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# THE VALUE MANAGER

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## THE VALUE MANAGER

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## AIMS AND OBJECTIVES OF THE HKIVM

- To create an awareness in the community of the benefits to be derived from the application of Value Management in Hong Kong (HK).
- To encourage the use of the Value Management process by sponsors.
- To establish and maintain standards of Value Management practice in HK.
- To contribute to the dissemination of the knowledge and skills of Value Management.
- To establish an identity for the Institute within HK and overseas.
- To encourage research and development of Value Management with particular emphasis on developing new applications of the process.
- To encourage and assist in the education of individuals and organisations in Value Management.
- To establish and maintain a Code of Conduct for Value Management practitioners in HK.
- To attract membership of the Institute to support these objectives.

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## EDITORIAL

Welcome to the forth issue of The Value Manager 2009. This issue presents two papers discussing the use of value management in design management. The first paper titled " The use of life cycle value assessment in design management" is written by Dr. George Chen (lead author) from the Heriot-Watt University, United Kingdom. His paper introduces a life cycle value assessment (LCVA) oriented group decision-making framework integrated with the RIBA Outline Plan of Work 2007. The paper concludes that this framework is useful and practical for decision makers to evaluate different options at key work stages across project cycles. The second paper titled "The value based requirement definition process in construction briefing" is written by Jacky Chung (lead author) from The University of Hong Kong, Hong Kong SAR. His paper assumes that different project requirements carry different weights in terms of value, since some of them have much higher value than others. Based on this idea, the paper introduces a methodology named 'relative value index' to demonstrate the use of value analysis techniques in enhancing the outputs of construction briefing.

Additionally, we would like to share a report on the value management training workshops organised in Hong Kong and present some photos of our recent activities including the joint seminar with the HKICM and the HKIVM 14th Annual General Meeting & Christmas Party. Lastly, may I take this opportunity to wish every one of you have a Merry Christmas and a Happy New Year.

*Jacky Chung*

Editor, The Value Manager

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## MESSAGE FROM THE PRESIDENT

**Professor Geoffrey Q.P. Shen**

President of HKIVM

With the strong support from members and the dedicated services of the council, our Institute has done well and made improvement in a number of areas in the past year.

### *Membership*

We have managed to recruit more than 30+ new members and we have managed to attract a few past members to come back to the Institute. I wish to thank members for their hard work and dedicated efforts in extending our membership base, Ann and Jacky in particular, well done and thank you.

### *Promotion of VM*

We have conducted a number of seminars and other promotional activities, jointly with other professional institutions such as HKICM, HKIS, CIOB, and DLS to promote VM in all sectors of the construction industry and beyond. Thanks to all council members Chi-wan, Paco, Ivan, Ann and Shirley in particular, for their very dedicated efforts in organizing these events. We have also conducted training workshops for those who wish to become professional facilitators. Thanks to Ivan and Mei-yung and the organization and the training provided.

### *Research and development*

Our members in academic institutions continue to do well in winning research grants from prestigious funding bodies such as the Research Grants Council in HK, and disseminating research findings through papers in refereed journals and international conferences. Thanks to Mei-yung and Ann for their contributions in this area.

Collaboration with other VM/VE institutions worldwide.

We have continued our presence and close collaborations with other institutions worldwide, such as Miles Value Foundation. Our members' achievements have been recognized by

professional institutions such as SAVE International.

### *Targets for next year*

One of the major tasks next year is to work closely with the Government in organizing a joint forum on the successful VM implementation in public projects. Special thanks to Jacky for his willingness to take a leadership in organizing this important event. We will also continue to maintain our links with representatives in the sister institutions worldwide to explore the feasibility of jointly organizing a world congress on VM in the near future.

### *Election of new council*

As informed by our running officer Miss Rebecca Yang, the following members are elected as the council members for the coming year: Chung K.H., Jacky, Clifford, Bryan, Fan Shichao, Timmy, Fok K.H., Leung Mei-yung', Shen Qiping, Geoffrey, Tang Chi-wang, Tsang P.C., Paco, Wong, Thomas, YU Tit-wan, Ann.

I wish to congratulate all of them for being elected as council members, and to thank Rebecca for her time and efforts in conducting the elections.

Our treasurer Ms. Shirley Ho will retire from the Institute at the end of her term. I wish to propose a vote of thanks to her for her diligent work in keeping the Institute account in a healthy situation, it is very much appreciated.

The HKIVM is of the member, by the members, and for the members. Our Institute's future depends on our members. I wish to take this opportunity to call for active participation and support to various events and activities organized by the Institute.

Finally, I wish to take this opportunity to wish all of you and your family a merry Christmas and a prosperous and productive New Year!

Extracted from the President Report presented in the HKIVM 14<sup>th</sup> Annual General Meeting on 17 December 2009

# THE USE OF LIFE CYCLE VALUE ASSESSMENT IN DESIGN MANAGEMENT

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## ABSTRACT

This paper aims to introduce a life cycle value assessment (LCVA) oriented group decision-making framework integrated with the RIBA Outline Plan of Work 2007. The framework consists of 10 goal nodes in deference to the work stages defined by the RIBA; and the purpose of adopting this framework is to conduct appropriate value assessment through project cycles. The analytic network process (ANP) is adopted as the key technique to support multicriteria decision making at goal node across the framework. An ANP model is proposed to be built upon a set of multiple criteria with regard to the use of organizational environment theory in the practice of project management for construction and development; and those criteria consists of five risk clusters to cover the relevance of Social, Technical, Economic, Environmental and Political (STEEP) issues with regard to the LCVA for generic use in any construction and development project. In terms of the use of ANP in practice, this paper summarises current progresses with regard to the adaptability of ANP modelling inside the proposed group decision-making framework, and there is also a real case study for options evaluation at appraisal stage. It is concluded that the framework is useful and practical for decision makers to evaluate different options at key work stages across project cycles.

## KEYWORDS

Lifecycle value assessment, project management, group decision making, RIBA, ANP

## INTRODUCTION

Multicriteria decision making is crucial to support realizing commercial strategies in the construction industry. Among many multicriteria decision-making approaches, the Analytic Network Process (ANP) has been coming into applications in relevant areas in the past three years (Chen, 2007b). As the ANP approach allows decision makers to set up their decision-making models based on entire considerations about complex inter-relation among all indicators and their clusters, and reliable collection and reuse of experts' knowledge in related domains, the ANP models can be regarded as a practical interpretation of expertises to support decision making. The aim of this paper is to summarise the general procedure of ANP approach that has been

adopted in several applications, including evaluating alternative

- places for locating new construction projects,
- design solutions for buildings and building facade systems,
- partners for specific projects,
- plans for either construction or demolition projects,
- system solutions for either enterprise or project management, and
- materials for teaching and learning in professional education.

Based on current application of ANP in construction and development, this paper aims to introduce a life cycle value assessment

(LCVA) oriented group decision-making framework integrated with the RIBA Outline Plan of Work 2007. The framework consists of ten goal nodes in deference to the work stages defined by the RIBA, and these stages are Appraisal, Design brief, Concept, Design development, Technical design, Production information, Tender documentation, Tender action, Mobilisation, Construction to practical completion, and Post practical completion. The purpose of adopting this framework is to conduct appropriate value assessment through project cycles; and the ANP is adopted as the key technique to support multicriteria decision making at goal node across the framework. Therefore, a generic ANP model is introduced, which is built upon a set of multiple criteria with regard to the use of organizational environment theory in the practice of project management for construction and development; and those criteria consists of five clusters of factors, which cover the relevance of Social, Technical, Economic, Environmental and Political (STEEP) issues with regard to the LCVA for generic use in any construction and development project. In terms of the use of ANP in practice, this paper summarises current progresses with regard to the adaptability of ANP modelling inside the proposed group decision-making framework, and there is also a real case study from a project in Liverpool for options evaluation at appraisal stage. It is concluded that the framework is useful and practical for decision makers to evaluate different options at key work stages across project cycles.

## METHODOLOGY

The ANP is a general theory of relative measurement used to derive composite priority ratio scales from individual ratio scales that represent relative measurements of the influence of elements that interact with respect to control criteria developed by Saaty (1996). To support multicriteria decision-making process, an ANP model consists of two functional parts, including

- a network of quantitative interrelationships among each paired nodes or clusters, and
- a control networking hierarchy of criteria and sub-criteria that control interactions based on interdependencies and feedback.

And the control networking hierarchy is generally employed to build an ANP model, and it is a hierarchy of criteria and sub-criteria for which priorities are derived in the usual way with respect to the goal of a system being considered. The criteria are used to compare the clusters of an ANP model, while the sub-criteria are used to compare the nodes of a cluster.

There are four general steps in ANP based multicriteria decision-making process, including model construction; paired comparisons between each two clusters or nodes; supermatrix calculation based on results from paired comparisons; and result analysis for the assessment (Saaty, 2005). Steps of the ANP analysis for the environmental-conscious construction planning is laid out below from Step A to D:

**Step A: ANP model construction.** This step aims to construct an ANP model for evaluation based on determining the control hierarchies such as benefits, costs, opportunities and risk, as well as the corresponding criteria for comparing the components (clusters) of the system and sub-criteria for comparing the elements of the system, together with a determination of the clusters with their elements for each control criteria or sub-criteria. Regarding how to quantitatively select the most appropriate sub-criteria for defined control criteria, two approaches have been developed, including Energy-Time use Index and Environment Impacts Index (Chen, Li, and Turner, 2007c).

**Step B: Paired comparisons.** This step aims to perform pairwise comparisons among the clusters, as well as pairwise comparisons between nodes, as they are interdependent on each other. On completing the pairwise comparisons, the relative importance weight (denoted as  $a_{ij}$ ) of interdependence is determined by using a scale of pairwise judgement, where the relative importance weight is valued from 1 to 9 (Saaty, 1996). The weight of interdependence is determined by a human decision maker who is abreast with professional experience and knowledge in the application area. In order to facilitate the process of collecting experts' opinions in regard to the importance of sub-criteria as well as control criteria in the questionnaire survey, a pairwise table approach called Pairwiser has been developed so that the number of questions

could be dramatically reduced no matter how large the number of sub-criteria could be (Chen, 2007a).

**Step C: Supermatrix calculation.** This step aims to form a synthesised supermatrix to allow for the resolution of the effects of the interdependences that exists between the elements (nodes and clusters) of the ANP model. In order to obtain useful information for the assessment, the calculation of supermatrix is to

be conducted following three sub-steps, which transform an initial supermatrix to a weighted supermatrix, and then to a synthesised supermatrix.

**Step D: Selection.** This step aims to evaluate each alternative so as to select the most appropriate one to support final decision making. The criterion to make this selection is the weights of alternatives that can be taken from the synthesised supermatrix.

**Table 1: LCVA criteria for construction and development.**

Clusters	Nodes	Valuation methods
Social risks	Workforce availability	Degree of Developer's satisfaction to local workforce market (%)
	Cultural compatibility	Degree of business & lifestyle harmony (%)
	Community acceptability	Degree of benefits for local communities (%)
	Public hygiene	Degree of impacts to local public health & safety (%)
Technological risks	Site conditions	Degree of difficulties in site preparation for each specific plan (%)
	Designers and Constructors	Degree of Developer' satisfaction to their professional experience (%)
	Multiple functionality	Degree of multiple use of the property (%)
	Constructability	Degree of technical difficulties in construction (%)
	Duration	Total duration of design and construction per 1,000 days (%)
	Amendments	Possibility of amendments in design and construction (%)
	Facilities management	Degree of complexities in facilities management (%)
	Accessibility & Evacuation	Degree of easy access and quick emergency evacuation in use (%)
	Durability	Probability of refurbishment requirements during buildings lifecycle (%)
Environmental risks	Adverse environment impacts	Overall value of the Environmental Impacts Index
	Climate change	Degree of impacts to use and value due to regional climatic variation (%)
Economic risks	Interest rate	Degree of impacts due to interest rate change (%)
	Property type	Degree of location concentration (%)
	Market liquidity	Selling rate of same kind of properties in the local market (%)
	Confidence to the market	Degree of expectation to the same kind of properties
	Demand and Supply	Degree of regional competitiveness (%)
	Purchaseability	Degree of affordability to the same kind of properties (%)
	Brand visibility	Degree of Developer's reputation in specific development (%)
	Capital exposure	Rate of estimated lifecycle cost per 1 billion pound (%)
	Lifecycle value	5-year property depreciation rate (%)
	Area accessibility	Degree of regional infrastructures usability (%)
	Currency conversion	Degree of impacts due to exchange rate fluctuation
	Buyers	Expected selling rate (%)
	Tenants	Expected annual lease rate (%)
	Investment return	Expected capitalization rate (%)
Political risks	Political shifts	Probability for rapid political shifts (%)
	Regulatory Impact	Probability of regulatory impact (%)

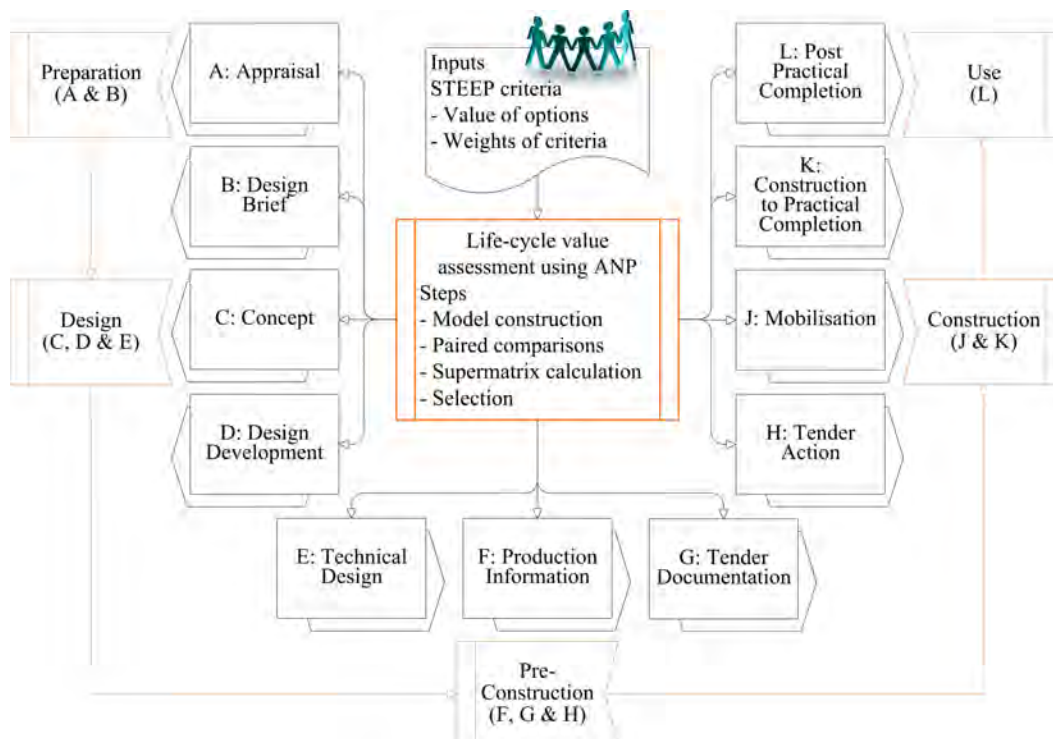
**LIFE CYCLE VALUE ASSESSMENT**

The Life Cycle Value Assessment (LCVA) is a unique, practical and multidisciplinary systems-analysis methodology for business decisions and design (Pembina, 2007a&b), and it involves a series of techniques and tools to help decision-makers elicit more complete financial, environmental and social information about the impact of any project, product, or service. As mentioned by Cook (2007), the LCVA tool is designed to look at a project’s metrics and impacts in a holistic manner.

In order to set up an ANP model for LCVA in construction and development, it is essential to define a list of assessment criteria and their measurements so as to facilitate the use of ANP not only in laboratory study but also for potential commercial use. To improve the quality of decision-making using ANP, the criteria for assessment should be comprehensive and practical with regard to the sustainability requirements for construction and development. In this regard, literature review has been conducted to form initial list of assessment criteria and Table 1 summarise the initial criteria in five categories, including social

factors, technical factors, environmental factors, economic factors, and political factors, which are regarded as general issues to be covered by LCVA for construction and development. Table 1 provides a list of assessment criteria used to set up the ANP model, and related measurement approaches adopted to quantify factors.

With regard to all criteria identified and defined in Table 1, a group decision-making framework for LCVA is then developed (see Figure 1). The framework model consists of two main groups of components, including a process cluster of construction and development processes which are regulated according to the RIBA Plan of Work 2007, and a decision-making support functional unit based on a standard ANP procedure with embedded assessment criteria covering STEEP issues in terms of generic characteristics of construction and development projects under assessment. To implement the framework in practice, it is essential to set up an appropriate ANP model, and for the purpose of not only experimental study but also real use, this paper presents an ANP model (see Figure 2).



**Figure 1: The group decision-making framework for LCVA.**



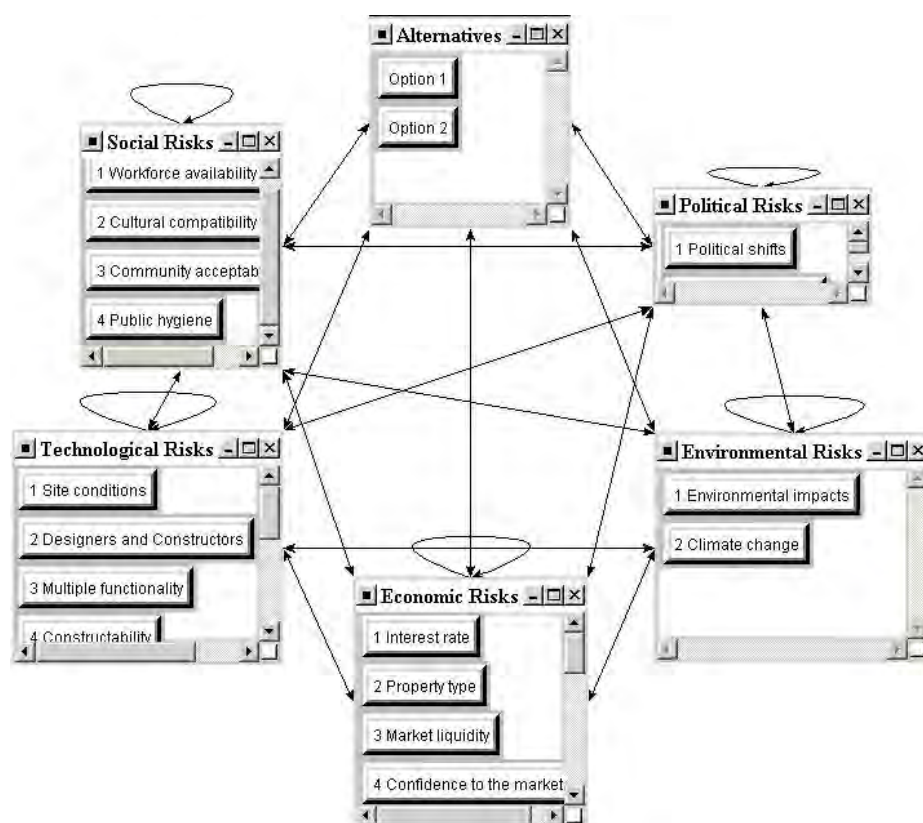


Figure 2: The ANP model for LCVA.

## EXPERIMENTAL CASE STUDY

This section aims to demonstrate the use of ANP in real construction and development project. As mentioned in the Introduction section, there have been a number of experimental case studies to apply ANP in different stages across the construction and development process, and these include

- location evaluation for stage A,
- design evaluation for stage E,
- partnership evaluation for stage H,
- construction plan evaluation for stage J,
- system evaluation for stage K, and
- knowledge material selection for stage L and others.

The experimental case study here is to justify the effectiveness of using ANP in Stage A of the entire LAVC framework (see Figure 1).

The experimental case study focuses on a consultation project for the construction and development of a new Royal Hospital in Liverpool, UK. Based on Client's feasibility study at early stage, a wide range of

stakeholders are consulted on two proposals during July to October 2008. According to the Royal Liverpool and Broadgreen University Hospitals NHS Trust (shortly the Liverpool NHS Trust) (2008) has investigated the options available for the future provision of the hospital services planned under its service model to be based at its hospitals, and the two overall options for the Royal site are being considered:

Option 1: developing a new hospital building next to the existing Royal Liverpool University Hospital

Option 2: refurbishing the existing Royal Liverpool University Hospital

Each option would also entail investment in improving facilities at Broadgreen Hospital and the development of services outside hospital. These options have been considered in a detailed option appraisal with involvement from its stakeholders. And the Trust's preferred option is Option 1, which is based on a comparison among a range of criteria in terms of how each option would improve service delivery, facilities, health outcomes, patient experience and satisfaction, staff experience and

motivation, as well as how difficult it would be to implement each option and their impact on the wider community (Liverpool NHS Trust, 2008). With regard to the adoption of ANP led LCVA at Appraisal stage in construction and development, it is of interest to further justify this preferred option with calculated results.

Based on the fact and scenario of two development options for the specific project, further assumptions are made in Table 3. To make more reasonable assumptions, information from real projects is considered; and one important information source is BCIS? (Building Cost Information Service), which is the UK's leading provider of cost and price information for construction and property occupancy? Although interdependences among 31 assessment criteria can be measured based on experts' knowledge, the ANP model should comprehend all specific characteristics of each option. Therefore Table 3 is adopted to transform specific features of options to a form that can be used for ANP modelling. According to the fundamental scale of pair-wise judgments (Saaty, 1996/2005) in ANP, all possible

interdependences between each option and each assessment criterion and between paired assessment criteria in regard to each alternative plan are valued against the ANP model shown in Figure 2, and this forms a two-dimensional super-matrix for further calculation. The calculation of super-matrix aims to form a synthesized super-matrix to allow for the resolution of the effects of the interdependences that exists between nodes and clusters of the ANP model (Saaty, 2005). In order to obtain useful information for evaluating options, the calculation of super-matrix is conducted following three steps, which transform an initial super-matrix based on pair-wise comparisons to a weighted super-matrix, and then to a synthesized super-matrix. Results from the synthesized super-matrix are given in Table 4. According to the results, Option 1 is identified as the most appropriate plan for the specific project because it has the highest synthesized priority weight among the two alternatives. As result, it is the suggestion of ANP to select Option 1 for this regeneration project in Liverpool.

**Table 2: The environmental impacts of alternative development plans (Chen, et al., 2005)**

No.	Factors of adverse impacts	$\lambda_{i,j}$	$EII_{i,j}$	
			Option 1	Option 2
1	Soil and ground contamination	0.3	-0.5	-0.4
2	Ground and underground water pollution	0.3	-0.1	-0.1
3	Waste	0.7	-0.8	-0.5
4	Noise and vibration	0.7	-0.4	-0.6
5	Dust	0.7	-0.5	-0.5
6	Hazardous emissions and odours	0.5	-0.3	-0.3
7	Wildlife and natural features impacts	0.2	-0.1	-0.1
8	Archaeology impacts	0.5	-0.5	+0.3
	Total impact		-1.79	-1.29

Note:

Option 1: developing a new hospital building next to the existing Royal Liverpool University Hospital

Option 2: refurbishing the existing Royal Liverpool University Hospital

The calculation of the total environmental impact:

$$EII_i = \sum_{j=1}^8 \lambda_{i,j} EII_{i,j} \quad (j = 1, 2, \dots, 8)$$

Where

$EII_i$  is the total environmental impact caused by  $KPI_i$  or  $Project_i$ .

$EII_{i,j}$  is individual environmental impact leading to one of the eight possible pollutions and hazards, including Soil and ground contamination ( $j=1$ ), Ground and underground water pollution ( $j=2$ ), Waste ( $j=3$ ), Noise and vibration ( $j=4$ ), Dust ( $j=5$ ), Hazardous emissions and odours ( $j=6$ ), Wildlife and natural features impacts ( $j=7$ ), and Archaeology impacts ( $j=8$ ).

$\lambda_{i,j}$  is the coefficient of  $EII_{i,j}$ . The value of  $\lambda_{i,j}$  is defined to be a subjective weight that belongs to the range of [0, 1] in terms of the tendency of environmental management in a project; generally, if  $\lambda_{i,j}$  is set to a outer extreme, say 0, it means that the specific adverse environmental impact  $j$  ( $j=1,2,\dots,8$ ) is basically ignorable; and if  $\lambda_{i,j}$  is set to 1, it means that the specific adverse environmental impact  $j$  ( $j=1,2,\dots,8$ ) is extremely considerable.

**Table 3: Assumptions of alternative development plans for ANP evaluation.**

Criteria	Sub-Criteria	Unit	Options	
			Option 1	Option 2
Social risks	Workforce availability	%	100	90
	Cultural compatibility	%	90	70
	Community acceptability	%	100	80
	Public hygiene	%	80	100
Technological risks	Site conditions	%	20	20
	Designers and Constructors	%	100	100
	Multiple functionality	%	100	70
	Constructability	%	10	20
	Duration*	%	182	365
	Amendments	%	80	90
	Facilities management	%	90	100
	Accessibility & Evacuation	%	100	90
	Durability	%	70	90
	Environmental risks	Environment impacts**	%	-179
Climate change		%	40	50
Economic risks	Interest rate	%	70	80
	Property type	%	80	80
	Market liquidity	%	90	80
	Confidence to the market	%	90	80
	Demand and Supply	%	100	70
	Purchaseability	%	100	100
	Brand visibility	%	100	90
	Capital exposure*	%	48	62
	Lifecycle value	%	-15	-20
	Area accessibility	%	90	80
	Currency conversion	%	30	60
	Buyers (Patients)	%	80	50
	Tenants	%	100	80
Political risks	Investment return	%	10	7
	Political shifts	%	10	20
	Regulatory Impact	%	20	50

Note:

\* Rates about Duration and Capital exposure are based on real figures given in Table 4.

\*\* Calculations are given in Table 2.

**Table 4: Comparison of alternative development options.**

Characteristics (Liverpool NHS Trust, 2008)	Options	
	Option 1	Option 2
Construction and Development	New build	Refurbishment
Expected construction period (years)	4	9
Estimated total investment (million pounds)	477	612
Fit for purpose of the Trust	Yes	Partially
Achieves the vision	Yes	Partially
ANP Results		
Synthesized priority weights	0.7001	0.2999
Ranking	1	2

## CONCLUSIONS

This paper presents a research into the ANP led LCVA methodology for multicriteria decision making at different stages through the RIBA Plan of Work procedure. The STEEP criteria are introduced to the setting up of a generic ANP model, which can be adopted in adaptive decision making with regard to different targets through construction and development. The research of ANP applications in construction and development is summarised and used in this paper to demonstrate the possibility of incorporating ANP with holistic problem solving across the proposed group decision-making framework. According to Google, there is not result under a combined searching criterion, i.e., "life cycle value assessment" and "analytic network process". In this regard, this paper provides a novel approach to multicriteria decision-making method led LCVA for not only construction and development but also a more generic application in other industries.

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# THE VALUE BASED REQUIREMENT DEFINITION PROCESS IN CONSTRUCTION BRIEFING

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## ABSTRACT

This paper is based on the premise that different project requirements stipulated in a project brief should in fact carry different weights in terms of value, since some of them have much higher value than others. Therefore the overall values of project requirements can be significantly improved if the requirements with lower value can be identified and downgraded proportionately, or even removed if trivial, after establishing their relative values. This argument is developed, to promote an innovative concept of applying value analysis techniques to project briefing so as to achieve value improvement. The value methodology development demonstrates how to apply value analysis techniques to enhance the values of project briefs in practice. The proposed system applies a concept of 'relative value index' by comparing the ratio between the function index and the cost index. It provides an effective tool and helps practitioners to enhance the values of project briefs by capturing the inputs of clients, designers and other stakeholders. The direct application of this system is expected to result in significant value enhancement in project briefs.

## KEYWORDS

Briefing, project requirements, value analysis, value index.

## INTRODUCTION

Briefing is a process by which a client informs others of his or her needs, aspirations and desires, either formally or informally in a construction project. It is also described as a process of identifying and analysing the needs, aims and constraints of the client and the relevant parties, in formulating the design problem. The brief is the main product of briefing. It is a working document which specifies at any point in time the relevant needs, aims, and resources of the client and user, the context of the project and any appropriate design requirements within which all subsequent briefing and designing can take place (BSI, 1995), (ISO, 1994).

The terminology used in describing the types of brief has not been standardised and various terms are used across different professions and different building types. In this paper, construction briefs have been classified into two types and are defined as follows:

- Strategic Brief is the statement of the broad scope and purpose of the project and its key parameters including overall budget and programme (CIB, 1997).

- Project Brief is the full statement of the client's functional and operational requirements for the completed project (CIB, 1997).

### *Importance of project briefing in design*

Briefing helps project owners to define and differentiate their true needs from wants, to transform them into a set of clear technical requirements for design teams. This process imposes a significant impact on project cost saving and therefore, a landmark report (Latham, 1994) described it as one of the most critical success factor in project management. It is crucial to conduct the briefing in an effective and efficient way at the project inception stage.

Nevertheless, literature review reveals that briefing is a persistent problem area in the construction industry. It was said that in the UK, clients often do not know their own minds and therefore, inadequate briefs are presented to the consultant and/ or the contractor (Latham, 1994). As a result, these clients subsequently require many changes in the ongoing work. These modifications cause a significant impact on cost and programme, leading to delays and cost overruns in the construction stage. Of

course, such phenomena affect construction projects in other countries too.

## VALUE MANAGEMENT APPLICATIONS IN BRIEFING

A significant amount of research activities have been undertaken to improve briefing since the Banwell Report (HMSO, 1964) produced by the Ministry of Public Building and Works of the UK. Value management (VM) is defined as a structured and analytical process that seeks to achieve value for money by providing all the necessary functions at the lowest cost consistent with required levels of quality and performance (Standards Australia, 1994). Previous studies have already successfully applied VM methodology to briefing and some publications are as follows:

- SMART value management for building projects (Green, 1994)
- VM case study for early project development (Hamilton, 2002)
- A technique for understanding the customer's project value criteria (Kelly and Male, 2002)
- A functional framework for capturing client requirements (Shen et al., 2004)
- A how-to-guide to value briefing (Yu et al., 2006)

### *Value improvement in project briefing*

With reference to the definitions given in the Introduction, project briefing helps to develop the project objectives agreed in a strategic brief into a set of project requirements, and to present them in technical terms so as to define the design problem including functional and operational details for the design team. It is noted that defining the value of these requirements is challenging because of the following reasons:

- Value is a subjective matter affected by various factors such as economic situation, social, cultural and educational background etc.;
- Evaluating value involves the assessment of some intangible factors including social expectation, historical background and

sustainability, which are extremely difficult to quantify;

- The investigation of value requires much up-dated project information, but information available at the briefing stage is very limited;

As a result, the current project briefing practice is mainly confined to the process of requirements definition, with not much attention given to evaluating their values.

### *Organization of this paper*

For the above reasons, this paper proposes a new approach to applying value analysis techniques originating from VM, to project briefing so as to achieve value improvement. It describes a conceptual framework which helps the briefing teams to define and compare the values of project requirements and thus, to optimise the selection of project requirements by removing less valuable ones.

## USING VALUE ANALYSIS APPROACH TO SELECT PROJECT REQUIREMENTS

Value generally describes the relationship between outputs and inputs. Moreover, value has been defined as the ratio between function and cost in VM as in the equation below:

$$\text{Value} = \frac{\text{Function}}{\text{Cost}}$$

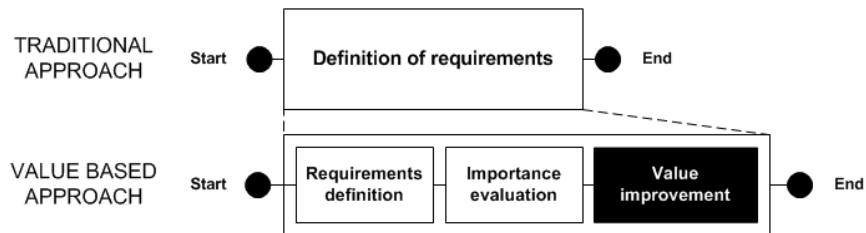
In project briefs, different project requirements carry different weights in terms of value, in that some of them have much higher value than others. It is noticed that the factor of importance / relative importance, which has been widely used, is insufficient to indicate the true values of these requirements because of the following reasons:

- “The ‘equal importance’ requirements do not have equal effectiveness.” An extreme case will be where providing youth and elderly centres are listed as an additional lease requirement in a project brief. However, this requirement only makes a small contribution in helping project owners to achieve their project objectives such as maximising the sale price.
- “The requirements with ‘equal effectiveness’ do not cost the same.” For

example, the installation of galvanized mild steel balustrade or glass balustrade in footbridge can provide the same function to avoid pedestrians falling from the footbridge and fulfil the safety requirement of Building Regulations. However, the cost of the glass one is three times more than the metal one. Hence, they come up with different values.

improved if the requirements with lower value can be clearly identified and downgraded where less significant, or even removed where insignificant, after studying their relative values in detail. It is suggested to introduce a value improvement exercise after the requirements definition process and the importance evaluation process. This is illustrated in Figure 1.

Authors suggest that the overall values of project requirements can be significantly



**Figure 1:** analysis approach for project briefing **Value**

**A VALUE METHODOLOGY FOR SELECTING REQUIREMENTS**

*Introduction to relative value index*

As described in section 1.3, project briefing helps to translate and develop the project objectives agreed in a strategic brief into a set

of project requirements. Referring to the VM value equation, the major function of project requirements is to achieve the given project objectives and a specific value definition for requirements in project briefing is given below:

$$\text{Value} = \frac{\text{The level of "effectiveness" in achieving a specific project objective}}{\text{The total "opportunity costs" of implementing this requirement}}$$

Based on this definition, a scoring method called "Relative Value Index" (RVI) has been

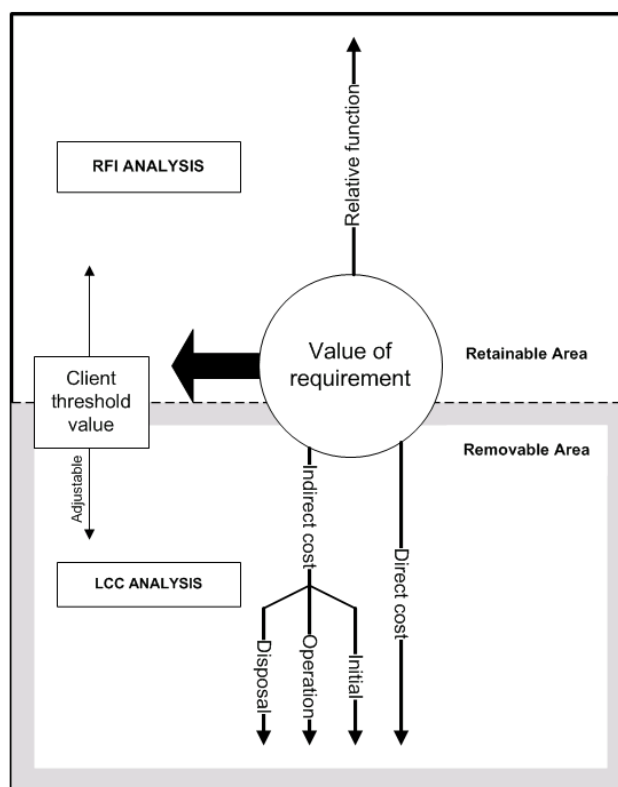
developed to define and compare the values of project requirements. It is defined as below:

$$\text{Relative value index (RVI)} = \frac{\text{Relative function index (RFI)}}{\text{Life cycle cost index (LCI)}}$$

This indexing system which is designed to build up a standard platform to compare the values of

requirements and the cost is illustrated in Figure 2.





**Figure 2: A conceptual evaluation framework of project requirements**

This index indicates the relative value by comparing the ratio between the relative function index and the life cycle cost index. For easy reference, the requirement of “adopting low energy consumption lighting units” will be used as an example for the following discussion.

#### *Calculation of a relative function index*

The relative function index (RFI) indicates the relative effectiveness of the requirements in achieving the project objectives. The index value is between 0 and 1 and the assessment method includes the following tasks:

#### 1. Defining common objectives

Briefing team members are invited to compile a list of common objectives (except cost factor) through group discussion. These objectives (from O1 to O4 in Table 1) will be used as evaluation criteria to justify and compare the effectiveness of requirements in achieving project objectives. To assign the weighting factors, a pairwise comparison matrix will be set up by comparing the objectives with each other through pair-wise comparison techniques. An example is given in Table 1.

**Table 1: Pairwise Comparison Matrix for common objectives**

Objective	A Time	B. Quality	C. Safety	D. Environmental friendly	Relative weighting	Adjusted relative weighting
A Time	-	A1	C3	D1	1	0.07
B Quality	-	-	B2	B3	5	0.36
C Safety	-	-	-	C4	7	0.50
D Environmental friendly	-	-	-	-	1	0.07
Total					14	1
4: Major preference, 3: Medium preference, 2: Minor preference, 1: Slight preference, 0: No preference						

As shown in the Table, the result A1 indicates that a slight preference (indicated by 1) will be given to A (time factor) when making a comparison between A and B. Adding results of C3 and C4 given in the comparison matrix produces the summation score of 7 in the 'relative weighting' column. Using the total score of 14 as a common base, the score of 7 has been normalised to give a score of 0.50 in the 'adjusted relative weighting' column.

2. Rating of the requirements

The rating of requirements adopts the professional judgment approach so as to simplify the evaluation process. A small group of experts form a focus group and assess the requirements according to the agreed common objectives in Table 1. The scores ranging from 1 (Poor performance) to 10 (Excellent performance) will be assigned to the requirement by group consensus during meetings. An example of a scoring table and a weighting evaluation matrix are shown in Table 2.

**Table 2: Scoring table of the requirements**

ADOPT THE USE OF LOW ENERGY CONSUMPTION LIGHTING UNITS	
Objective	Score
A Time	NA
B Quality	8
C Safety	5
D Environment	8
1: Poor performance, 5: Fair performance, 10: Excellent performance, NA: Not applicable	

**Table 3: Weighting Evaluation Matrix for the RFI**

Factor	Score	Adjusted relative weighting	Weighted score	Total score (RFI)
A Time	NA	0.07	-	5.93
B Quality	8	0.36	2.86	
C Safety	5	0.50	2.50	
D Environmental friendly	8	0.07	0.57	

**Calculation of life cycle cost index**

The life cycle cost index (LCI) indicates the total opportunity cost including both direct and indirect cost that a project owner has to incur and/or sacrifice so as to implement a particular requirement in design. The index value is between 0 and 1 and the assessment method includes the following tasks:

1. Defining cost items

The total opportunity cost includes different types of direct cost including initial cost, operation cost and disposal cost, and indirect cost. The indirect cost refers to the costs that cannot be specifically associated with a particular cost area such as social expectation,

historical significance and sustainability etc. These factors could result in some collateral/ ancillary problems such as protests against project impacts, and damage of public image, which then requires additional resources for their resolution. The recent sagas of the Star Ferry Pier and Queen Pier demolition exercises in Hong Kong have provided good examples of the importance of including indirect cost items into consideration in project briefing. As with common objectives, briefing team members are advised to compile a comprehensive list of cost items by brainstorming. Some basic examples are given in Table 4

**Table 4: A summary table of cost items**

	Direct cost			Indirect cost
	Initial	Operation	Disposal	
Examples	<ul style="list-style-type: none"> <li>• Installation cost</li> <li>• Time cost</li> <li>• .....</li> </ul>	<ul style="list-style-type: none"> <li>• Running cost</li> <li>• Maintenance cost</li> <li>• .....</li> </ul>	<ul style="list-style-type: none"> <li>• Dismantle cost</li> <li>• Disposal cost</li> <li>• .....</li> </ul>	<ul style="list-style-type: none"> <li>• Social cost</li> <li>• .....</li> </ul>

2. Rating of cost items

As discussed in previous section, project cost information is very limited in the briefing stage. Moreover, the rating of cost items involves an extensive investigation into cost and intangible factors, making it almost impossible to complete this exercise at the briefing stage. Similar to the rating of requirements, the professional judgment approach has been

adopted in the rating of cost items so as to keep the cost analysis exercise simple and efficient. Another group of experts will be invited to evaluate these cost items by assigning scores ranging from 1 (Cost is extremely low) to 10 (Cost is extremely high). An example of the weighting evaluation matrix incorporating weighting factors is given in Table 5.

**Table 5: Weighting evaluation matrix for LCI(BSI, 1995)**

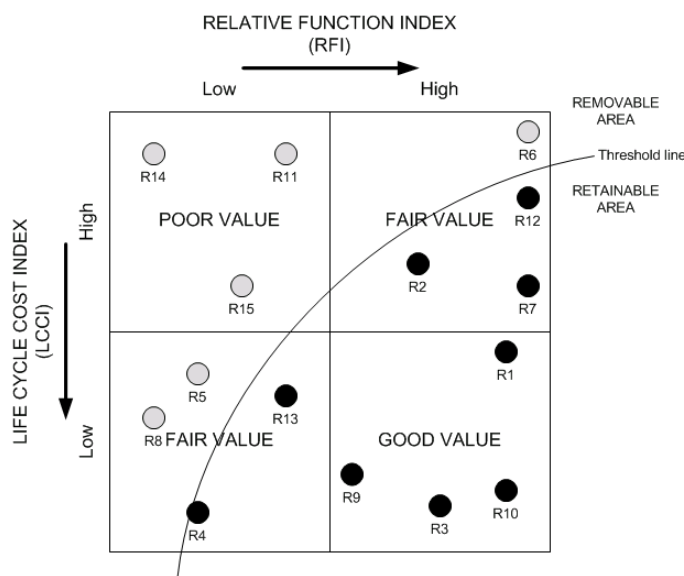
Category	W1	Type	W2	Item	W3	Score	Weighted score	Total score (LCI)
Direct	0.8	Initial	0.4	Installation cost	0.3	6	1.8	3.85
				Time cost	0.1	2	0.2	
		Operation	0.3	Running cost	0.2	3	0.6	
				Maintenance cost	0.1	2	0.2	
		Disposal	0.1	Dismantle cost	0.05	5	0.25	
				Disposal cost	0.05	8	0.4	
Indirect	0.2	-	0.2	Social cost	0.2	2	0.4	

10: Cost is extreme high. 5: Fair cost, 1: Cost is extreme low

**Selection of requirements**

Referring to the RVI equation, a set of value indices based on the results from Tables 3 and 5.

These indices are summarized and presented in the form of a RVI matrix table as in Figure 3.



**Figure 3: Relative value index matrix**

Figure 3 shows that there are four quarters including the regions of (i) poor value, (ii) fair value, and (iii) good value. Subject to the discretion of project owners, a threshold line is drawn to set the boundary distinguishing the removable area and retainable area. For example, those requirements dotted inside the area enclosed by this line (black spots) are

suggested to be valuable and they should be retained on the requirement list. However, those requirements dotted outside the area (grey spots) are not valuable and should be dropped (removed) to release more resources for supporting the retained one. As a result, the overall value of project briefs can be improved.

## DISCUSSION OF THE METHODOLOGY

This paper promotes an innovative concept of applying value analysis techniques to project briefing so as to achieve value improvement. The value methodology demonstrates how to apply these value analysis techniques to enhance the values of project briefs in practice, while a scoring method for a ‘Relative Value Index’ (RVI) is introduced.

### *Key benefits*

This methodology provides a structured mechanism to help briefing teams to optimise the selection of requirements in project briefing. Some key benefits of the RVI are as follows:

- It introduces a specific definition to standardize the value concept in project briefing. This helps a briefing team to measure the relative value of requirements by transforming subjective discussions into more objective exercises;
- It introduces a simple scoring system to standardize the value improvement process in project briefing. This provides a step-by-step guideline helps non-trained users to conduct value analysis easily.
- It introduces the life cycle cost index to promote the concept of sustainability and public engagement in project briefing. This encourages briefing teams to extend the scope of their considerations to important areas which have not been covered in traditional project briefing.
- It introduces a professional judgment approach to assist the rating of cost items so as to keep the cost analysis exercise simple and efficient. This also helps to capture comprehensive inputs from clients; design and stakeholders to enhance the values of project briefs.

### *Practical implications*

This methodology has successfully introduced value analysis technique to inject value improvements in project briefing. It provides an effective tool helping users to identify, compare and remove the less valuable

CIB (1997). *Briefing the Team: a guide*. London, Thomas Telford Publishing.

requirements so as to enhance the values of project briefs

## CONCLUSIONS

This paper shows how different project requirements included in the project brief carry different weights in terms of value - some of them have much higher value than the others. Hence, the overall value of project requirements can be significantly improved if the requirements with lower value can be identified and removed or downgraded, after studying and evaluating their relative values. This paper also introduces an innovative concept of applying value analysis techniques to achieve value enhancements in project briefing. The applied value methodology demonstrates how to deploy value analysis techniques to achieve such enhancements in practice. This system also applies a conceptualised ‘relative value index’ by comparing the ratio between a function index and a cost index. This provides an effective tool in helping practitioners to enhance the values of project briefs by capturing comprehensive weighted inputs of clients, designers and other stakeholders. The application of this proposed system is expected to result in significant value enhancements in project briefs.

## ACKNOWLEDGMENT

This paper presents the findings of an on-going study on 'Collaborative Briefing' which is part of the RIVANS (Relationally Integrated Value Networks) project undertaken by the Centre for Infrastructure and Construction Industry Development (CICID) of The University of Hong Kong (HKU); and supported by Grant HKU7138/05E of the Hong Kong Research Grants Council (RGC). The support of CICID and the HKSAR RGC are gratefully acknowledged.

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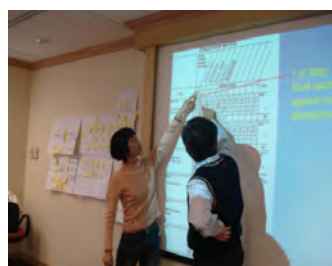
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## VALUE MANAGEMENT TRAINING WORKSHOPS FOR CONSTRUCTION PROFESSIONALS IN HK

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Recently, a certified Value Management (VM) training workshop for construction professionals comprising two modules was successfully conducted by the Hong Kong Institute of Value Management (HKIVM) and the Hong Kong Institute of Surveyors (Quantity Surveying Division) in Hong Kong. Module I was held over 13<sup>th</sup> - 15<sup>th</sup> and 20<sup>th</sup> - 22<sup>nd</sup> November 2009, while Module II was held over 4<sup>th</sup> - 6<sup>th</sup> December 2009. Dr. Mei-yung Leung, as a vice president of HKIVM, was the facilitator of the training workshops. The increasingly fierce competition in Hong Kong's construction industry necessitates that professionals use various VM techniques to improve the quality of construction products. Hence, this training workshop was designed to equip professionals with diverse VM skills in order to maximize the project value through creative decision-making approaches.

**Module I** taught the VM knowledge in a project-based approach. Attendees formed teams in which they need to improve the design of large-scale and complex real construction projects. This 5-day module began with an introduction to the VM approaches to projects, covering the history of VM, its development and definitions, and the six typical phases of a VM job plan.

**Module II**, which offered in-depth VM knowledge, was intended for participants who had completed Module I and planned to become a facilitator. All phases of the VM job plan, including the function analysis phase, the creativity phase, and evaluation phases, were covered. The module concluded with a look at the VM standard and development.

Both modules were approved by the SAVE International Society. After completion, the participants could sit examinations in order to acquire the VM qualifications of Associate Value Specialist or Certified Value Specialist of SAVE. The workshops were conducted in an interactive way through presentations and group discussions to facilitate understanding of concepts and applications. In total, 19 participants from various organizations, including developers, consultants, contractors, and the government, with an average working experience of 15 years, took this workshop and found it to be practical and beneficial. They are ready to apply the VM knowledge they have acquired in the practical decision-making process to optimize their project values in practice. Upon completion of the workshop, all of the attendees were planning to become facilitators, and they made valuable suggestions about how the VM industry could be promoted.

## HKIVM NEWS AND EVENTS

### JOINT SEMINAR WITH THE HKICM - VALUE MANAGEMENT IN CONSTRUCTION

A CPD seminar on " Value Management in Construction" was jointly organised by the HKIVM and the Hong Kong Institute of Construction Managers (HKICM) at the SCOPE Admiralty Learning Centre on 27 August 2009. Prof. Geoffrey Shen, President of the HKIVM, and Mr. K.H. Fok, Programme Director of the HKIVM, gave a presentation introducing the definitions, historical development, components, methodology and job plan of VM as well as its applications with real life examples in this seminar. The seminar was received and attended by over 60 construction professionals.



#### ABOUT THE SPEAKERS

**Prof. Geoffrey SHEN** is the Chair Professor of Construction Management and Head of Department of Building & Real Estate of The Hong Kong Polytechnic University. Professionally, he is the President of the Hong Kong Institute of Value Management (HKIVM) and member of the Institute of Value Management (IVM) in the UK. As a Certified Value Specialist (CVS) and Value Management Facilitator (VMF) recognised by the Hong Kong SAR Government, he has professionally facilitated a large number of value management and partnering workshops for a variety of large client organisations in both the public and private sectors.

**Mr. K.H. FOK** is an elite few on the HKIVM Facilitators "List A" recognized by the Government of HKSAR for Value Management workshops for the Public Works and has facilitated many Value Management / Risk Management / Partnering workshops for various Government Departments. KH's interest in leveraging the knowledge and wisdom of people was formulated during his earlier working life in the construction field. He has worked in various positions in Civil and Foundation Engineering for nearly 30 years, successfully managed more than 50 construction projects. KH's extensive practical experience has qualified himself to provide expert advice on engineering issues for arbitration and court cases particularly for piling and foundation projects.



### HKIVM ANNUAL GENERAL MEETING & CHRISTMAS PARTY

The HKIVM 14th Annual General Meeting & Christmas Party were held at the City University of Hong Kong on 17<sup>th</sup> December 2009. The President's Report and Treasurer's Report had been presented and approved in the meeting.



## **THE VALUE MANAGER** **CALL FOR ARTICLES**

THE VALUE MANAGER is the official publication of the Hong Kong Institute of Value Management. It intends to provide a lively forum and means of communications for HKIVM members and those who are interested in VM. To achieve this objective, we need your support by sharing with us your articles or comments. The following are the notes to contributors:

1. Articles submitted to the journal should fall in one of the following categories: New VA/VE/VM techniques or methodologies, Review of conference VM papers, VM case studies, VM research trends and directions, Reports of innovative practice.
2. Papers or letters should be submitted on a CD / DVD and A4 hard copy. Discs will be returned to authors after editing. Figures, if any, should be sent separately, in their original and preferred sizes. The length of each paper should be around 1000-1500 words.
3. The preferred software for processing your article is Microsoft Word, other packages are also acceptable. If the above word processing package is not available, please find a computer with scanning capabilities; the typewritten copy can be transferred to a file as specified.
4. All articles and correspondences should be sent directly to the Editor:

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