A FRAMEWORK FOR IMPLEMENTING SUSTAINABLE CONSTRUCTION IN BUILDING BRIEFING PROJECT

Ali M. Al-Yami[1] **and A. D. F. Price**

Department of Civil and Building Engineering, Loughborough University, Leicestershire, LE11 3TU, UK

The current demand for economically viable buildings in the Saudi Public Sector is coupled with the need to maximise the efficient use of Saudi Arabian natural resources. The lack of consideration paid to sustainability issues during the conceptual phase has resulted in higher consumption of materials and energy during both the construction and operational phases of many building projects. This paper proposes a theoretical framework to implement sustainable construction principles in briefing process. It integrates Soft Value Management (SVM) to sustainable construction to enable the client and project team to put into action sustainability principles in the briefing process. The proposed framework was synthesised from a review of literature and current best practice. This paper is part of an ongoing research which aims to exploit the VM experiences and skills of those in the Saudi Public Sector in order to accelerate the understanding and implementation of sustainable construction in the country.

Keywords: framework, Saudi Arabia, sustainable construction, value management

INTRODUCTION

Value Management approach offers a crucial method for the client to achieve a better-built environment and good chance to encourage upgrading in the construction process. Sustainable construction is broadly taken to signify the responsibility of the construction industry for the efficient use of natural resources, minimisation of any negative impact on the environment as well as satisfaction of human needs and improvement of the quality of life. The essence of optimal usage is strongly related with the philosophy of Value Management (VM), which is applied to satisfy value for money in building and infrastructure projects. Male (1998) stated that "VM is a very good tool for breaking existing perceptions, to force people to take a fresh approach to problem solving and assisting in setting our tasks and objectives with value for money at the front of their thinking". In some cases, the project is the product of a strategic VM process conducted during its life cycle, which offers a greater opportunity for project stakeholders to exchange different views and perspectives, thereby enabling them to avoid many of the problems that typically arise in building projects, as well as satisfying the demand for long-term value (Best and De Valence, 1999). Egan (1998) defined VM as "a structured method of eliminating waste from the brief before binding commitments are made".

---

[1] A.al-yami@lboro.ac.uk

Al-Yami, A M and Price, A D F (2006) A framework for implementing sustainable construction in building briefing project. *In:* Boyd, D (Ed) *Procs 22nd Annual ARCOM Conference*, 4-6 September 2006, Birmingham, UK, Association of Researchers in Construction Management, 327-337.

Briefing is perhaps the most important step in the design process; here client requirements and needs are identified and the main pledge of resources prepared (Shen and Chung, 2004). In 1976, the Pruitt-Igoe buildings were demolished as it did not satisfy the requirements and social needs of users (Newman, 1996). This example as with many others demonstrates that stakeholders' needs and sustainable construction in terms of its three dimensions - social, economic and environmental - need to be taken into account in the briefing process. The consideration of sustainable construction during the briefing process may minimize the negative impacts on environment and satisfy the needs and requirements of the user in addition to minimising the whole life cost of a project.

Saudi Arabia is currently experiencing a construction boom due to strong oil prices and ongoing reforms in the country. The boom is also spurred on by major government construction activities and the development of building projects, as well as a rapidly expanding tourism sector (Al-Yami and Price, 2006). The lack of consideration paid to sustainability issues during the conceptual phase has resulted in higher consumption of materials and energy during both the construction and operational phases of many building projects (Al-Yami and Price, 2005). Because of this, the implementation of sustainability principles in the Saudi construction industry is crucial and should be taken into account at early stages of building projects to guarantee the advocacy of the key stakeholders.

THE AIM AND OBJECTIVES OF THE STUDY

This main aim is to develop a theoretical framework to Soft Value Management (SVM) and sustainability principles to enable the key stakeholders to put into action the consideration of sustainability in the building briefing process in Saudi Arabia. The framework also aims to exploit the VM experiences and skills of those in the Saudi Public Sector in order to accelerate the understanding and implementation of sustainable construction in the country, in addition to improve and promote their technical knowledge in terms of sustainability principles. Moreover, the integration of principles of sustainability will upgrade VM to continue its competitiveness in delivering its objectives and services in terms of realising value for money in building projects. Furtherer, it endeavours to improve and promote the technical knowledge and skills of VM practitioners with regard to sustainability aspects, as well as sustain and spread VM implementation in the country.

METHODOLOGY

This study adopted the hypothetico-deductive method which it entails the development of a theoretical framework prior to its testing through empirical observation. The framework was synthesised through a review of related literature, best practice and reinforced with information distilled from interviews conducted with people working in or possessing significant experience of the Saudi Public Sector.The data for this research were obtained through semi-structured interviews with twelve experts who have a great deal of experience and work in Saudi Arabia. The overall experience average in the Saudi Arabian construction industry approximately was 14 years. The qualifications of interviewees were: five of them hold a PhD; four hold an MSc; and three hold a BSc. The interviews lasted between 55 minutes and 2:32 hrs. These semi-structured expert interviews were conducted to investigate in-depth and obtain an overall picture of the current situation of VM and sustainability in Saudi Arabia.

SUSTAINABLE CONSTRUCTION

Sustainability is a major concept underlying a variety of efforts to ensure a good quality of life for future generations. The Bruntland Report (1987) defines sustainable development as "… meeting the needs of the present without compromising the ability of future generations to meet their needs". This definition indicates that the environment and social issues are as paramount as economic issues, and suggests that human, natural, and economic systems are interdependent. It also involves intergenerational justice, highlights the liability of the current nations for the wellbeing of millions yet unborn, and involves the idea that present generation are borrowing the planet, its resources, and its environmental function and quality from future generations (Kibert, 2005).

The term sustainable construction is generally used to describe the application of sustainable development in the construction industry. In 1994, the Conseil International du Batiment (CIB) defined sustainable construction as "…creating and operating a healthy built environment based on resources efficient and ecological principles" (Kibert, 1995). Hill and Bowen (1997) extend the definition to four pillars: social, economic, biophysical and technical. Du Plessis (2002) defined it as "a holistic process aiming to restore and maintain harmony between the natural and built environments, and create settlements that affirm human dignity and encourage economic equity". The CIB postulated seven principles of sustainable construction which inform decision makers during each stage of the design and construction process persisting throughout the whole life cycle of a building which are: reducing resource consumption; reusing resources; using recyclable resources; protection nature; eliminating toxics; applying life-cycle costing; and emphasising quality (Kibert, 2005). To obtain optimal solutions to current difficult construction and infrastructure problems, it is vital to consider environmental technical, social, political and economic aspects, their synergies and the inevitable balances between them. Sustainability in this way expresses solutions with regard to a whole system, with an entire combination of outcomes as expressed by a variety of comments and conclusions (Ferng and Price, 2005). A sustainable construction industry does not simply mean to continue its business and growth, but also needs to meet the principles of sustainable development, which mean it may need, in some cases, to stop growing or grow in different ways (Du Plessis, 2002).

Sustainable construction drivers

According to the United States Green Building Council, Leadership in Energy and Environmental Design (USGBC), buildings in the USA constitute 36% of total energy use and 65% of electricity consumption, 30% of greenhouse gas emissions, 30% of waste production and 12% of drinkable water consumption (USGBC, 2003). The advantages of implementing sustainability principles into the briefing process are associated with three main aspects:

- environmental benefits are in the improvement of air and water quality, minimization of energy and water consumption and reduction of waste disposal;
- economic benefits are reducing operating and maintenance cost and increasing revenue (sale price or rent); and

- health and community benefits are enhancing occupant comfort and health and minimizing absenteeism, turnover rate and liabilities ((Kats and Alevantis, 2003).

Moreover, achieving sustainable design will produce buildings: with lower embodied energy and harmful emissions; using reusable, renewable, recyclable and reparable resources; and using water and energy more efficiently. It will increase the demand of practitioners (buildings, designers, consultants ...etc.) and increase marketing and promotional opportunities associated with sustainable building (Ashe, 2003). Hayles (2004) stated that the adaptation of sustainable construction principles delivers better long-term value to the built environment and its occupants.

Manoliadis and Tsolas (2006) outlined fifteen drivers for change to implement sustainable construction, which are: energy conservation; waste reduction; indoor environmentally quality; environmentally-friendly energy technologies; resource conservation; incentive programmes; performance-based on standards; land use regulations and urban planning polices; education and training; re-engineering the design process; sustainable construction materials; new cost metrics based on economic and ecological value systems; new kinds of partnerships and project stakeholders; product innovation and/or certification and recognition of commercial buildings as productivity assets. These drivers should stimulate stakeholders to adopt sustainable design in their building project at the briefing process.

Sustainable construction barriers

There are several potential barriers to the implementation of sustainable construction with the main one being perceived cost. The common perception about sustainable buildings appears to be that they cost more than ordinary buildings. They increase initial costs by an average of 2 to 7 per cent over ordinary building cost, and only some projects can recoup overall net costs in a short period. Decision makers rarely use whole life cycle costs to estimate reduced operating expenses (Castillo and Chung, 2005). These barriers can be overcome by move the thinking of stakeholders from cost to value and from short-term to long-term.

THE PROCESS OF VALUE MANAGEMENT

Value management evolved within the manufacturing industry during the Second World War due to shortages of materials. It was developed by Mr. Lawrence D. Miles, who worked for in the General Electric Company. It aims to realize value for money by minimising the whole life cost without sacrificing the quality and performance of a project (Dell'Isola, 1997). Since its inception, it has speedily developed and broadened across many industries and countries (Ashworth and Hogg, 2000)

Terminology

Value management has a broad terminology which is important to for both readers and practitioners to understand. The terminology used is different depending on the situation and context, an aspect that probably puzzles those who are new to the approach of VM. In the UK, the term VM is generic, for the whole process including both value engineering value analysis and value planning.

Value management (VM) is the term used to explain the whole philosophy and range of method to describe the application of the processes at the early, strategic stages of a project. Therefore, value planning, value engineering and value analysis form a part of value management (Ashworth and Hogg, 2000). It explains the whole process of maximising the value of a project for a client from the concept phase to operation and use. It therefore connects to the principle of total quality management (Kelly and Male, 2004). Green (1994) defined VM as “a structured process of dialogue and debate among a team of designers and decision makers during an intense short-term conference”.

Value planning is carried out prior to the decision to build the project or at briefing or at outline design stage.

Value engineering denotes value techniques during the detailed design stages and construction stages. In other words, it focuses on enhancing value in the design and construction stages of a project. It connects to the principles of quality assurance. Green (1994) defined it as “a disciplined procedure directed towards the achievement of necessary function for minimum cost without detriment to quality, reliability, performance or delivery”.

Value analysis defines the value techniques that are applied following the completion of a building (Ashworth and Hogg, 2000).

Soft Value Management methodology

The use of both soft and hard value management tools and techniques in the structured job plan will consider the impact of new and current buildings in terms of achieving sustainable construction principles which will immediately influence the inputs, development and outputs to ensure a ‘best value’ solution to the project (Hayles, 2004). Soft Value Management (SVM) techniques are most highly used in the early project stages when the project is not completely defined to reach consensus with stakeholders (Dallas, 2006). It is specifically designed to deal with difficult problems ‘unstructured’ experienced in project initiation, whereby many stakeholders are involved in the course of action and high-level facilitation skills are vital to its accomplishment (Barton, 2000). It derives from the body of knowledge known as ‘group decision support’ which is defined as “any process that supports a group of people seeking individually to make sense of, and collectively act in, a situation in which they have power” (Bryant, 1993).

SMART (simple multi-attribute rating technique) VM methodology was developed by Stuart Green. The distinction of SMART VM is the way in which it offers a framework to facilitate thought and communication. It is confined to the use of VM throughout the briefing and outline design stages of building projects. The determination of all stakeholders and representation of interested parties are necessary for the successful use of this method (Green, 1994). Although the SMART VM approach has its origin in decision analysis, it is mainly focused on decision structuring rather than decision making (Shen and Chung, 2004).

INTEGRATING SVM AND SUSTAINABILITY PRINCIPLES

There must be a shift of thinking from clients, operators and managers in the construction industry during implementation of sustainable construction principles in a project from short term to long term; shareholders to stakeholders; product to service; local to global; and cost to value. These changes represent the key priorities of a Value Management project (Hayles, 2004). Soft Value Management offers a suitable vehicle to address the need to incorporate a variety of requirements due to its structured and inclusive approach. Barton (2000) defined Soft Value Management as "a structured, facilitated, human activity in which stakeholders, technical specialists and others work to bring about value-based outcomes in systems, processes and products". SVM particularly identifies the situation of a 'soft' problem and utilizes an 'enabling and learning' facilitation methodology to solve it (ibid). At the strategic level, SVM is a reliable means for producing visions of a new direction and filtering objectives on the road to the foundation of needs and desired products including formulating policy. It is highly beneficial to adapt SVM for use in uplifting sustainable construction principles so as to implement in the early stages of building projects. Figure 1 illustrates the proposed framework for implementation of sustainable construction principles in building briefing projects through six SVM processes. The reason behind integrating sustainable construction principles with VM is to consider sustainability principles at the early stages of VM thinking and throughout its processes; consequently it will be effectively managed as early as possible in the briefing of the project to guarantee the client commitment (Zainul-Abidin and Pasquire, 2005). The framework comprises six interconnected stages: planning, identification, analysis, creativity, evaluation and development. The framework can be outlined as follows:

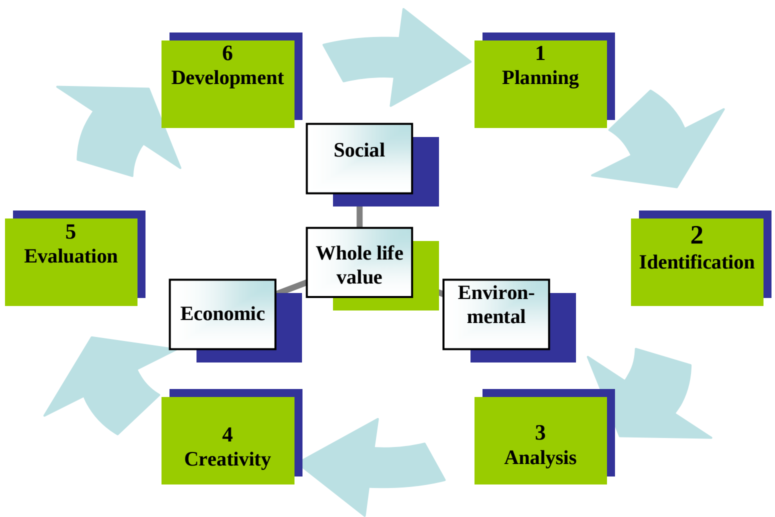

Figure 1: The theoretical framework to SVM and sustainable construction

Stage* 1**: *Planning:** The main tasks of this phase are to construct the team and define the briefing workshop. A qualified facilitator should be appointed by the client(s) to complete the process. The capability of the facilitator is crucial to the success of the study. The major objectives carried out in this stage are as follows: (1) Selecting the typical study team which should include client representatives, project manager, contractors, sustainability advisor, design team and facilitator. (2) Identifying and inviting stakeholders to participate in the workshop at senior level; their participation is central to the success of the study and the workshop, without their participation, will be useless. (3) Collecting information: the study leader should have a very clear vision of what is expected of the workshop and what information will be required and ensure that sufficient information exists in the study to meet the design objectives.

Stage 2: *Identification*: The main tasks of this phase are to define and agree the scope and objectives of the project and study. The drivers of sustainable construction should be presented to the clients and other key stakeholders to obtain their support when implementing sustainable construction principles in the project. Setting the sustainable construction implementation must be one of the design objectives. Having defined sustainability as one of the project's objectives and got the light green from stakeholders who affect the project (owner, investor, developer, architect, engineer, urban designer, planner, surveyor, other technical/professional consultants, workers, suppliers and manufacturers of the materials used etc.), the goals will be very clear to all team members and easy to take it into account during the life cycle of the project development.

Stage 3: *Analysis**:*** The main tasks of this phase are to integrate sustainable construction principles into functions and to convert information into understanding of the project. Function Analysis (FA) is considered the heart of VM which provides one of its defining attributes and distinguishes it from numerous other problem-solving techniques. It also improves understanding of the project and underlining areas for value improvement to generate innovative solutions to problems that as yet may have evaded them. FA has a number of different techniques, some very structured, such as the Function Analysis System Technique (FAST) which is known by many practitioners and practiced broadly in the United State, and some less formal, such as value trees, which may give a similarly scrupulous functional model of the project (Dallas, 2006). A function is that which makes an item or service work or sell (SAVE International, 1998). It could be defined in this stage by VM from the perspective of sustainable construction principles. FA filters needs from wants and promptly and agreeably primary objectives can be shaped. A similar application of the VM process can apply to the same topics and needs within sustainable construction principles or sustainability initiatives (Yeomans, 2002). This includes three steps which are explained as follows:

Step 1: *Identifying and defining functions*: Miles (1972) stated that "the determination of function(s) is a requisite for all value studies". In order to accomplish the project objectives, it is essential for the project team to determine its primary functions. These primary functions clearly describe the project objectives with regard to what the client(s) is expecting from the building (Dallas, 2006). A function is invariably articulated by an active verb and measurable noun. The verb answers the question, '*What is it to do?*' and the noun answers question, '*What does it do?*' respectively (Shen and Chung, 2004).

Step 2: *Classifying functions*: this step is to classify the functions articulated in the earlier stage into two categories: *basic* and *secondary*. A basic function in a FAST diagram for a building project is the primary aim for which that building is designed. It must be accomplished to satisfy the purpose of the project. Secondary functions are defined as those that support the basic function. They can be broken down intoa sub-classifications of *'required'*, *'aesthetic'* and *'unwanted'* functions in order to improve the analytical evaluation process (SAVE International, 1998).

Step 3: *Develop function relationships*: this step is to depict the relationships between functions through using FAST models. FAST is a horizontal diagram portraying functions within a project, with the following statutes: (1) the series of functions that happen in a sequence on the critical path from left to right and answer the questions *'How is the function to its immediate left performed?'*; (2) the series of functions that happen in a sequence on the critical path from the right to left and answer the question *'Why is the next function performed?'*; (3) functions happening simultaneously or caused by functions on the critical path appear perpendicularly underneath the critical path; (4) the basic function of the project is invariably farthest to the left of the diagram within the scope of the study; (5) two more functions are categorized as (a) highest order- the reason or purpose that the basic function exist and it answers *'why'* question, (b) lowest order – the function that is required to initiate the project and is depicted farthest to the right (SAVE International,1999). In order to illustrate the technique, a FAST diagram for sustainable construction has been presented in Figure 2. The ultimate purpose, *implementation of sustainable construction*, is laid on the left hand side of the diagram. The basic functions including the purpose of the design are located next to the highest-order function. The *level one* functions are broken down into *level two* functions, which can then be broken down into further *sub-level* functions to describe how these functions can be accomplished.

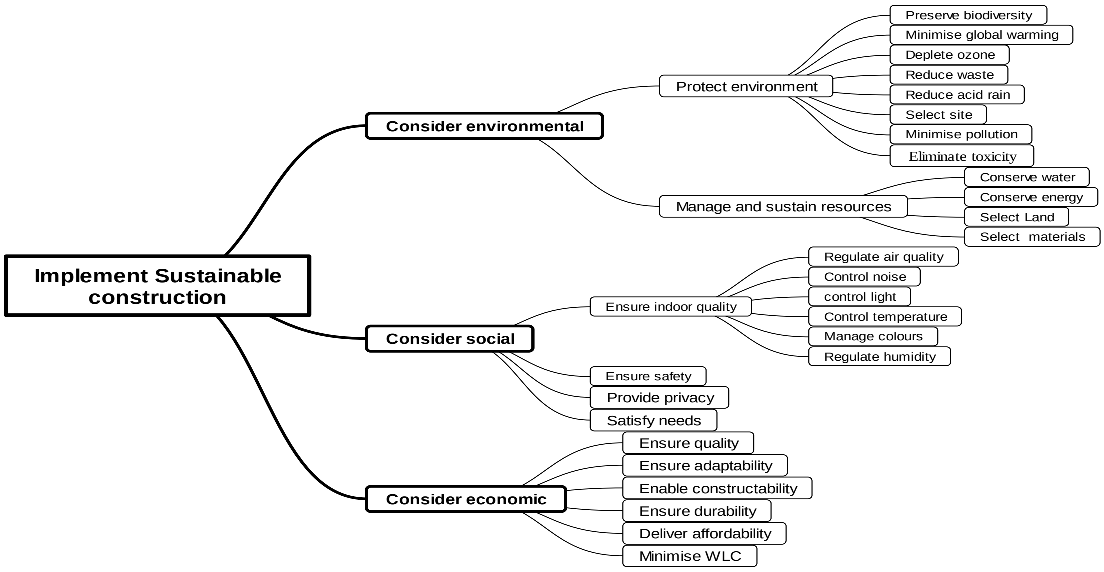

Figure 2: A FAST diagram of 'sustainable construction'

Stage 4: *Creativity*: The main task of this phase is to stimulate a brainstorming session to generate a quantity of ideas for achieving each function selected in the study within the scope and objectives of the project. It is highly recommended that the sustainable construction principles be taken into account when the team starts to generate ideas. This is a creative type of effort, thoroughly unimpeded by customs, tradition, negative attitudes, assumed restrictions, and specific criteria. The advantages and disadvantages of each idea selected will be evaluated and developed in the next stages.

Stage 5: *Evaluation*: The main tasks of this phase are to combine ideas and concepts produced in the previous stage and to select feasible and sustainable proposals for the next stage. All generated ideas will be evaluated against the defined functions and the objectives of the project. The process typically involves several steps: (1) eliminate unviable ideas; (2) categorize similar ideas into groups such as electrical, mechanical, structural, materials, special processes, etc.; and (3) rank the ideas within each category according to the prioritized evaluation criteria using such techniques as indexing, numerical evaluation, and team consensus.

Stage 6: *Development*: The main task of this phase is to decide on and prepare the "best" alternative(s) in terms of sustainable construction and value for money. The information prepared for each of the alternatives should provide as much technical, cost, and schedule information as practical so that the designer and project sponsor(s) may make an initial assessment concerning their feasibility for implementation. It should start with the highest ranked value ideas, develop a benefit analysis and implementation requirements, including estimated initial costs, life cycle costs, and implementation costs, taking into account sustainable construction issues.

CONCLUSIONS

Integrating both Soft and Hard Value Management and sustainable construction are essential to shape the development of the project brief by considering the principles of sustainability in its three dimensions; environmental, social and economic. Thereby, Soft Value Management is an intrinsic tool to be used in identifying and developing the briefing of a building project to minimise negative impacts on the environment, optimise whole life cost of a project and satisfy good indoor environment in the project. It shifts a person or team from a general understanding to a specific and precise understanding and consequently improves the value of the product.

The proposed framework has considerable potential to accelerate the understanding and implementation of sustainable construction .The framework enables the key stakeholders the implementation of sustainability principles in the building briefing process and will shift their thought from short-term to long-term and from cost to value. It also enables them to effectively participate, communicate, exchange ideas and share information to improve the value of the briefing process and identify the best proposal. The possible limitations of this proposed framework would be the capability of ensuring the participation of the key stakeholders and sustainability advisors who have experience in sustainable construction and Value Management. It also needs additional cost and time to be efficiently implemented in the briefing process. This paper is part of an ongoing research which aims to exploit the VM experiences and skills of those in the Saudi Public Sector in order to accelerate the understanding and implementation of sustainable construction in the country.

REFERENCES

Al-Yami, A. and Price, A. D. F. (2006) Assessing the feasibility of using value management to accelerate the implementation of sustainability. In: Delft, *Proceeding of the 6th International Postgraduate Research Conference in the Built and Research Institute for the Built and Human Environment*, 6-7th April , Vol. 1, pp765-774.

Al-Yami, A. and Price, A.D.F. (2005) Exploring conceptual linkages between value engineering and sustainable construction. In: SOAS, *Proceeding of the 21st annual conference of the association of researchers in construction management (ARCOM)*, 7-9 September, Vol. 1, pp375-384.

Ashe, B et al. (2003) *Sustainability and the building code of Australia*.

Ashworth, A. and Hogg, K. (2000) *Added Value in Design and Construction*. Edinburgh Gate, Harlow, England: Pearson Education Limited.

Barton, R. T. (2000) Soft value management methodology for use in projection initiation a learning journey. *Journal of Construction Research*, **1**(2). 109-122.

Best, R. and de Valence, G., eds, (1999) *Building in value*. London: ARNOLD.

Bryant, J. (1993) Supporting management teams, or Insight, **6**(3), 19-27.

Castillo, R. and Chung, N. (2005)Last update, the value of sustainability, [Online]. Available: http://www.stanford.edu/group/CIFE/online.publications/WP091.pdf [21 April 2005].

Dallas, M.F. (2006) *Value and Risk Management: A guide to best practice*. Oxford, UK: Blackwell Publishing Ltd.

Dellisola, A.J. (1997) *Value engineering: practical applications for design, construction, maintenance and operations*. Kingston, Mass: R. S. Means Company.

Du Plessis, C. (2002) Agenda 21 for Sustainable Construction in Developing Countries. Pretoria, South Africa: *The CSIR Building and Construction Technology*.

Egan, J. (1998) *Rethinking construction.* London: Department of the Environment, Transport and the Regions (DETR).

Ferng, J. and Price, A.D.F. (2005) An exploration of the synergies between Six Sigma, total quality management, lean construction and sustainable construction. *International Journal of Six Sigma and Competitive Advantage,* **1**(2), 167-187.

Green, S.D. (1994) Beyond value engineering: SMART value management for building projects. *International Journal of Project Management,* **12(**1), 49-56.

Hayles, C. (2004) The Role of Value Management in the Construction of Sustainable Communities, *The Value Manager,* The Hong Kong Institute of Value Management 15-19.

Hill, R.C. and Bowen, P.A. (1997) Sustainable construction: principles and a framework for attainment. *Construction Management and Economics,* **15**(3), 223-239.

Kats, G., Alevantis, L. et al. (2003) *The cost and financial benefits of green buildings*- A report to California's sustainable building task force.

Kelly, J., Male, S. and Graham, D. (2004) *Value management of construction projects*. Oxford: Blackwell Science.

Kibert, C. J. (2005) *Sustainable construction: green building design and delivery*. Hoboken, New Jersey: John Wiley and Sons, Inc.

Male, S. and Kelly, J. (1998) *Value management: the value management benchmark : research results of an international benchmarking study* . London: Thomas Telford Publishing.

Manoliadis, O., Tsolas, T. and Nakou, A. (2006) Sustainable construction and drivers of change in Greece: a Delphi study. *Construction Management and Economics*, **24**, 113-120.

Miles, L.D. (1972) *Techniques of value analysis and engineering*. 2ed. New York: McGraw-Hill.

Newman, O. (1996) *Creating Defensible Space, US Department of Housing and Urban Development*. Office of Policy Development and Research, Washington, DC.

SAVE International (1998) *Function: Definition and Analysis,* Monograph , SAVE International, October.

SAVE International (1999) *Function Analysis Systems Technique: The Basic*. USA: SAVE International, March.

Shen, Q., Chung, H.J. and Hui, P. (2004) A framework for identification and representation of client requirements in the briefing process. *Construction Management and Economics,* **22**(2), 213-221.

USGBC (2003) *United States Green Building Council, Why Build Green?* [Online] Available at http://www.usgbc.org/AboutUs/whybuildgreen.asp [Cited 8 November 2004].

Yeomans, P.Y. (2002) Environmentally sustainable development plus value management equals results minus rhetoric, *International Conference of the Institute of Value Management*, 29-30 August.

Younker, D.L., (2003) *Value Engineering: analysis and methodology*. New York: Marcel Dekker.

Zainul-Abidin, N.Z. and Pasquire, C.L. (2005). Delivering sustainability through value management. Engineering, Construction and Architectural Management, **12**(2), pp. 168-180.