		2F	Presentation	Method of presentation,	List benefits and constraints	prepare reports, communication,
3	Post Study	3A	Implementation	Implement presented ideas	Who will implement it? What changes are needed?	Eliminate road blocks actualize plan, implement ideas
		3B	Follow up	Check results	Ideas successful or not, benefit and setbacks	Final feedback and feed forward

(Source:Olanrewaju, 2013)

METHODOLOGY:

The Study Area:

Second Small Town Water Supply and Sanitation Sector Project (SSTWSSSP) is selected based on convenience. The purpose of the Project is to develop safe, accessible and adequate water supply and sanitation facilities for 24 towns with total project cost of $71.7 million. The expected outcome of the Project is improved, affordable, and sustainable Water Sanitation and Hygiene (WASH) services, which are governed and managed by locally accountable representative bodies. There are many stakeholders in implementation of the project.
Seven Design and Supervision Consultant (DSC) were assigned to provide the technical support such as feasibility study, Initial Environmental Examination (IEE) study and preparing detailed design and cost estimate reports of the projects with seven packages in two batches as shown in the table 3. below.

Table 3: Batch and Packages for DSC's

Batch	Package	Project	Region	DSC
1st	Package 1	Baitadi, Khalanga – Baitadi	Far Western	ERMC
		Shivanagar, Kailali	Far Western	
		Adarsha Nagar/Bhasi	Far Western	
		Narayan NP, Dailekh	Mid-Western	
	Package 2	Lamahi, Dang	Mid-Western	COEMANCO
		KarahiyaMakrahar, Rupandehi	Western	
		Sandhikharka, Arghakhachi	Western	
		Baglung, Baglung	Western	
	Package 3	Indrapur, Morang	Easten	ITECO
		Damak, Jhapa	Easten	
		Duhabi, Sunsari	Easten	
		Phidim, Panchthar	Easten	
2nd	Package 4	MusikotKhalanga, Rukum	Mid-Western	ERMC
		SitalpatiKhalanga, Salyan	Mid-Western	
		Darakh/Sukkhad, Kailali	Far Western	
	Package 5	Byas Nagar, Tanahun	Western	IDRS
		Rampur, Palpa	Western	
		Mukundpur, Nawalparasi	Western	
	Package 6	Meghauli, Chitwan	Central	COEMANCO
		SakhuwaMahendranagar, Dhanusha	Central	
		Khandbari, Sankhusabha	Eastern	
	Package 7	Dhankuta, Dahnkuta	Eastern	BDA
		Letang, Morang	Eastern	
		Kakadbhitta, Jhapa	Eastern	

Source: SSTWSSSP, 2012

Implementation modality of the SSTWSSSP:

The financing of town project, water supply systems is being financed by WUSCs (50%) and the Government (50%). The initial cash contribution of WUSCs may range between 5% and 15% of the civil works contract, including a 5% upfront cash contribution, depending upon its willingness and capability, with the remaining 35%–45% to be borrowed from the Town Development Fund (TDF). The TDF will lend the funds to WUSCs at an interest rate not exceeding 5% per annum with a maturity of 20 years including a grace period of 5 years (ADB, 2010).

Method and Source of Information:

The first step of the method involved review of secondary information sources that led to identification of research questions, setting out the study objectives and identification of the appropriate sets of tools for achieving the objectives.

Primary Data Collection:

Questionnaire Survey:

Two sets of questionnaire were set, one for client and another for the consultants in which first section is common and remaining sections are specific questions. Thirteen questionnaires were distributed to clients from

Project Management Office (PMO) and Project Implementation Unit Office (PIUO). On the other set of questionnaires, seventeen were distributed DSC engineers. Some questionnaires were given as ranking systems for the different factors. Five ranking Likert scale was used for attitude assessment of client and consultant on Value Management and for hindrance factors for not implementing Value Management.

DATA ANALYSIS AND INTERPRETATION:

Significant Mean weight score for attitude assessment was done by T test; relative hindrance index was done for assessment of hindrance factor along with their rank significance through Spearman Rank Correlation Coefficient. The results were presented in pie chart, bar diagram, tables.

Following Formals were used for Calculations:

Mean Weightage:
The weightage for Strongly Agreed 5, for Agreed 4, for Undecided 3, for Disagreed 2 for strongly disagreed 1, and f for frequency

$$\text{Mean Weightage} = \frac{\text{f of SA}*5+\text{f of A}*4+\text{f of U}*3+\text{f of D}*2+\text{f of SD}*1}{\Sigma f}$$

Relative Hindrance Index (RHI):

The weightage for Strongly Agreed 1, for Agreed 0.8, for Undecided 0.6, for Disagreed 0.4 and for strongly disagreed 0.2, f for frequency

$$\text{RHI} = \frac{\text{f of SA}*1+\text{f of A}*0.8+\text{f of U}*0.6+\text{f of D}*0.4+\text{f of SD}*0.2}{\Sigma f}$$

Spearman Rank Correlation Coefficient(ρ)

$$\rho = 1 - \frac{6*\Sigma d^2}{n^3-n}$$

Where:
d= Difference in two Ranks
n = Total no of Frequency

T test

$$t = \frac{(X_1-X_2)}{\sqrt{S_p^2(1/n_1+1/n_2)}}$$

Where:
X = mean

$$S_p^2 = \frac{1}{n_1+n_2-2}\{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n_2}\}$$

n = no of Frequency

The disaggregated data collected were analyzed under the headings with their various activities as below in Table 4.

Table 4: Tools for the Analysis

S. No.	Specific Objectives	Source of Information	Interpretation and Analysis
1	To explore the existing attitudes and perceptions to the Value Management concept	Questionnaire	Qualitative and quantitative with Mean weight score, and T test supporting facts
2	To examine and discover the reason for not implementing Value Management	Questionnaire	Qualitative,and RHI with rank coorelation

RESULTS AND DISCUSSION:

The questionnaire design was done on three sections, common for client and consultants, clients only and consultants only.

Attitudes and Perceptions towards Value Management Concept

The first objective of the study was to explore the existing attitude and perceptions to the Value Management concept of the client and consulting engineers of the Second Small Town Water Supply and Sanitation Sector Project. The result of the questionnaire survey from the client and consultants are shown separately in the Table. 5.

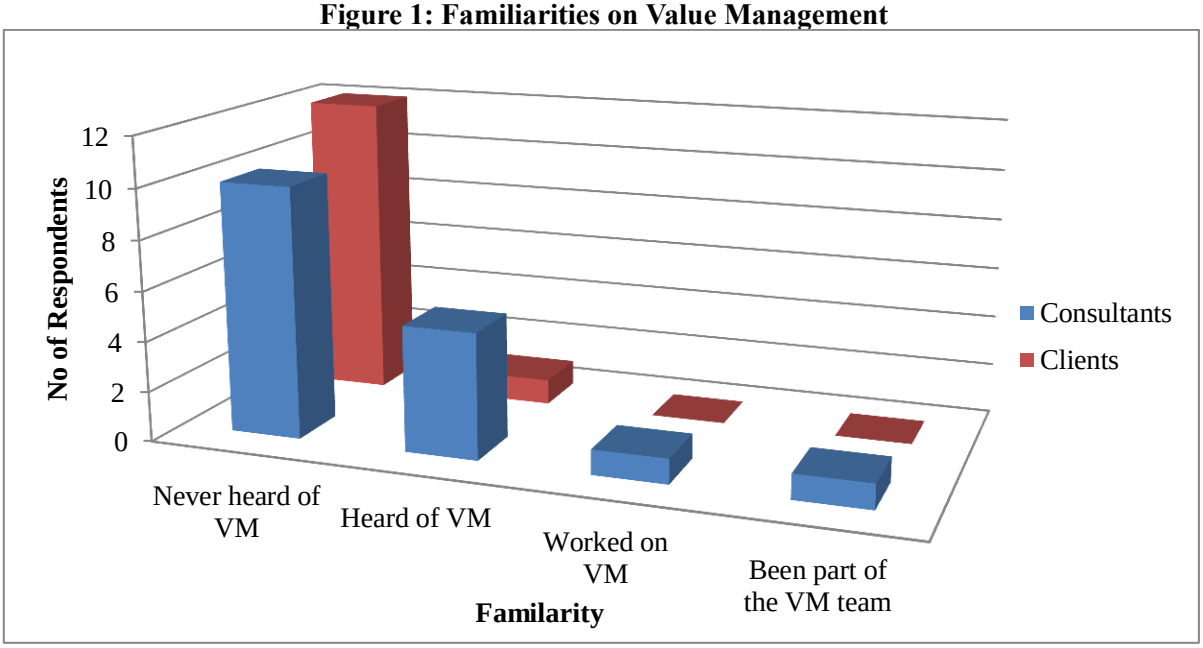
Table: 5. Details of the result from the questionnaire survey for objective one

S N	Question Asked	Client		Consultant	
		Yes %	No %	Yes %	No %
1	Are you aware of Value Management (VM) technique for construction projects?	0.00	100.00	11.76	88.24
2	Do you believe value management can provide any real benefits?	38.46	61.54	82.35	17.65
3	In your views, does LCC affect the sustainability of any project?	76.92	23.08	82.35	17.65
4	Have you ever applied VM on construction projects			5.88	94.12
5	Have you established design alternatives while selecting a Project?			82.35	17.65
6	Have you estimated all possible project costs O&M cost of the design alternatives?			82.35	17.65
7	Have you done Life Cycle Cost Analysis of the designed Project?			64.71	35.29

The first question was asked to client and consultant both, all of the clients were not aware about VM concept but among the consultant only 11.76% were aware about it remaining 88.24% were not aware. Most of the respondents has negative response that is due to the professional engineers are reluctant to change the existing practices and technologies into new ones.

In another question the familiarity of the respondents were analyzed giving options. The result obtained from the clients was given in the figure 5.

Figure 1: Familiarities on Value Management



Most of the respondents 92% of the clients never heard about VM only 8% have heard about VM.
Dissimilar of clients, more of the respondents from consultants heard about VM 29% of the consultants heard about VM and 59% never heard. 6% of the respondents have worked on VM project while other 6% have been part of VM team. VM concept is not new concept for the world, but it is new in the Nepalese context, but respondents who respond positively have also misconception that economic feasibility study and risk reduction as well as cost optimization process in the construction projects was taken as VM though there were no any formal VM techniques were applied. The clients were seemed more traditional in the construction field and reluctant in acquiring new techniques as compared to consultants.
As the most respondents were not aware of VM concept, brief overviews were put forward before other questions. Then the result of respondents for question no 2 of table 5 seemed 38.46% of clients believe that VM can provide real benefits and 61.54% clients do not believe in real benefits from VM while at the same time 82.35% of consultants have positive response that they believe in the real benefits from the VM and 17.65% do not believe. Value Management techniques were extensively used in developed countries and developing countries also used it so most of the respondents from consultants have positive response that if developed countries use it why not in our countries. But in case of clients, most of most of the respondents have negative response.
Being Life Cycle Costing is a technique of Value Management; both of the respondents were asked "In your views, does LCC affect the sustainability of any project?'. The result was 82.35% of consultant and 76.92% of clients have positive response remaining 17.65% of consultants and 23.08% of clients have negative response. The perception of the respondents have positive as a part of Life Cycle Cost in use in the traditional economic calculation while analyzing feasibility study of Project and seem positive operation and maintenance cost of the system.
The professional of the consultants were asked that they have ever applied VM in construction project; 5.88% have responds as "yes" and 94.12% have "No". In the discussion with the respondents, they have said that they are practicing economic analysis of the project for the optimization of cost which was assumed as Value Management. But, in the application of Value Management, detailed step by step procedure should be followed for real benefits from it.
Generating alternative ideas while designing a project is a step of Value Management Procedure and related with this two questions: "Have you established design alternatives while selecting a Project?" and "Do you have estimated all possible project costs O&M cost of the design alternatives?" asked to the consultant and the result was 82.35% has "yes", and remaining 17.65% have "no". While studying in depth the practice of establishing design alternatives is generating alternatives within the design team only, but in Value Management process the numbers of alternative ideas generated in Value Management workshops organized by Value Management team. In the literature review there are examples of generation of forty five alternative ideas in three days' workshop. Though the positive response of the respondents their practice may be part of VM but incomplete and it may ne be provide real benefit of Value Engineering.
Likewise the consulting engineers were asked "Have you done Life Cycle Cost Analysis of the designed Project?" and the result is 64.71% "yes" and 35.29% "no". In Value Management practice the detailed Life Cycle Cost analysis is done for all possible alternatives, but in our practice the detailed economic calculation is done only for the selected alternatives only, if the result gets positive, the project will be approved. The practice is also incomplete though the majority of the respondents have positive response about the question.
In the design process of projects of Second Small Town Water Supply and Sanitation Sector Projects, the final design submitted by the consultant were approved by the client and related to this a question "Are you satisfied with the DSC's design of town projects which may perform with least Life Cycle Cost?" to the client and the result was as shown in figure 4.2.

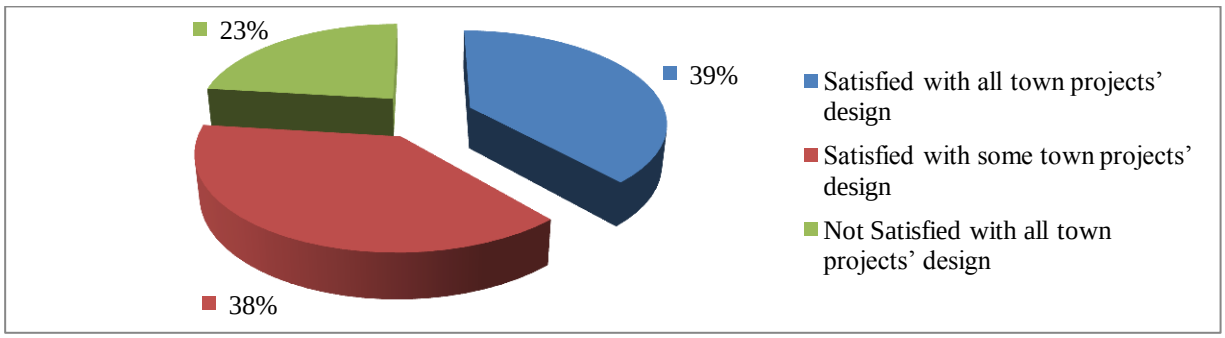


Figure 2: Satisfaction with Design of SSTWSSS Projects for client

39% of the clients were satisfied with the design submitted by the consultant, 38% were satisfied with some town project's design and 23% have not satisfied with all town projects' design. Clients have authority to reject or accept the design prepared by the consultant. As the consultant were appointed as they have better knowledge of design of a project and clients accepts it that is why most of the respondents were satisfied but some respondents who are not satisfied also accepted the design as they have no option apart from acceptance of the project design.

For that objective questionnaire related to the practice of Value Management techniques in Second Small Town Water Supply and Sanitation Sector Project was asked to both clients and consultants separately. The result of the questionnaire survey from the client and consultants are shown separately in the Table. 6.

Table 6: Details of the result from the questionnaire survey for project specific

S. No.	Question Asked	Client		Consultant	
		Yes%	No %	Yes%	No%
1	Do you have established design alternatives while selecting the Small Town Project Design?			100.00	0.00
2	Have you followed the VM and LCC procedures in designing SSTWSSSP?			0.00	100.00
3	In your views, the project operates with optimum level of Operation Cost?			82.35	17.65
4	Is there any budgeting for VM an LCC analysis of the Town Projects?	0.00	100.00		
5	Do you have any process to check VM an LCC analysis process done in the project design before the approval of the Town Projects?	0.00	100.00		

Generating alternative ideas while designing a project is a step of Value Management Procedure and related with this two questions: "Do you have established design alternatives while selecting the Small Town Project Design?" and "Have you followed the VM and LCC procedures in designing SSTWSSSP?" asked to the consultant and the result was 100% has "yes", in the first and 100% "no in the second question. While studying in depth the practice of establishing design alternatives is generating alternatives within the design team only, but in Value Management process the numbers of alternative ideas generated in Value Management workshops organized by Value Management team. Since there were not appointed any value manager or VM team and as per respondents negative response in second question there were no procedure followed. Though the positive response of the respondents their practice may be part of VM but incomplete and it may ne be provide real benefit of Value Management.

The consultants were asked with the question "In your views, the project operates with optimum level of Operation Cost?" the result was 82.35% "yes" and 17.65% "no". This shows the positive response of the respondents that they have practice of economic calculation of the selected design of the project, if the result was positive it would be selected and no further analysis of other alternatives would be carried out. As a positive result given by the economic calculation, they were confident in their design to operate with optimum level of operation cost.

Two questions were put forward to the clients "Is there any budgeting for VM an LCC analysis of the Town Projects?" and "Do you have any process to check VM an LCC analysis process done in the project design before the approval of the Town Projects?", both the questions have 100% "no". In previous objective we have known that there were no any guidelines for introduction of VM in SSTWSSSP and in government systems there would not be allocated any budget without guidelines of the implementation. So, no any budget was allocated for VM and LCC analysis. To check any process there would be approved procedure as per guidelines and without guideline there would be not any procedure for checking mechanism.

To find the opinions of the clients and consultants on Value Engineering, they were asked to as SA for strongly agreed, A for agreed, U for Undecided, D for Disagree, SD for Strongly Disagreed and marking was done 5 for SA, 4 for A, 3 for U, 2 for D and 1 for SD, the result was shown in table 7. and table 8.

Table 7: Remarks of Clients opinion on VM

Factors	Mean Weightage	Remarks
VE is merely cost cutting techniques	2.23	Positive attitude
VE increases function at same cost	2.00	negative attitude
Increase function and LCC	3.69	negative attitude
Decrease Life Cycle Cost	2.15	negative attitude
Designer practices Value Managementindependently	3.46	negative attitude
Value Managementhas no scope	2.62	Positive attitude
Why increase time & cost going to VE consultant when designer can do the same	4.31	negative attitude
With advancement in Project Management tools VE has certain scope	3.85	Positive attitude
Certainly makes difference the way we conceive the project & execute it	3.85	Positive attitude

The clients have positive attitudes on the facts that Value Managementis merely cost cutting techniquesas mean weightage less than 3 for negative factor and negative attitude on VE increases function at same costas mean weightage less than 3 for positive factor.They assume VE does not save cost but more cost is required for the VE procedure and VE does not increase function at same cost. The clients have negative attitude in the factors that VE increases function and Life Cycle Cost as the mean weightage for the factor 3.69 is more than mean score value 3 but in real VE decreases LCC. As the mean weightage for the factor VE decreases Life Cycle Cost 2.15 is less than mean value 3, they does not assumes it positively that VE reduced LCC of a project.
Clients assumed that the designers practices VE independently but in reality for VE different Value Management team or value manager should be appointed for application of VM. Since the mean weightage 2.62 for the factor VE has no scope is less than mean value 3, the majority of clients have positive attitude. Clients seem the designer and VE consultant are same, appointing VE consultant consumes extra time and cost. Only the designer cannot view the deficiencies in their design, it can be seen from different way to get real benefits from the VE application. As per literature reviews, the nominal cost of VE team can save more than 10 times more.
The clients have positive attitude towards the factors **'**with advancement in Project Management tools VE has certain scope' and 'Certainly makes difference the way we conceive the project & execute it' as majority of the clients have agreed the facts and mean weightage 3.85 is more than the mean value 3.

Table 8: Remarks of Consultants opinion on VM

Factors	Mean Weightage	Remarks
VE is merely cost cutting techniques	4.00	Negative Attitude
VE increases function at same cost	4.06	Positive Attitude
Increase function and LCC	2.47	Positive Attitude
Decrease Life Cycle Cost	3.82	Positive Attitude
Designer practices Value Managementindependently	2.82	Positive Attitude
Value Managementhas no scope	2.24	Positive Attitude
Why increase time & cost going to VE consultant when designer can do the same	2.47	Positive Attitude
With advancement in Project Management tools VE has certain scope	3.88	Positive Attitude
Certainly makes difference the way we conceive the project & execute it	4.18	Positive Attitude

Unlike clients, the consultants have positive attitude towards VE beside one factor as the marks for the positive factors have more marks than mean mark 3 and the marks for negative factors have less mean weightage than mean value 3. Though the result shows positive attitude of the consultants, all the consultants have not positive attitude as the marks obtained have near to the mean values.
The T-test was done for the remarks of the opinions of both client and consultant with mean value, the both results lies in the acceptance region. So, the opinions of the clients and consultants were true. The details of the calculations are shown in the Annex I.

Table 9: T-test for opinions of clients and consultants at 95% confidence level

Factors	Value of t	Acceptance region	Remarks
VE is merely cost cutting techniques	2.113	1.701	Not Significance
VE increases function at same cost	2.332	1.701	Not Significance
Increase function and LCC	1.535	1.701	Significance
Decrease Life Cycle Cost	1.927	1.701	Not Significance
Designer practices Value Managementindependently	0.834	1.701	Significance
Value Managementhas no scope	0.450	1.701	Significance
Why increase time & cost going to VE consultant when designer can do the same	2.047	1.701	Not Significance
With advancement in Project Management tools VE has certain scope	0.043	1.701	Significance
Certainly makes difference the way we conceive the project & execute it	0.380	1.701	Significance

In overall, the respondents perceives confusing perceptions with incomplete practice of Value Management and negative attitude towards new ideas as they are pleased of in the traditional way of project management.

Reason for Not Implementing Value Management:

The introduction of Value Management in the world being long time, there are no application in the construction projects of Nepal. Despite most of the respondents agrees that VM and LCC plays vital roles in any construction projects, these are not in much use in the construction projects in Nepal. The second objective of the study was to examine and discover the reason for not implementing Value Management.

There are some reasons for not implementing VM in construction projects. Respondents views were taken such as SA for strongly agreed, A for agreed, U for Undecided, D for Disagree, SD for Strongly Disagreed for the factors as shown in Table 4.6and Relative Hindrance Index (RHI) and Ranks for the factor were analyzed by marking 5 for SA,4 for A, 3 for U, 2 for D and 1 for SD.

Table 10: Rank and Relative Hindrance Index of Client and Consultant

Factors	Clients		Consultants	
	Rank	RHI %	Rank	RHI %
Lack of local guidelines & information about VM	1	89.23	9	56.47
Conflicts of objectives by different project stakeholders	2	86.15	6	72.94
Not suitable for low cost project	3	86.15	4	80
Lack of trained professionals in VM	4	84.62	1	85.88
Lack of knowledge & practice in VM	5	83.08	2	84.71
Lack of training opportunities in VM	6	81.54	3	83.53
Interruption to the normal work schedule	7	76.92	10	50.59
Non conducting environment for team work	8	76.92	8	68.24
Lack of practice of formal managerial techniques	9	76.92	5	80
Too expensive to carry out VM	10	75.38	11	48.24
Lack of commitment of leadership	11	69.23	7	71.76

The clients have ranked the factor ‘Lack of local guidelines & information about VM’ as major reason for not implementing Value Managementin construction fieldas it has highest 89.23% of RHI while consultants have ranked the factor ‘Lack of trained professional in VM’ as major reason as it has highest 85.88% RHI. This shows that consultants feels requirement of trained professionals while clients feels requirements of guidelines and information about VM for the implementation of VM.

Likewise, as per opinions of clients the factor ‘Conflicts of objectives by different project stakeholders’ as

second rank with RHI 86.15% while consultants have ranked 'Lack of knowledge & practice in VM' as second with RHI 84.71%. The clients have ranked the factor 'Not suitable for low cost project' as third with RHI 86.15% and consultants have ranked 'Lack of training opportunities in VM' as third reason for not implementing VMwith RHI 83.53%.

The client shows the factor 'Lack of commitment of leadership' with 69.23% of least RHI while consultants have scored least RHI of 48.24% for 'Too expensive to carry out VM'.Likewise other results were shown in the table 4.5 above.

Relative Hindrance Index (RHI) were analyzed for the factors not implementing Value Management and significance test was carried out by rank correlation.

For the test of the significance of the Relative Hindrance Index obtained from the clients and consultants, Spearman's Rank Correlation Coefficient of the RHI was analyzed. The Coefficient of Spearman's Rank Correlation Coefficient of RHI of Client and Consultant was found to be 0.318, which shows positive relation with weaker relationship and both were in same direction but the priorities of the both have weak relation.

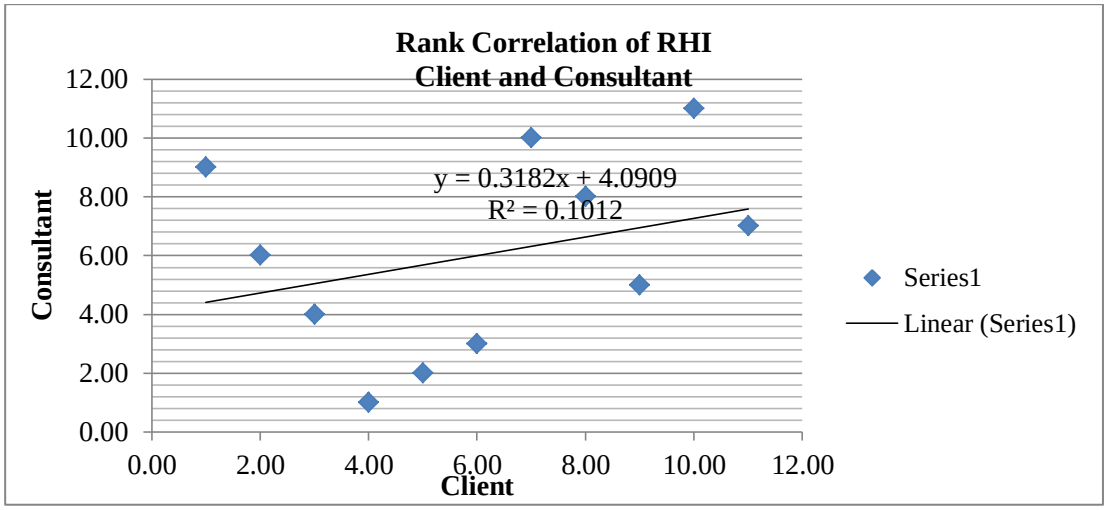


Figure 3: Rank Correlation Coefficient of RHI of Client and Consultant

The common ranks RHI was also calculate by combining the two ranks of client and consultants as given in the table 4.7.

While combining the RHI of clients and consultants, the factor 'Lack of trained professionals in VM' became first rank with 85.33% RHI and the factor 'Lack of knowledge & practice in VM' ranked as second with 84.00% of RHIwhich were first and second rank also among the consultant. Likewise other ranks were shown in the table 10.

Table 11: Rank of the factor for not implementing VM with common RHI

Factors	Common RHI %	Rank
Lack of trained professionals in VM	85.33	1
Lack of knowledge & practice in VM	84.00	2
Lack of training opportunities in VM	82.67	3
Not suitable for low cost project	82.67	4
Conflicts of objectives by different project stakeholders	78.67	5
Lack of practice of formal managerial techniques	78.67	6
Non conducting environment for team work	72.00	7
Lack of local guidelines & information about VM	70.67	8
Lack of commitment of leadership	70.67	9
Interruption to the normal work schedule	62.00	10
Too expensive to carry out VM	60.00	11

In overall, lack of guidelines and lack of trained professionals are the major reason for not implementing VM as per client and consultants respectively. The clients seek towards guideline of VM which can guide them for implementation while consultants seek trained professionals for the implementation of VE.

CONCLUSIONS:

It can be said that VM techniques in industry are not a new subject in the world, the techniques is new for Nepal. Literature review shows that there are a lot of publishing and examples of application on VM and LCC in the world, but there are only few studies related to VM and LCC and no example of application of it.

The professional from both clients and consultants have confusing perceptions towards practice of Value Management techniques in construction industry. The professional who are aware of Value Management understand that the practice of economic analysis done in the feasibility study of a project as Value Management. They have not broad concept of Value Management but the traditional practice of economic analysis and the alternative analysis are part of Value Management they have no tendency to use formal procedure of Value Management. Clients have negative attitude towards factors 'Designer practices VM independently', 'Why increase time & cost going to VE consultant when designer can do the same' and ,VM has no scope', 'With advancement in Project Management tools VM has certain scope', 'Certainly makes difference the way we conceive the project & execute it' but the consultants have positive attitude towards except one factor 'VE is merely cost cutting technique'..

The reasons for not implementing VM in the construction field are ranked series with the common Relative Hindrance Factor (RHI) from client and consultants 'Lack of trained professionals in VM', 'Lack of knowledge & practice in VM', 'Lack of training opportunities in VM', 'Not suitable for low cost project', 'Conflicts of objectives by different project stakeholders', 'Lack of practice of formal managerial techniques', 'Non conducting environment for team work', 'Lack of local guidelines & information about VM', 'Lack of commitment of leadership', 'Interruption to the normal work schedule', 'Too expensive to carry out VM'.The major reason is the Lack of trained professionals in VM and the factor 'Too expensive to carry out VM' is not significant as the reason of not implementing VM. The clients have given more focus on lack of guidelines while the consultants have focus on lack of trained professional on VM.

RECOMMENDATIONS:

Based on the results and discussion, the following are recommended are advised for projects in Nepal;

I. For the development of medium to high level of construction projects or water supply projects, a Value Manager or Value Management Team should be assigned to get best option of the project.
II. To optimize risk to the possible extent appropriate guidelines should be prepared for the application of VM and for the best result; VM and LCC should be mandatory provisions on the guidelines.
III. Commitment from the top management level of organization is required for successful implementation of VM. National and top level workshop should be organized on VM and LCC.
IV. Highly experiencedpersonnel should be appointed in a VE team to perform best result from the VM and LCC analysis.
V. Appropriate coordination mechanism with client, consultant and users should be prepared during all phases of the project.
VI. Further research should be continued to analyze the VM approach and Life cycle costing.

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APPENDIX I

SUMMARY AND OVERVIEW OF STEPS

Step		Outcome/Achievement
1	Identify the main purpose of the LCC Analysis	Statement of purpose of analysis Understanding of appropriate application of LCC and related outcomes
2	Identify the initial scope of the analysis	Understanding of: Scale of application of the LCC exercise Stages over which it will be applied Issues and information likely to be relevant Specific client reporting requirements

Step		Outcome/Achievement
3	Identify the extent to which sustainability analysis relates to LCC	Understanding of: Relationship between sustainability assessment and LCC Extent to which the outputs from a sustainability assessment will form inputs into the LCC process Extent to which the outputs of the LCC exercise will feed into a sustainability assessment
4	Identify the period of analysis and the methods of economic evaluation	Identification of the period of analysis and what governs its choice Identification of appropriate techniques for assessing investment options
5	Identify the need for additional analyses (risk/uncertainty and sensitivity analyses)	Completion of preliminary assessment of risks/uncertainties Assessment of whether a formal risk management plan and/or register is required Decision on which risk assessment procedures should be applied
6	Identify project and asset requirements -	Definition of the scope of the project and the key features of the asset Statement of project constraints Definitions of relevant performance and quality requirements Confirmation of project budget and timescales Incorporation of LCC timing into overall project plan
7	Identify options to be included in the LCC exercise and cost items to be considered	Identification of those elements of an asset that are to be subject to LCC analysis Selection of one or more options for each element to be analysed Identified which cost items are to be included
8	Assemble cost and time (asset performance and other) data to be used in the LCC analysis	Identification of: All costs relevant to the LCC exercise Values of each cost Any on-costs to be applied Time related data (e.g. service life/maintenance data)
9	Verify values of financial parameters and period of analysis	Period of analysis confirmed Appropriate values for the financial parameters confirmed Taxation issues considered Application of financial parameters within the cost breakdown structure decided
10	Review risk strategy and carry out preliminary uncertainty/risk analysis	Schedule of identified risks verified Qualitative risk analysis undertaken – risk register updated Scope and extent of quantitative risk assessment confirmed
11	Perform required economic evaluation	LCC analysis performed Results recorded for use at Step 14
12	Carry out detailed risk/uncertainty analysis(if required)	Quantitative risk assessments undertaken Results interpreted
13	Carry out sensitivity analyses (if required)	Sensitivity analyses undertaken Results interpreted
14	Interpret and present initial results in required format	Initial results reviewed and interpreted Results presented using appropriate formats Need for further iterations of LCC exercise identified
15	Present final results in required format and prepare a final report	Final report issued, to agreed scope and format Complete set of records prepared to ISO 15686 Part 3
