

# ENHANCING THE VALUE IN CONSTRUCTION VIA INTEGRATION OF SUSTAINABLE CONSTRUCTION TO VALUE PLANNING

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## ABSTRACT

*Sustainable Concept (SC) has shed a spotlight towards the rapidly developing construction sector since concerns on SC principles are widely emerged recently which focused to ensure both present and future generations a good quality of life. Currently Sri Lanka is on construction boom which feeds the requirement of establishing sustainable concept to the construction projects. This paper aims to investigate the current situation of Value Planning (VP) and SC in local construction sector and to present a framework for integrating concept of value for money in sustainable construction.*

*A comprehensive literature survey was carried to observe the existing knowledge on SC and VP concepts to develop a conceptual linkage between the two disciplines. This was followed by an expert semi structured interview survey among experts having considerable knowledge on both aspects to ascertain the current situation of those concepts in Sri Lankan construction industry. Findings of the research revealed that the application, knowledge and experience of experts are not satisfactory in both of these concepts. It is established that there is a huge requirement of applying these concepts in local construction projects. In order to overcome the issues identified, a Framework has been developed to integrate SC and VP in Sri Lankan construction projects.*

**Keywords:** *Infrastructure Projects; Sri Lanka; Sustainable Construction; Value.*

## 1. INTRODUCTION

The construction industry has both positive and negative impacts on environment as well as people. The effect of impact will vary accordingly with rise or fall of the industry. In Sri Lankan context, construction industry became a major contributor with average 7% contribution to the Gross Domestic Production (GDP) and by showing a 17.3% growth in Sri Lankan economy which is a record in 2009 (Central Bank Annual Report, 2009). In addition the sector provides job opportunities for about 7.2 % of the country's total work force which amounts to around 570,000 persons (Media Centre for National Development Sri Lanka, 2012) while the industry's contribution to Gross Domestic Capital Formation was 70% (Rajapaksha, 2010). These evidence shows that Sri Lanka is currently experiencing a construction boom due to the increased interest of investors after end of the three decade-long conflict and restoring the peace. This boom is being encouraged by rapidly expanding tourism sector as well as major government infrastructure projects. As a negative effect, however, this will lead to increase in adverse environment issues since rise in construction industry conversely depleting natural resources which causes unwanted side effects while the impact caused by construction activities on the environment occurs throughout the project life cycle (Athapaththu, 2012). It is estimated that the construction industry is responsible for approximately 40% of energy consumption, 30% of CO<sub>2</sub> emissions and 40% of total solid production waste globally (Hajek, 2002).

If the construction industry is to provide the required buildings, infrastructure and reduce environmental degradation, it must adopt more sustainable practice and policies (Ngowi, 2000). The objectives of SC include environmental impact reduction, resources optimisation, social and cultural improvement, achievement of quality, affordability and durability in a project (Kibert, 2008). Although the sustainable concept is a vital requirement to the world and for safeguard of future generations, there are several potential barriers to the implementation. The key barrier is perceived as cost since the common perception about sustainable buildings appears to be that they cost more than ordinary buildings (Castillo and Chung, 2005). Furthermore Castillo and Chung stated that sustainable buildings increase initial costs by an average of 2 to 7 percent over ordinary building cost. According to Bartlett and Howard (2000), engaging sustainability

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issues in construction projects faces several challenges such as negative perception about cost. This shows that clients may tend to dislike the SC approach because of this cost factor. Conversely, Value Management (VM) attracts clients since it reduces the unnecessary costs of the project with no deduction to the expected quality and performance (Hayles *et al.*, 2011).

Value Management is about how to create the best value of products or services on the basis that the function must be sustained (Fong *et al.*, 2001). As a systematic, multi-disciplinary and structured methodology, Value Management aims to improve the value and optimise the life cycle cost of a facility through identifying opportunities to remove unnecessary costs while ensuring quality, reliability, performance, and other critical factors to meet or exceed the customer's expectations (International Federation of Accountants, 2012). More deeply, there are economic considerations of SCs as profitability, lifecycle cost, rehabilitating cost of ecosystem, resettling cost of people, adverse impact on tourism value and employment of labour (Athapaththu, 2012). Accordingly it is clearly identifiable that the value for client's money is not directly addressed in the SC concept as well as cost which have to incur is more than the VM. In this context, Sustainable approach can be introduced through value management as an integrated approach to the clients which will be more effective rather than applying SC alone. The expected benefits will not be one ended since the client will have a better value for his money while the other stakeholders will be beneficial environmentally, economically and socially through their sustainability.

Thus, this paper aims at present a framework to integrate SC to VP in construction projects. The scope of this paper covered a brief introduction to SC, VP and their viable linkages, the current status of integration of VP in SC in Sri Lanka and a framework for integration.

## **2. LITERATURE REVIEW**

### **2.1. SUSTAINABLE CONSTRUCTION**

According to the United Nations World Commission on Environment and Development (WCED) sustainable development is defined as 'development that meets the needs of the present generations without compromising the ability of the future generations to meet their own needs (2012). The construction industry concentrates on the three aspects of sustainability; environmental, social and economic, in different ways.

Ministry of Environment and Natural Resources (MENR) in Sri Lanka has identified the timely requirement of sustainable development as they put a step forward to contribute sustainable development in Sri Lankan context by introducing a guideline which is named as National Sustainable Development Strategies (NSDS). The Green Building Council was established in 2010 in line with Tsunami Sustainable Building Guideline for South-East Asia which provides numerous environmental, safety and financial benefits through sustainable reconstruction management guideline (UNEP, 2007). There are some few building projects which were recognised in the Sri Lankan construction industry as sustainable buildings such as Heritance Kandalama hotel and MAS Intimates Thurulie (Pvt.) Ltd. Even though some steps were taken to introduce and deliver sustainability to Sri Lankan construction industry, still Sri Lanka is struggling from not only environmentally but also economic and social issues due to unstable development during past decades (Athapaththu, 2012). Thus, Employers, Clients, Contractors, Consultants, Government and all other stakeholders of the industry have great responsibility to work towards efficient design, construction and maintenance of our built environment in sustainable manner through the inevitable adoption of sustainable practices.

### **2.2. VALUE PLANNING**

Value Management (VM) is a systematic approach that analyses the facilities, services, supplies, functions of systems and equipment to ensure they achieve their essential functions at the lowest life-cycle cost consistent with required performance, quality, reliability and safety. Typically the implementation of the VM process increases performance, quality, reliability, durability, effectiveness, safety or other desirable characteristics (Kelly Male and Graham, 2004). The systematic process of value management can be simply divided into three main phases, namely Value Planning, Value Engineering (VE) and Value Analysis (VA) to ensure that the value is delivered to the project in the most effective manner.

VP is applied in the earliest stages of a project prior to the decision to build the project or at the concept phase of a project (Kelly, Male and Graham, 2004; Ashworth and Hogg, 2000). Significant reason for application of VP in the concept phase of a project is to ensure that value is planned into the whole project from its inception.

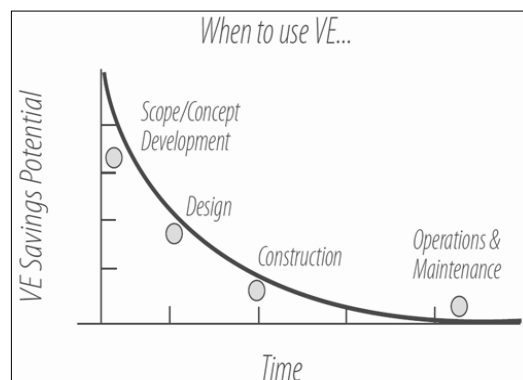


Figure 1: When to Use Value Engineering

Figure 1 shows that application of VE at the earliest stage has the highest saving potential with delivering the maximum value for a project. Accordingly the selection of VP is justifiable and more benefits can be achieved through integration of SC at earlier stages.

General concern of the local construction industry is to reduce the cost rather than improving the actual value of the outcome (Gamage, 2011). This is due to Sri Lanka is still a third world country and the majority of local citizens need the end product just only to fit to the purpose. However currently there is an increment of the value consideration in Sri Lankan construction industry (Rajapaksha, 2010).

### 2.3. CONCEPTUAL LINK BETWEEN SUSTAINABLE CONSTRUCTION AND VALUE PLANNING

It has been understood that VM and SC have strong linkages and relationships in terms of their application and aims in construction projects.

Kelly *et al.* (2004) identified strengths and limitations of value management which can be similarly used as strengths of VP to integrate SCs. These are as involvement of multidisciplinary professional teams, different skills and techniques to build knowledge of SC, structured and systematic job plan to deliver SC, creativity phase generates sustainable options and avoid initial idea that springs to mind, function analysis can be used to identify and understand the project and use sustainable dimensions as project functions, the VM tools and techniques help decision-makers to take correct and suitable actions, the critical timing of VM provides significant positive effects on whole project delivery, VM is applied in a successive manner which enhances and monitors SC process, VM can be used as quality assurance to monitor sustainable principles, VM proposals are based on cost-effectiveness and considered sustainability dimensions could be used to persuade clients' attitude in future, potential to reduce the project whole life-cycle cost, even if it contains sustainable principles, through eliminating unnecessary cost; and facilitator helps to guide the process. Furthermore Kelly *et al.* (2004) demonstrates some limitations as time restriction, client commitment is a necessary to promote SC, and it needs the team members to have knowledge on both topics, VM and SC.

### 3. RESEARCH METHODOLOGY

Comprehensive literature review has been carried out in order to observe existing literature on sustainable concept and value planning concept individually and the extent to which those has been addressed on the scope of integration in local context and international context. Identification of the conceptual linkage was done accordingly to feed the main conceptual framework derived from VM job plan.

Data required for the research were collected using Expert Semi-structured interviews which are the most appropriate method for collecting qualitative information. An appropriate interview guideline was prepared by focusing on the main two topics in terms of application, current status and barriers to implementation

including both closed ended and open ended questions. Selected sampling method was non random sampling which also known as purposely sampling technique since this research is specific to VP and SC which are not generic in the Sri Lankan context. This was used as a filtering process of the required experts from the general expert population. Accordingly the data was obtained by conducting interviews with 16 experts having significant experience in Sri Lankan construction sector projects with both Sustainable and Value planning concepts applied. The interviewee profile is presented in Table 1. Some interviews were audio recorded as with the permission of the interviewers. Transcripts were prepared with the help of those recordings in order to use in the analysis process. Since the Collected data of this consists with both closed ended (Quantitative) and open ended (Qualitative) portions, data analysis was also required to use statistical analysis and content analysis separately.

Table 1: Interviewee Profile

Number	Profession	Experience Category
1	Quantity Surveyor	More than 20 years
2	Quantity Surveyor	15 – 20 years
3	Quantity Surveyor	15 – 20 years
4	Quantity Surveyor	10 – 15 years
5	Quantity Surveyor	10 – 15 years
6	Quantity Surveyor	05 – 10 years
7	Engineer	15 – 20 years
8	Engineer	10 – 15 years
9	Engineer	10 – 15 years
10	Engineer	10 – 15 years
11	Engineer	05 – 10 years
12	Architect	More than 20 years
13	Architect	10 – 15 years
14	Architect	05 – 10 years
15	Project Manager	More than 20 years
16	Project Manager	15 – 20 years

The analysed research findings are presented below in separate sections.

## 4. FINDINGS

### 4.1. OVERVIEW OF SC AND VP

This section focused on qualitative data findings which are analysed using standard SPSS software (Statistical Package for the Social Sciences). Five closed ended questions were asked from respondents regarding both SCs and VP with each having a respondent scale of five answers. The analysis was done to get an overview on level of application, importance, and satisfaction on current status, current knowledge and required application level, stage of application and the team leader of both SC and VP.

#### 4.1.1. FREQUENCY OF APPLICATION

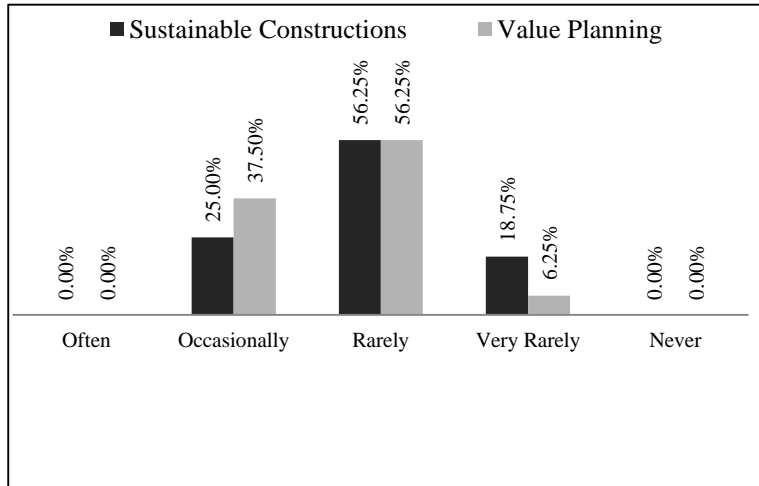


Figure 2: Frequency of Application of SC and VP

Application level of VP is slightly higher than the application level of SC in Sri Lankan construction sector. However the overall consideration impressed that the current application level is rare in both these disciplines as shown in Figure 2. The reasons were identified mainly as lack of awareness of people, clients dislike and shortage of experts.

#### 4.1.2. LEVEL OF IMPORTANCE

According to the Figure 3 it is crystal clear that ultimately 100% of the expert sample established that the levels of importance in both these concepts are high or very high.

The reasons were that currently Sri Lanka is on construction boom with vast building and infrastructure developments. Therefore, sustainability is a vital requirement globally as well as locally since resources are getting low rapidly. Thus, social, environmental, and economical sustainability is emerging as a vital requirement. Moreover, Value for money is becoming essential to the clients since the scope, complexity, size, and cost of construction projects are increasing rapidly.

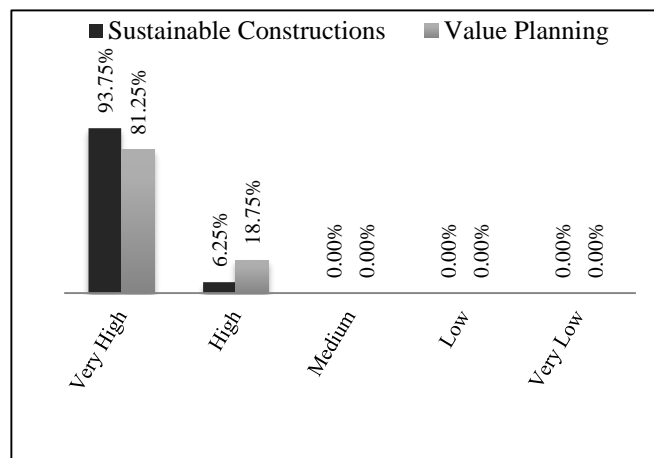


Figure 3: Level of Importance of SC and VP

#### 4.1.3. SATISFACTION ON CURRENT PRACTICE

Satisfaction on the current status of practice with regards to SC and VP are being illustrated in Figure 4. More than 80% of the population stated that both the SC and VP application are not at a satisfactory level.

The rationale behind some professionals picking “Satisfied” level on SC 6.25% and on VP 18.75% is merely the influence on the current government policies and technologies being adapted but it are unfair to conclude dissatisfied.

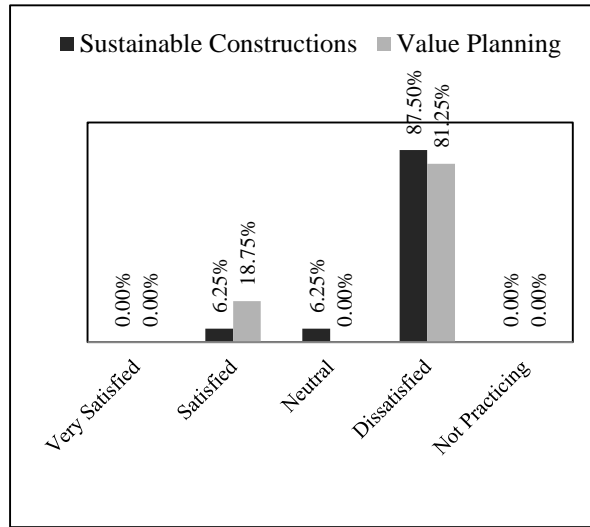


Figure 4: Satisfaction on Current SC and VP Practice

#### 4.1.4. CURRENT KNOWLEDGE LEVEL

The SC concept, 68.75% of the total population was on the positive side while on VP concept is 93.75%. Therefore it can be assumed as the knowledge on VP is higher than the SC.

It was revealed that even though the knowledge level is considerably fair the application level is not match with the knowledge level. The reason for the fact is that the people who practicing in management levels in the industry is not knowledgeable as required. Moreover, the relevant knowledgeable experts are more towards in academic instates rather than practicing.

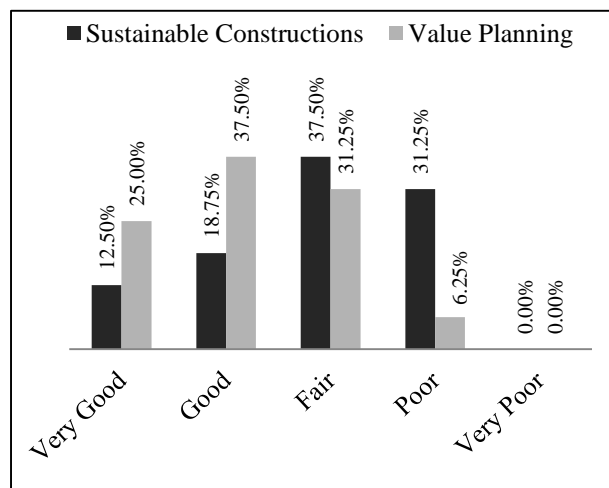


Figure 5: Knowledge Level on SC and VP

**4.1.5. REQUIRED APPLICATION LEVEL**

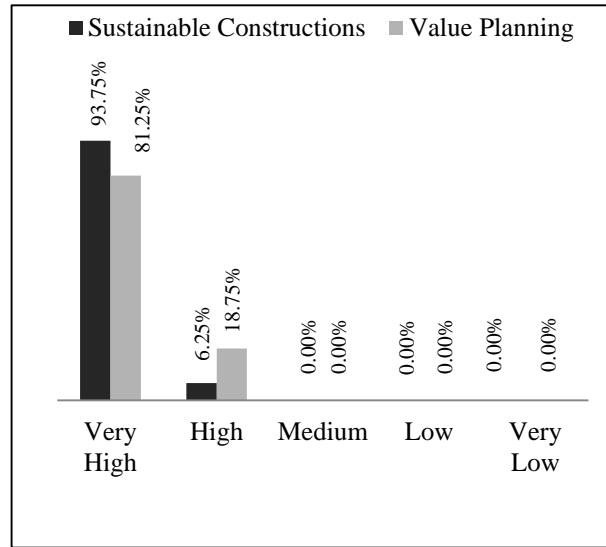


Figure 6: Required Application Level of SC and VP

Figure 6 is the summary of data collected and the analysis under the required level of application. Eventually an overall view certified that the 100% of population of interviewees strongly or averagely believe that SC and VP concept should be applied to the Sri Lankan construction industry more than the current application level. This result came because of the current application level is very low which identified above in “level of application” and “the level of importance” is very high according to the above findings.

**4.1.6. STAGE OF APPLICATION**

Figure 7 provides the analysed data on stage of application. Accordingly, the general idea on experts is that both of these concepts should apply as early as possible or at the planning stage of the project since all these stages are covered in the planning level.

The composition and leadership of the VP and SC teams will be the most important factor affecting the decision making and the success of the process. The identified suitable responsibility and leadership of both SC team and VP team are as follows.

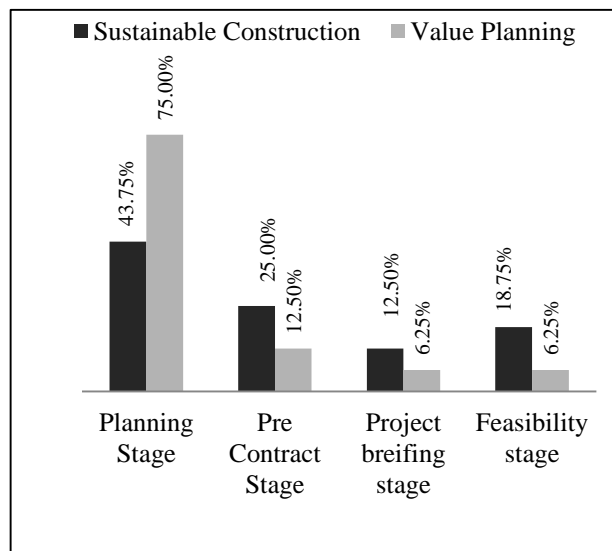


Figure 7: Stage of Application of SC and VP

#### 4.1.7. TEAM LEADER OF SC AND VP

Figure 8 established an idea on the suitable leader as an Architect for the SC team and a Quantity Surveyor for the VP team. Most importantly both of those team leaders should have the required skills, knowledge, and experience on the relevant field and able to take the responsibility and the leadership of the process.

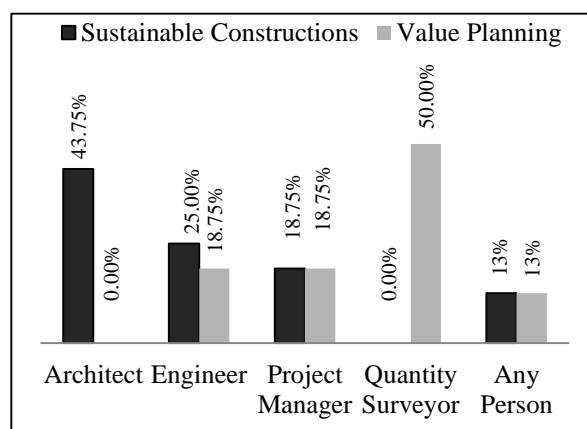


Figure 8: Team Leader of SC and VP

#### 4.2. PROBABLE BENEFITS, DRAWBACKS AND THE WAY FORWARD OF SC AND VP

There is no standard or regular process used in sustainable studies and VP studies in Sri Lankan construction sector. What is happening currently is conducting brainstorming sessions at the initial stage of the project and at certain intervals as required as the process goes on.

Findings revealed that number of benefits can be gained by both sustainable and value consideration. Specially, intangible benefits which are hard to achieve in normal construction process can be achieved by the value consideration which leads the end product more compatible with surroundings and also for occupants.

When considering sustainable concept, the benefits include resource conservation, environment friendly in construction and maintenance, improve energy efficiency of the building, reduce total lifecycle cost of the building, reduce wastage of projects initially and operationally, enhance attributes and skills of people who involved in the project, enhance the comfort level and health level of users, increase the employee satisfaction and productivity and reduce strain on the available local infrastructure.

When considering VP concept, benefits include client will gain good value for his money, reduce or eliminate unnecessary costs, reduce whole lifecycle cost, client's and/or users' requirements and needs will be achieved, improve quality of the final outcome and enhance attributes and skills of people who involved in the project.

Barriers and drawbacks of the SC and VP concepts can be identified as lack of awareness of client in SCs and/or value planning, sustainable designs cost more than regular designs when considering the initial cost, lack of government support, more time consuming in the initial stage of design, less knowledge on the sustainable field, consultants do not come up with sustainable proposals and/or VP proposals, shortage of expertise related to the sustainable field, lack of regulation and policies on the SC concept and VP concept, lack of availability of some sustainable or value enhancement technologies in Sri Lanka and lack of guidance on SCs to clients.

Findings on steps to enhance the practice of these two concepts can be filtered as motivation of people who engage in the fields of SC and VM by offering incentives and providing rewards, offering the stakeholders of SC or VP process a percentage of cost saving achieved at the end, arrange competitions and provide certifications and awards for professional-wise and organisational-wise for those who applied SC and VM technique to their projects, obtaining the support of top-level decision makers and arranging free seminars and symposiums to maximise the awareness.



## 5. FRAMEWORK FOR INTEGRATION OF SC AND VP

The proposed framework shown in Figure 9 is derived from the VM job plan by adding the SC principles during briefing stage. Expected objectives of the proposed framework are, increase awareness of client; top management, study team; design team and the contractor on SC and VP; identify client's needs in terms of SC and VP with main requirements; enhance good communication level and understanding among the team members and other project stakeholders and obtain more commitment of clients to with respect to SC and VP.

The best time for the proposed integrated approach is shortly after appointing the project manager (Consulting Project manager) or facilitator and prior to the selection of the design team. The timeframe of the study depends on basically type, size and complexity of the project. At the end, the objectives should be set in such a way that the plan can be effectively addressed within the allocated time limit since if the study continues for an extended period of time, the approach itself will be opposite to the value concept.

Furthermore introducing each party to others with regards to involvement to the project, specialisation, and key required information will leads to a firm platform to the project. Stakeholders should be aware on the impacts of both project inputs and outputs. A process of having vast communication, transparency, and further improvements should be continued.

Master brainstorming session is the basic workshop involving learning, discussing, explaining, clarifying, and translating sustainable and value issues within the key stakeholders and the project team. All the factors related to sustainable principles and value principles will be taken into consideration at this stage to achieve sustainability and value for money. Predetermined, systematic and sequential approach will be suitable to successful completion of this stage. Finally the concluded aspects will be added to the project brief with the approval of the top management (decision makers).

Conclusions of the brainstorming stage will be made and disseminated at the informational stage. It includes identifying relationships between sustainable and value drivers. This should address the clients' needs, allocated budget limit, allocated time limit, overcoming of barriers and challenges and the practicability. Development of guidelines, tools and techniques with standards, benchmarks, sustainable and value specifications will be a key concern of this step.

In the next step priorities for sustainable principles should be defined. The suitable and successful criteria are the most accepted sustainable values by the design team experts. Sustainable values can be added to the value criteria under three main sub categories as environmental, economical and social.

Creativity phase involves with generation of innovative ideas and possible alternatives as many as possible in order to achieve each function identified in previous stages. These ideas should be in line with the sustainable and value principles as discussed above. Each idea should be considered and written down in a systematic order. Then the design team carefully evaluates each idea and comes to an agreement where the project objectives should be clearly focused.

In the development stage the selected ideas and alternatives in the previous phase will be developed into a practical base. Selection of best alternative is again a part of this step. Presence of the client (project sponsor) will be more effective in this phase to make an assessment considering the feasibility of these ideas when implementing. Finally the best idea will be developed with the help of the expert team members considering all the aspects and possible issues.

In the decision making and recommendation phase the final decision is taken after considering all the facts and recommendations being presented. Advantages and disadvantages of all proposed and listed ideas, rationale for selecting the final idea and reasons for rejecting other ideas are needs to be revealed.

Preparation of an implementation plan including all ideas and alternatives accepted by the team in previous stages is the key task of this phase. This is the phase where all the above efforts come to a reality. If all the previous steps have been completed accurately, there is no margin of error in the implementation phase.

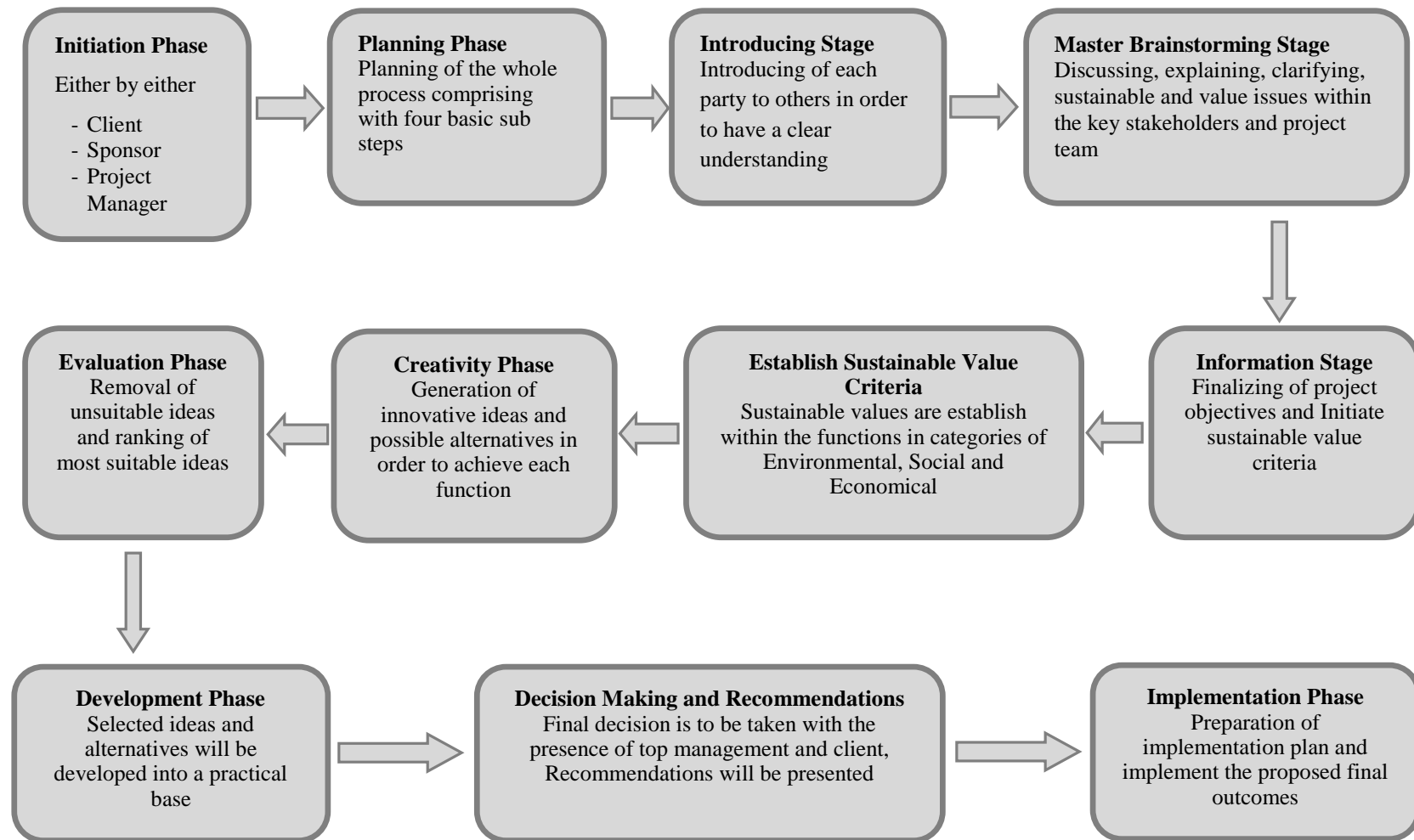


Figure 9: Proposed Final Framework for Integration of SC and VP

### **5.1. AVOIDANCE OF IDENTIFIED ISSUES BY THE PROPOSED FRAMEWORK**

Proposed framework provides understanding and implementation of principles of VP and SC in Sri Lankan construction industry to the client and other stakeholders at the initiation stage and/or planning stage as well as latter stage. It will help the establishment of sustainable development concept to the project.

At the tender evaluation stage, if reasonably high marks are awarded for the bidders who come up with SC proposals and value enhancement proposals, it will increase the contractors concerns, knowledge and awareness on SC and VP. This will help overcome two identified barriers, contractors' unwillingness and unawareness on these concepts and the current poor application of these disciplines.

Team leader will demonstrate the client on VP and sustainability application, outcomes, and benefits it can gain. This will clearly enhance the awareness of clients in the industry on both VP and SC concepts. Through the brainstorming session in stage four, each team member will become aware of special expertise area and experiences of others. This will enhance the knowledge level of experts in the industry.

As two disciplines are to be addressed in a single process with a single team, it helps enhance the knowledge level and skills of Value experts on SC aspects, and to enhance the knowledge level and skills of SC experts on VP aspects.

Integration of SC principles into VP approach will results a hybrid approach including two benefits from one process. Implementation of both as a one exercise shall provide far more effective opportunities in implementing the value for money in the project. Moreover it will help shift the thinking of all stakeholders from sustainability to sustainable value and cost to value. Ultimately it will save time and money for not having two approaches separately. This will overcome the major barrier of cost factor identified previously.

## **6. CONCLUSIONS**

It is established that VP can be upgraded to keep its competitiveness while enhance the performance of sustainable concept and expand the implementation status throughout the country in delivering value for clients' money. Findings revealed that even the level of importance is a very high, current situation of SC and VP implementation in the Sri Lankan construction sector is not at a satisfactory level. Moreover it was found that there is considerably good expert knowledge in the field. Consequently, the most appropriate team to be involved in the process has been identified. Poor awareness, lack of government support, initial time and cost factor were identified as the main barriers for the integration. Thereafter incentives to accelerate the implementation were assessed.

Development of a framework for integration of SC and VP for construction projects has been done by assessing the feasibility of using the value concept to implement Sustainable concept, identifying VM techniques, identifying the capability and limitations of SC and VP, identifying the enhancers and barriers to SC and VP and by using the VM job plan as a base. The main perception behind was defined sustainability as a one value to achieve from the project in the value concept therefore sustainable agenda becomes a value to achieve through the process.

## **7. REFERENCES**

- Ashworth, A. and Hogg, K., 2000. *Added value in design and construction*. England: Pearson Education Limited.
- Athapaththu, A.M.K.I., 2012. *Delivering sustainability in Sri Lankan construction industry*. Thesis (B.Sc). University of Moratuwa, Moratuwa, Sri Lanka.
- Bartlett, E. and Howard, N., 2000. Informing the decision makers on the cost and value of green building. *Building Research and Information*, 28(5/6), 315-324.
- Castillo, R. and Chung, N., 2005. *The value of sustainability* [online]. Available from: <http://www.stanford.edu/group/CIFE/online.publications/WP091.pdf> [Accessed 13 June 2013].
- Central Bank of Sri Lanka, 2009. *Central bank of Sri Lanka annual report 2009* [online]. Available from: [http://www.cbsl.gov.lk/pics\\_n\\_docs/10\\_pub/\\_docs/efr/annual\\_report/AR2011/English/6\\_Chapter\\_02.pdf](http://www.cbsl.gov.lk/pics_n_docs/10_pub/_docs/efr/annual_report/AR2011/English/6_Chapter_02.pdf) [Accessed 21 June 2013].
- Committee of the International Federation of Accountants, 2012. *Guide to practice management for small- and medium-sized practices*. 3rd ed. New York: International Federation of Accountants.

- Fong, P.S., Shen, Q. and Cheng E.W.L., 2001. A framework for benchmarking the value management process. *Benchmarking*, 8(4), 306-316.
- Gamage, M.G.O.S., 2011. *Value achievement in construction industry*. Thesis (B.Sc). University of Moratuwa, Sri Lanka.
- Hajek, P., 2002. *Sustainable Construction through environment-based optimisation*. New York: McGraw-Hill.
- Hayles, C.S., Kerlin, S. and Perera, S., 2011. An analysis of value management in practice: The case of Northern Ireland's construction industry. *Journal of Financial Management of Property and Construction*, 16(2), 94-110.
- Kelly, J., Male, S. and Graham, D., 2004. *Value management of construction projects*. Oxford: Blackwell Science.
- Kibert, C. J., 2008. *Sustainable construction: green building design and delivery*. Hoboken, New Jersey: John Wiley and Sons, Inc.
- Media Center for National Development of Sri Lanka., 2011. *Construction sector becomes major contributor of GDP* [online]. Available from: <http://www.development.lk/news.php?news=1530> [Accessed 28 June 2013].
- Ministry of Environmental and Natural Resources., 2007. *Sri Lankan strategy for sustainable development* (Report No. 978-955-0033-08-09). Colombo: MENR.
- Ngowi, A. B., 2000. Competing with environment-friendly construction practices. *Cost Engineering*, 42(5), 28-33.
- Rajapaksha, M., 2010. *Mahinda chinthana- a brighter future* [online]. Available from: [http://www.mahinda2010.lk/downloads/mahinda\\_chinthana\\_vision\\_for\\_the\\_future\\_eng.pdf](http://www.mahinda2010.lk/downloads/mahinda_chinthana_vision_for_the_future_eng.pdf) [Accessed 20 March 2013].
- UNEP-United Nation Environment Programme, 2007. *After Tsunami sustainable building guideline for South-East Asia* (Report No. 978-92-807-2782-1). Switzerland: Swiss resource centre and consultancy for development.