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THE VALUE MANAGER

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THE HONG KONG INSTITUTE OF VALUE MANAGEMENT

The Value Manager

Editor: Dr. Geoffrey Q.P. Shen, Assistant Editor: Jacky Chung

Council Members of HKIVM

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.
- To encourage the use of the Value Management process by sponsors.
- To establish and maintain standards of Value Management practice in Hong Kong.
- To contribute to the dissemination of the knowledge and skills of Value Management.
- To establish an identity for the Institute within Hong Kong 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 in Hong Kong.
- To establish and maintain a Code of Conduct for practitioners of Value Management in Hong Kong.
- To attract membership of the Institute to support these objectives.

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Editorial

The Tony Toy Memorial Award is established by the HKIVM to acknowledge and remember the outstanding services and commitment of our founding president Mr. Tony Toy to this Institute. This is the first year we present the award, which went to Dr. Mei-yung Leung and Mr. Jacky Chung. Both of them have presented their papers at the HKIVM 5th International Conference, and their papers are published here for a wider audience. Leung's paper aims to identify and allocate the behavioural responsibilities between the facilitators and the participants, which influence the decisions in the VM workshop. A questionnaire survey has been conducted internationally. The results indicated that cohesiveness is the major behavioural responsibility of facilitators, while information analysis and value added interpretation should be managed by the project participants during the VM process. Chung's paper introduces GDSS and how it can be integrated with the VM methodology. It shows that GDSS is highly useful in improving the effectiveness of presentation, avoiding the conformance pressure in evaluation, improving the availability of information, and enhancing communication in VM studies. A discussion of the feasible ways of applying GDSS to VM studies is given and a three-level GDSS application is introduced to demonstrate its implementation in VM studies.

Dr. Geoffrey Qiping Shen
Editor, The Value Manager

MESSAGE FROM THE PRESIDENT

Tony Wilson, President of HKIVM

We are now into the autumn. Our economy is down and our under employment figures are on the rise giving cause for insecurity and concern. This is right across the board, therefore what can we do about it?

Sometimes not a lot when the circumstances are so adverse, however it is important to remember that it is just, "circumstances", not the individuals that are the problem. The individuals are the ones who may suffer the consequences but must not take it to heart if it is something they could not change.

What are the remedies? Very different in all cases, however there is the consideration of option planning. Value Management (VM) can assist, as different options will have different outcomes. VM techniques can help weigh the options and provide a method of positioning key issues. If a series of scenarios or options can be prepared, it can give a definite way forward. I remember being told once by an excellent mentor, that you should have at least six options running at the same time! This is a positive approach but it does need to be flexible. It can help with the issue of perhaps positioning retraining in some thing new, or the option of looking for something similar to the current skills but at a lower salary in the short term. A new sideline hobby can be considered for future development to take on a major lifestyle role. The risks of this can be considered and positioned. Perhaps it is better to have more people involved in these individual problems as the range of views, ideas and comments can help.

In these difficult times, the Institute has just concluded our Fifth International Conference. If I believe our International speakers, we now have earned the reputation of being the best VM conference in the world and we have met all our targets for the event. This is a major achievement from our modest start in May 1996, when we were the new kids on the block. This has come about by a mixture of, professionalism, flexibility, adaptability, hard work, enthusiasm, and the ability not to just follow the rest but make our own way. This, plus the unique location of our city and our Hong Kong hospitality has given us an edge, which we will build on for the future. We are starting to plan for our next Conference in November 2003 and our first draft options will be prepared soon. I would like to again thank all those involved with the Conference for everything, as this was an event to be really proud of.

At the Conference, Mrs. Annie Toy presented our first Tony Toy awards to three very worthy winners. This was another milestone for the Institute and one that I personally feel very pleased about. There was also the opportunity to talk to other Presidents and members of other Institutions, and we are moving towards a formal recognition of members between us. This will take some time but it does mean that we must firm up and publish our membership criteria soonest. We must also continue to operate under our strict membership and professional codes.

Currently I believe that membership fees are due, therefore please continue to share with us the changes in the world of VM and send in your subscriptions on time. As an Institute we are keen to develop and serve our members. Please feel free to contact us if there are issues that you feel that we could do better or would be of assistance to you,

I hope that for some there will be summer vacations on the horizon and I wish you all well in the coming months,

Best regards to you all,

Tony Wilson.

FOND MEMORIES OF THE HKIVM'S 5TH INTERNATIONAL CONFERENCE

The HKIVM 5th International Conference had been completed successfully on 24 May 2002 and some of the conference photos are shown below. More photos now are available on the HKIVM website and please visit http://www.hkivm.com.hk/activities/5th_conference/index.htm for details.

Welcome reception dinner at the H.K. Jockey Club

Opening speech given by the President of the HKIVM, Mr. Tony Wilson

Welcome reception dinner at the H.K. Jockey Club

Opening speech given by the Keynote Speaker, Sir Gordon Y. S. Wu

Day 1 conference

Q&A session at day 1 conference

Group photo taken at the end of the conference

Souvenir was presented to Mr. Michael Dallas, from the United Kingdom

Souvenir was presented to Mr. Axel Peter Ried, from Germany

Souvenir was presented to Mr. David Baguley, from Australia

Souvenir was presented to Mr. David Yau, the Conference Director

TONY TOY MEMORIAL AWARD

The Tony Toy Memorial Award is established to acknowledge and remember the outstanding services and commitment of our founding president Mr. Tony Toy to this Institute. This shall be a regular award, to be presented at each HKIVM International Conference, to students of any discipline based on the quality of research projects/dissertations relating to value management.

To qualify, the dissertations should have been accepted as part of any recognised degree of study (Bachelor, Postgraduate Diploma, Master or Doctorate) in Hong Kong and China within two years of the proceeding HKIVM International Conference (typically held every 18 months).

- The awards will be based on the quality of the dissertations submitted to the Award Assessment Committee.
- Two separate sets of awards will be arranged for students from Hong Kong and from Mainland China.
- A maximum of six awards will be given at each International Conference for students in Hong Kong and China.

Category	Hong Kong	China
Memorial Award	1 person @ HK$5,000	1 person @ HK$5,000
Distinction Award	1 person @ HK$2,000	1 person @ HK$2,000
Merit Award	1 person @ HK$1,000	1 person @ HK$1,000
	Total : HK$8,000	Total : HK$8,000

- The Memorial award recipients in both locations will be invited and sponsored (up to HK$4,000 to cover travelling and registration expenses) to present their papers at the International VM Conference organised by HKIVM.
- The submission of the paper to the HKIVM International Conference and presentations must be in English and with full acknowledgments.
- HKIVM reserves the right to review each year at the AGM and to agree on the level of the award for the following International Conference.

On 23 May 2002, the Tony Toy Memorial Award was presented during the HKIVM 5th International Conference and recipients of the award are listed in the following table:

Category	Hong Kong
Memorial Award	Dr. Mei-yung Leung
Distinction Award	Mr. Jacky Kin-hung Chung
Merit Award	Mr. Michael Chun-kit Cheung

The award winners, Dr. Leung and Mr. Chung, have been invited to present their research findings during the conference and their papers are illustrated in the next section.

For any further information, please contact Dr. Frederik Pretorius at the following address:
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RESPONSIBILITIES OF FACILITATORS AND PARTICIPANTS IN THE VM PROCESS

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Abstract

Value management (VM) is aimed at establishing a focused definition of project goals through interaction amongst the project's team members. In order to identify the best value (goal) in the VM process, the VM facilitator plays an important role to lead the whole team (participants) in track for stimulating and solving the crisis in the team. Based on a systematic leadership model and a systematic VM model, a cyclical cognitive Facilitation –Participation VM model is developed for the evaluation of interactions between the facilitator and the project participants in the VM workshop. This paper aims to identify and allocate the behavioural responsibilities between the facilitators and the participants, which influence the decisions in the VM workshop. A questionnaire survey has been conducted internationally, including the USA, UK, HK, Australia, and Korea. The results indicated that cohesiveness is the major behavioural responsibility of facilitators, while information analysis and value added interpretation should be managed by the project participants during the VM process.

INTRODUCTION

Value Management (VM) has become a leading methodology for clarifying the objectives of multiple stakeholders amongst project team members in the early development stage (Green 1994). It is normally led by a facilitator throughout the workshop. The interactions between the facilitator and the project participants thus play an important role in the whole decision process. Generally, VM practitioners have tended to focus on various techniques within a systematic approach for decision-making (Dell'Isola 1982; Kelly and Male 1992). However, the responsibilities of VM facilitators and participants are seldom identified by various academics and practitioners in the construction industry. Since both the technical tasks and the human resource variables are equally important, this paper evaluates the behavioural responsibilities of both facilitators and participants in the VM workshop.

A COGNITIVE F–P VM MODEL

There are various leadership styles in the management process (e.g., Vroom and Jago 1988; Slevin 1989). The Leadership Process Model (Chemers 1987) systematically indicates the relationships between the leader and the participants in a management process. The Leader's characteristics and basic values influence the Followers' goal and behavior and, subsequently, affect the team's performance.

Recently, Leung and Liu (1998) established a systematic VM model involving the Value–Goal–Outcome cyclical processes. The model indicates that the project goal affects the participants' behaviours and the final outcome, while the goal is decided in a decision process based on the basic values of the project participants. The construction participants usually each have their own opinions and objectives for the particular construction project involved in the decision process. Through the VM workshop, facilitators assist the project participants to clarify their roles and responsibilities, to specify the value and goals of the project/task and to create and maintain an environment conducive to team discussion (Zimmerman and Evan 1993).

Stemming from the Systematic Leadership Model (Chemers 1987) and the Systematic VM Model (Leung and Liu 1998), a systematic Facilitation–Participation VM Model is established (see Figure 1).

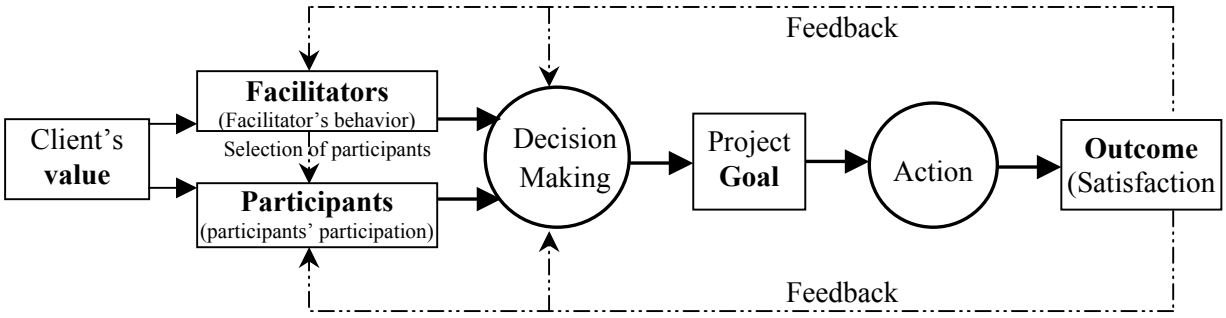

Figure 1: A Cyclical Facilitation–Participation VM Model

[note: ⟵ - major transformation process; ⟵··· - feedback loop]

Normally, the client is an initiator to establish the basic requirements (i.e. *value*) for the discussion and decision of particular tasks in the value management process. In the VM workshop, both facilitators and participants affect the decision process and the project goal. There are strong interactions between the facilitators and the participants in the decision making process. VM *facilitators* create and maintain positive environments for the *participants* for value-goal searching and problem solving, and thereby increase the team effectiveness and thus the opportunity for the best *value-goal* setting. They need to balance the participants' and tasks' dynamics by translating the ideas, monitoring the emotions and providing guidance amongst the participants for the tasks throughout the *decision* and *action* processes. Finally, the project *outcome* (either satisfaction or dissatisfaction) will subsequently affect the basic values of facilitators and participants in the future and influence the following decision processes and decision making for the subsequent tasks.

BEHAVIOURAL RESPONSIBILITIES

The behaviours of facilitators (e.g., collection of information, organization of VM workshop, selection of VM techniques, etc.) influence the participation of participants' in the decision process and vice versa. In addition to the systematic VM phases (information, function, speculation, evaluation and development) (SAVE 1998), a lot of behavioural responsibilities are also involved in the interactions between facilitators and participants in VM studies.

In the construction industry, there exist numerous parties such as the client, project manager, architect, structural engineer, building services engineer, quantity surveyor, landscape architect, as well as the contractor (Walker 1996). Indeed, it is not easy to select the best value (goal) for a construction project due to the multiple objectives amongst the project participants. Each party has different *personal backgrounds* representing various professional disciplines and cultures during the face-to-face discussions in the VM workshop.

In order to ensure that the participants understand the problems of the task and the basic requirements of the client, *specific basic information* (Leung and Liu 1998; Liu and Leung 2002) including both client's values and professional's contributions are important to support the participants for selecting the best value (i.e. goal) and specifying the expected performance (goal) in the VM workshop. During the *analysis* phase in the VM workshop, facilitators need to select the appropriate decision techniques for the participants to analyse and interpret the collected information for decision making amongst the project participants.

Conflict during decision-making and the implementation of specific tasks is inevitable but beneficial, especially in the pre-decision stage, in order to achieve best value (goal). It is affected by personal characteristics and previous experience (evaluated satisfaction) and, simultaneously, influences the expected goal

and the final outcome. Functional conflict is treated as essential for creative thinking, and thus produces better performance and better outcomes (Leung and Lui 1998). Therefore, facilitators need to control both the task conflict amongst design objectives and the team conflict amongst the participants throughout the decision process. They must also make sure that an optimal level of conflict is stimulated and solved in the workshop.

VM emphasizes the *teamwork* spirit, especially in the decision process (Dell'isola 1982). In organizational behavior, participation and cohesiveness are often encouraged from both leader and followers for the improvement of organizational effectiveness (Erez and Zidon 1984; Vroom and Jago 1988; Slevin 1989). In the workshop, facilitators have to motivate and maintain full participation and high cohesiveness amongst the participants, such as the project manager, consultants, client, etc. Participation and cohesiveness increases cooperation and team spirit in the group discussion and results in greater knowledge (Champagne and McAfree 1987). Varying degrees of participation and cohesiveness by the various parties in the value-goal process would affect the final outcome (satisfaction), since the levels of participation and cohesiveness may influence their expected value (goal).

Finally, feedback provides a basis for assessing team performance and the project outcomes (participant satisfaction). The *performance evaluation* is influenced by the deviation between the expected goal and actual performance for the particular task and, simultaneously, affects the following decision making and action behavior for the subsequent task.

In sum, six behavioral responsibilities are identified amongst the facilitators and the participants in the VM workshop, including personal background (disciplines and culture), specific information (client's value/brief, consultants' information), information analysis (information interpretation and techniques application), conflict, teamwork (participation and cohesiveness) and performance.

A QUESTIONNAIRE SURVEY

In order to evaluate the responsibilities of facilitators and participants in the VM process, an international questionnaire survey was conducted between December 2000 and February 2001, including the USA, UK, HK, Australia, and Korea. A total of 65 questionnaires were returned, representing 23.3% of the 280 sent out; 16 and 49 sets were returned representing a response rate of 20% and 24.5% from Hong Kong and overseas respectively. Based on the six identified major factors (A-F) related to the facilitation skills, 13 variables were listed in the questionnaire (see Table 1). The mean and standard deviation were calculated to find out the average rate and the dispersion of the data.

$$\textbf{Mean} = \frac{\textbf{Total of weighting in each knowledge}}{\textbf{Total no. of sample}}$$

The results indicate that facilitators have various responsibilities in the decision process, including (1) to manage the teamwork (participation and cohesiveness); (2) to manage the different cultural backgrounds amongst the participants; (3) to stimulate and solve conflict; and (4) to use the most appropriate techniques for information analysis. However, facilitators should not influence the team decision by adopting the facilitators' preferred solution in the decision process. The project participants have the responsibilities to analyse and interpret the information in the analysis phase of the VM process. Both Facilitators and Participants have to work together as a team for generating and evaluating the alternatives and reaching the agreement (consensus) for the project goal.

Responsibility Factors	Mean Scores (Standard Deviation)	Responsibility Allocation						
		Facilitator	Most F Some VM	Most VM Some F	VM Team	Most VM Some P	Most P Some VM	Participant
A. Personal Background								
1. Cultural difference	2.63 (2.07)			→				
2. Disciplinary differences	3.17 (2.92)			→				
B. Specific Information								
3. Clarification of client's brief	3.62(2.04)				→			
4. Information input	3.91(3.26)				→			
C. Information Analysis								
5. Interpreting client's values	3.68 (1.86)				→			
6. Analyzing information	4.65 (1.71)					→		
7. Interpreting values added	4.37 (1.51)				→			
8. Techniques to be used	2.79 (1.55)			→				
D. Conflict								
9. Conflicts in decision making	2.73(1.48)			→				
10. Conflicts in implementation	3.63 (2.02)				→			
E. Teamwork								
11. Participation	2.62 (1.45)			→				
12. Cohesiveness	2.28 (1.42)		→					
F. 13. **Performance evaluation**	3.50 (1.72)				→			

Table 1: Behavioral Responsibility Allocation for Facilitators and Participants in the VM Process

CONCLUSION

VM in the construction industry is increasingly being employed as the soft thinking system for enhancing client value. During this value studies process, both facilitators and participants play important roles in search of the best Value–Goal for the client and in influencing the Decision outcome that, in turn, influences the final project Outcome. This paper establishes a cognitive F–P VM model for the interactions between facilitator and project participants in the VM process.

The research indicated the allocation of responsibilities between the facilitators and the participants in the VM workshop. Facilitators should not influence the participants' decision, but assist and support the participants to analyse and interpret the information for the selection of the best value (goal) in the decision making process. Teamwork with participation and cohesiveness, cultural difference, decision techniques and conflict management are considered to be the responsibilities of facilitators in the VM workshop, while information analysis and interpretation should be managed by the participants.

Since this study was carried out mainly on the basis of self-report, 'case study' and 'qualitative data analysis' are recommended for further research to cross-check the results presented.

ACKNOWLEDGEMENT

The work described in this paper was fully supported by a grant from CityU (Project No. 9030913-560).

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USING GROUP DECISION SUPPORT SYSTEMS TO IMPROVE VM STUDIES IN CONSTRUCTION

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Abstract

Group Decision Support Systems (GDSS) are a computer technology that combines communication, computing and decision support technologies to improve the group decision-making process. As there is a strong demand for improvements to the practice of Value Management (VM) in construction, research has been conducted to explore the application of GDSS in VM studies. The research aims to explore what and how GDSS functions can be applied to improve VM studies, and to examine their usefulness in the construction industry. This paper introduces GDSS and how it can be integrated with the VM methodology. It presents the validation results of GDSS supports, which show that GDSS is highly useful in improving the effectiveness of presentation, avoiding the conformance pressure in evaluation, improving the availability of information, and enhancing communication in VM studies. A discussion is given on the feasible ways of applying GDSS to VM studies and taxonomy of three-level GDSS application is introduced to demonstrate how GDSS can be implemented in VM studies.

INTRODUCTION

Value Management (VM) is a structured and analytical process that seeks to achieve value for money by providing all the necessary functions at the lowest costs consistent with required levels of quality and performance (AS/NZS 4183: 1994). There has been a surge of interest in VM applications since the Asian financial crisis in 1997. VM is becoming more popular and more important in the construction industry. Many government departments, public corporations, and private enterprises have applied VM in preliminary project feasibility studies in order to enhance project performance. However, it is observed that the implementation of VM studies is subject to a number of difficulties. Consequently, there is a strong demand for improvements to the practice, so as to maximise the benefits gained.

For these reasons, a research study entitled "An Investigation of the Feasibility of Using Group Decision Support Systems (GDSS) to Improve VM studies" has been conducted to explore the application of GDSS in VM studies. This research aims to explore what and how GDSS functions can be applied to improve VM studies, and to examine their usefulness in the construction industry. The findings of this research reveal that some local VM users are not entirely satisfied with the practice, due to the problems of (i) lack of information, (ii) lack of participation and interaction, and (iii) difficulty in conducting evaluation and analysis in VM studies (Shen and Chung, 2000). This paper introduces what GDSS is and illustrates how it can be applied and improved in its application to? VM studies.

WHAT IS GDSS?

GDSS, also known as Group Support Systems (GSS) or Computer Support Cooperative Work Systems (CSCW), is a computer technology combining (i) communication, (ii) computing, and (iii) decision support technologies to facilitate the formulation and solution of unstructured problems by a group of people (DeSanctis and Galluple, 1987). In short, GDSS is a computer-based system designed to support groups of people and engage them in a common task through the interface of a shared environment (Aiken et al., 1995). GDSS consists of (i) hardware, (ii) software, (iii) people, and (iv) procedures. GDSS research was mainly centralised in university research laboratories in the mid 1980s. A substantial amount of research shows that GDSS field studies have consistently shown positive results, and nearly all "real-world" users are extremely satisfied with the application of GDSS in meetings. It is concluded that GDSS is highly useful in improving the group decision-making process (Dennis et al., 1988; Chun and Park, 1998). Today, the success of GDSS is gaining acceptance and it has been widely applied many famous organisations, including the University

of Arizona (GroupSystems), IBM (Team Focus), and Xerox (the Colab System).

WHAT SUPPORT CAN BE PROVIDED BY GDSS?

The findings of this research suggest that the communication, computer and decision technologies of GDSS can be integrated and applied to VM studies in different areas. In order to illustrate this, a framework of three-dimensional GDSS support for VM studies has been developed in the research and is presented in Figure 1.

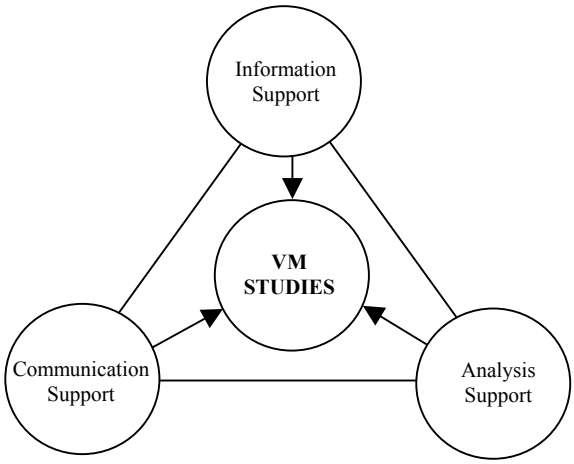

Figure 1: Three-dimensional GDSS Support for VM Studies

Figure 1 illustrates that GDSS can contribute to providing (i) information support, (ii) communication support, and (iii) analysis support for improving VM studies. These supports can either work alone to support a particular task or closely to support a particular process (a group of tasks) in VM studies.

Information Support

The information support aspect of GDSS mainly applies electronic information tools to facilitate information management in VM studies.

GDSS can improve the availability of information and resolve the difficulty of lack of information in VM studies. The connection to the Internet breaks the physical boundaries of conference rooms and allows members to access external information, such as public, corporate and private information, easily during workshops.

GDSS can enhance the information exchange process through setting up an electronic project information center in VM studies. This information center acts a project hosting system to manage the processes of information gathering, distribution, and circulation throughout studies. The information center enables point-to-group and real-time electronic communication. By using this, members can simply upload project information to the center and it will be automatically distributed to all members through the Internet. This approach simplifies the information exchange process and shortens the time required in the pre- and post-study phases. As a result, members can always receive the most up-to-date project information. The information center also enhances the information circulation process and improves the consistency of information by sharing project information on the Internet. As shown in Figure 2, the information center keeps track of all information in VM studies. This approach promotes a standard understanding and facilitates knowledge acquisition

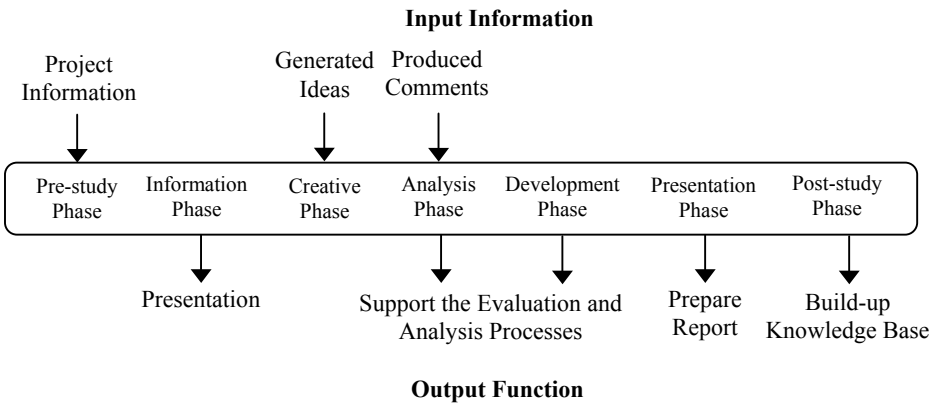

Figure 2: Information Flow in the Electronic Project Information Center

GDSS can improve the effectiveness of presentation in VM studies. The information center supports multi-media presentation including video and graphics. It enriches the media richness and the effectiveness of presentation in the information phase.

Communication Support

Communication support applies electronic communication tools to improve the effectiveness of discussion in workshops and to enhance collaboration between members in the pre- and post-study phases.

GDSS can promote active participation in VM studies. Some members are reluctant to speak out in idea generation because they are shy of speaking in public or afraid of sounding stupid. It is suggested that the creative phase be divided into two sessions: (i) an individual brainstorming session and (ii) a group brainstorming session. In the first session, the electronic communication tools of GDSS are applied to allow anonymous communication and thus to create a pressure-free environment. In the second session, facilitators present the collected ideas and invite additional ideas. This approach integrates electronic communication with face-to-face communication in VM studies so as to promote active participation without losing human interaction.

GDSS can avoid conformance pressure in VM studies. The findings of previous studies suggest that senior members may intentionally or unintentionally exert conformance pressure on junior members in traditional meetings. This prohibits the interaction of junior members and ultimately results in groupthink. The anonymous communication of GDSS creates an impersonal environment and encourages members to judge ideas solely based on their merits rather than considering any social factors. As a result, members are not afraid to criticise the ideas of more powerful players. Discussion becomes more vigorous and more issue-oriented in VM studies.

GDSS can prevent domination in discussion. Due to conflicting objectives, a few active members may dominate the discussion in traditional workshops, and prevent other members from expressing their opinions. As with the creative phase, it is suggested that the evaluation phase be divided into two sessions: these are presented in Figure 3. The parallel communication of GDSS allows all members to communicate simultaneously in the first session. This approach promotes equal chances to participate.

Analysis Support

The analysis support of GDSS applies electronic analysis tools to improve the efficiency and effectiveness of evaluation and analysis in VM studies. GDSS can simplify the evaluation and analysis processes in VM studies. The modelling tools of GDSS, such as the life cycle cost model and the multi-criteria evaluation model, standardise and streamline the analysis process. Members can simply input data into the models and results are generated automatically.

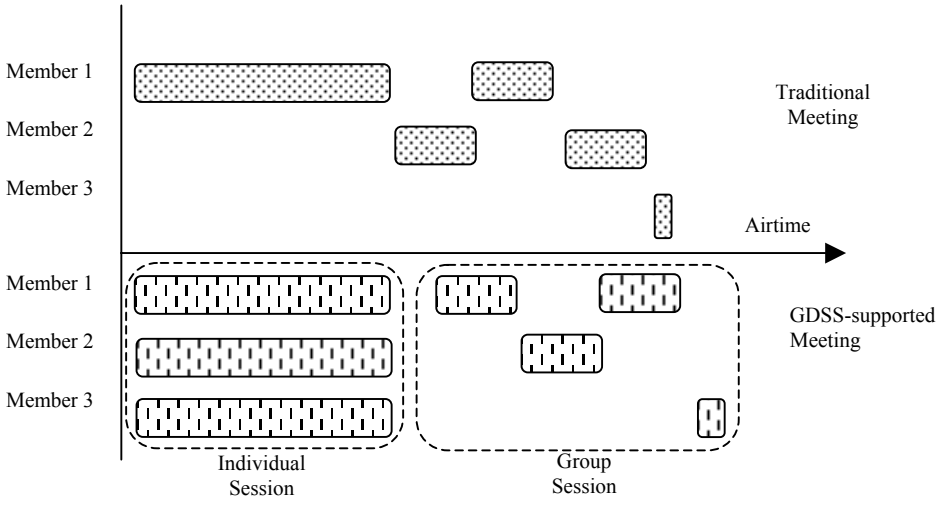

Figure 3: Parallel Communication in Group Discussion

In addition, some commonly used software, such as Microsoft Excel and Access, can also be used as analysis tools in VM studies. This software allows members to modify data in electronic files. Members can vary the input data and the general pattern, or the results of different scenarios can be produced quickly in workshops. These analysis tools improve the productivity of the evaluation and data analysis processes, and enable members to respond easily to "what if"-type questions.

GDSS can enhance the efficiency and effectiveness of the prioritisation process in VM studies. The electronic rating tools of GDSS, including the voting tool, the idea categorisation tool, and the weighting evaluation tool, simplify and shorten the required time for evaluation. In addition, these tools allow anonymous rating, which can avoid the conformance pressure in voting.

VALIDATION RESULTS OF GDSS SUPPORTS

In order to investigate the usefulness of the described GDSS functions, a validation was conducted at the Department of Building and Real Estate of the Hong Kong Polytechnic University in April 2001. A group of experienced VM practitioners, including a VM facilitator, a client, an architect, a project manager, a quantity surveyor, an engineer, and a contractor was invited to join the validation. A GDSS conference room was established to simulate the environment of a GDSS-supported VM study: a picture of it is given in Figure 4. In the validation, data is mainly collected through questionnaire survey, focus group meetings and interviews, and the results are presented in the following paragraphs.

Figure 4: A GDSS Conference Room at the Hong Kong Polytechnic University

Table 1: Summary of the Validation Results

Type of Support	GDSS Function	Score (Function)
Information support	1. GDSS can improve the availability of information	4.00
	2. GDSS can enhance the information exchange process	3.93
	3. GDSS can improve the effectiveness of a presentation	4.67
	Average Score of this Section	**4.20**
Communication support	4. GDSS can promote active participation in idea generation (technological efficiencies)	3.39
	5. GDSS can avoid conformance pressure in evaluation	4.11
	6. GDSS can prevent domination in discussion	3.67
	7. GDSS can enhance communication in the pre- and post-study phases	4.00
	Average Score of this Section	**3.79**
AnalyAnalyAnaly	8. GDSS can simplify the evaluation and analysis processes	3.78
	9. GDSS can enhance the prioritisation processes	3.88

The research findings show that the application of GDSS in VM studies is highly supportive. Most of the respondents (7 out of 8) were interested in implementing the GDSS functions in VM studies in the future. Nevertheless, one respondent disagreed with this. This was because many users were unfamiliar with VM and considered that the application of GDSS may cause additional difficulties in implementing VM studies. This is considered as a limitation of GDSS but one which would definitely be offset by improvements in VM studies in long run.

Table 1 demonstrates that information support is the most useful GDSS support in VM studies. Communication and analysis support are ranked as the second and third most useful GDSS supports respectively. Among these supports, respondents seem to favour those functions that can directly improve the productivity of VM studies; some reasons for this are suggested below:

- The improvements in productivity are tangible and easily identified.
- The improvements in productivity may directly reduce the cost of VM studies.
- Respondents may lack experience in using electronic communication tools, and therefore the benefits of interaction advantages are not fully explored.

In addition, the table also suggests that most GDSS functions are useful in improving VM studies; their scores range from 4.67 (strongly agree) to 3.67 (agree). In order to identify the top five GDSS functions, the functions are ranked in descending order, where "1" is the most useful and the results are presented in Table 2.

Table 2: The Top Five GDSS Functions in VM Studies

Rank	GDSS Function
1	GDSS can improve the effectiveness of presentation
2	GDSS can avoid conformance pressure in evaluation
3	GDSS can improve the availability of information
	GDSS can enhance communication in the pre- and post-study phases
4	GDSS can enhance the information exchange process
5	GDSS can enhance the prioritisation processes

Improving the effectiveness of presentation is ranked as the most useful GDSS function in VM studies. Further, avoiding conformance pressure in evaluation, improving the availability of information/ enhancing communication in the pre- and post-study phases are also ranked as the second and third most useful GDSS functions respectively. These GDSS functions are in line with the difficulties described at the beginning. This finding provides a strong argument to support the feasibility of applying GDSS to improve VM studies in the construction industry.

FEASIBLE WAYS OF APPLYING GDSS TO VM STUDIES

In reference to the GDSS framework presented in Figure 1, the taxonomy of a three-level GDSS application in VM studies has been developed and is presented in Table 3.

Table 3: Three-level GDSS Application in VM Studies

	Information Support	Communication Support	Analysis Support	Achieved Function
Level I	√	√		• Enhancing the information exchange process • Enhancing communication in pre-& post-study phases
Level II	√		√	• Improving the availability of information • Improving the effectiveness of presentation • Simplifying the evaluation and analysis processes • Enhancing the prioritisation processes

Level III	√	• Promoting active participation in idea generation • Avoiding conformance pressure in evaluation • Preventing domination in discussion

Level I GDSS aims to apply information and communication support in order to improve the information exchange process and enhance communication in the pre- and post-study phases. A virtual conference room, which comprises (i) a project briefing tool, (ii) an electronic notice board, (iii) an electronic forum, (iv) a construction library, and (v) the project information center, is introduced to improve collaboration in the pre-study phase.

Level II GDSS aims to apply information and analysis support in order to improve the efficiency and effectiveness of analysis in VM workshops.

Level III GDSS aims to apply communication support to enhance the effectiveness of discussion in workshops. The anonymous and parallel communication of GDSS are applied to promote active participation, avoid conference pressure, and prevent domination in VM studies.

CONCLUSION

GDSS is a powerful tool in improving VM studies. The paper introduces what GDSS is and illustrates how it can be integrated with VM methodology. It demonstrated that GDSS could provide information, communication and analysis support for VM studies. The paper also presents the validation results of GDSS supports, which show that GDSS is highly useful. A taxonomy of three-level GDSS application is developed to demonstrate the feasible ways of applying GDSS to VM studies. More research findings will be made available in the near future and readers are encouraged to visit our website at http://home.bre.polyu.edu.hk/~bsjacky/gdss/ for the latest information on this project.

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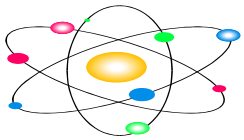

- 17 September 2002, the **HKIVM's 42nd Luncheon Meeting** was successfully organised and Dr. Arthur McInnis, who is an author of Hong Kong Construction Law and a regular Commentator on matters of interest to the construction industry, was invited to give a presentation entitled "Can Lawyers Ever Add Value?" The presentation was held in Hong Kong Club and it was well received by members and invited guests.

- 24 May 2002, the **HKIVM 5th International Conference** had been completed successfully and photos of the conference are now available on the HKIVM website. Please visit http://www.hkivm.com.hk/activities/5th_conference/index.htm to download the photos.

Mark Your Diary Now!

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