Pedagogy of Teaching Value Management in Postgraduate Construction and Property Program

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Abstract: As Value Management has been increasingly applied to enhance value in public construction projects, the core subject entitled "Value Management for Construction and Property" is being offered to the postgraduate students in the Department of Building and Real Estate at The Hong Kong Polytechnic University. Under the new outcome-based curriculum, the learning outcomes, pedagogy of teaching VM and activities of the VM workshops for the subject are described in this paper. The results of a questionnaire survey of the students' feedback on the performance of the workshops for the academic year 2007-08 are presented and discussed. Students believed that value management workshops are essential in the curriculum. They expressed that it was a valuable experience to participate in the VM workshop which enabled them to have a better understanding of the subject. Some improvement is also recommended for future organization and management of workshops based on the lessons learnt in these workshops.

CE Database subject headings: Value management; Engineering education; Curricula

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Introduction

Value Management (VM) is a structured, organized team approach to identifying the functions of a project, product, or service with recognised techniques and providing the necessary functions to meet the required performance at the lowest overall cost (SAVE International, 2001). It is being recognised as one of the most effective methodologies to increase benefits as regards a given investment. VM is used to achieve best value for money and to increase the achievement of stakeholder expectations in projects (Thiry, 2001). Apart from saving in project costs, VM can also provide a forum for the contracting parties to review the whole project and improve communication and team spirit among various construction professionals. An additional benefit is that, during the study, creativity is largely enhanced through the interaction of different professionals and external experts. Although the benefits of a properly administered VM is significant, the cost of implementation is not expensive which merely constitutes less than 1% of the total construction project cost in general (Norton and McElligott, 1995).

VM was introduced to Hong Kong in 1988 and there has been an increasing awareness of its merits and tremendous potentials in value enhancement and cost savings in construction projects. Since 1998, the government has taken a leading role in promoting and applying VM in Hong Kong. The Works Bureau and the Planning, Environment & Lands Bureau jointly issued a technical circular which demands VM studies for major projects in the subordinate departments (Works Bureau, 1998). Hong Kong professionals first learned of the process from the North American methodology based on 40-hour workshop model. This was characterized by the pre-existence of a design solution, an alternative design team and the five keys stages of information, speculation, creativity, evaluation, development and presentation, originally developed by Miles (1972), now commonly referred to as the Job Plan. Fong et al.

(1998) undertook research funded by the Hong Kong Polytechnic University into applications of VM in the construction industry in Hong Kong. They concluded that VM had a place within the industry but its form would need to be adapted to suit Hong Kong practice. Regarding the duration of the study, the study can be implemented and completed within 2 days by adopting the Australian approach. Alternatively, one can envisage his own approach according to the constraints and characteristics of the existing project. It is vital to understand that VM methodology is not a set of rules and procedures; it is more a conceptual framework within which amendments can be made according to one's needs. The Construction Industry Review Committee (2001) has also recommended that VM should be used more widely in local construction. Under government promotion, VM was increasingly applied to more construction projects in the public and quasi-public sectors. Therefore, the subject of Value Management in Construction and Property has been offered by the Department of Building and Real Estate of the Hong Kong Polytechnic University to the students who are taking the MSc/PgD in Construction and Real Estate and MSc/PgD in Project Management Degree Programs.

Pedagogy, as described in some of the educational literature, is sometimes used as a synonym for teaching. In this sense, pedagogy is seen as a catch-all term for such things as teaching procedures, teaching practice and instruction (Loughran, 2006). However, pedagogy can be seen to encompass much more than simply teaching (van Manen, 1999). Pedagogy is the art and science of educating students and as van Manen makes clear, focusing on the relationship between learning and teaching such that one does not exist as separate and distinct from the other is crucial to such education. Watkins and Mortimore (1999) define pedagogy as "any conscious activity designed by one person to enhance learning in another". In order to address the effectiveness of teaching and learning, teaching methods should be aligned with needs of

the learners and with the desired learning outcomes. The curriculum contents, pedagogy, and assessment methods of the subject must be relevant, competent, and meaningful (Wlodkowshi, 1999), and in line with following and teaching and learning strategies of the university:

- All-round development of students beyond the professional context including language or interpersonal enhancement, culture promotion and ethics.
- Student-centered learning strategies, for example, problem-based learning (PBL), project-based learning, peer tutoring, peer assessment, etc.
- A caring and supportive learning environment by the mechanisms for access to teaching staff, mentors, and head of departments;
- The importance of good teaching and professional development of teaching staff supported by the Learning and Teaching Resources Centre in the University;
- Using information and communication technology (e.g. web-based learning) as a tool to enhance learning and teaching; and
- Partnership with professionals and the community. For example, professionals are invited as guest lecturers and feedback is solicited from employers of the industry.

This paper describes the pedagogy of teaching the subject 'VM' using workshop approach for the PolyU students in the academic year 2007-08. Under the new outcome-based curriculum and work-integrated education requirements, the curriculum, learning outcomes, pedagogy and assessment for the subject are described here by answering the questions of "what should students learn in VM", "How Should VM Be Learned, Taught, and Assessed" and "what was the feedback from the students."

What Should Students Learn in VM?

This subject aims to meet the needs of construction professionals who wish to use value management/engineering methodology to obtain best value for money for their project, by broadening and deepening their knowledge in the theory and practice of value management/ engineering in construction context.

Syllabus of the subject includes:

- Value management basics:- historical development; definitions and concepts
- Value management methodology and techniques, including function analysis, function cost analysis, environment for creativity, life cycle costing
- Structured job plan (information, analysis, creativity, evaluation, development, presentation) and alternative VM approaches such as the Charette job plans
- Group dynamics, teamwork, group problem-solving methods, and facilitation skills
- Project sections for VM studies, application in Hong Kong and overseas, limitations
- Comparison of value management and traditional cost management techniques
- Case studies of the practice of value management
- Guided VM workshop for real life projects

The subject has been offered to MSc students since 1995. The original syllabus was created based on the knowledge of three academic colleagues who are active in research in the field of value management. The present syllabus of the subject has gone through several rounds of revisions and improvements. Each of these changes was arisen as a result of the additional knowledge and experience obtained through conducting relevant research and consultancy projects in the field of value management. Feedbacks from the students have also been taken into consideration.

What are the Subject Learning Outcomes?

Under the new outcome based curriculum, the learning outcomes of the Value Management subject are:

- Understand the value management methodology
- Use value management tools/techniques such as function analysis in workshops
- Organize and manage value management workshops in different phases of a project life cycle
- Exercise practical creativity skills and work with a team of stakeholders to arrive at innovative solutions
- Ensure value for money for projects by applying value management in business and/or technical situations
- Implement the value management methodology and techniques in real-life projects

Focusing on high status knowledge, high value skills, and real-world applications and according to the goals and objectives of the curriculum, study guide, reference readings, PowerPoint Slides are produced or chosen for the learning and teaching activities. Before the commencement of the lectures, a syllabus and teaching schedule of the subject are made accessible to students in the WebCT providing them with the learning objectives, curriculum content, assessment procedure, available resources, and planning and self-management skills to initiate self-controlled study (Parker and Harris, 2002). The learning, teaching and assessment activities comprise 12 hours of lectures with eight learning units (Table 1), independent study reading self study material, 1.5 day VM workshop, one term paper and one 3-hour written examination.

Insert Table 1

How Should VM Be Learned, Taught, and Assessed?

When selecting any teaching and learning method it is obviously important to ensure that the method will enable the students to achieve what are intended as learning outcomes. There are different kinds of methods available. Interactive lecture is characterised by interactions, both lecturer with students and students with their peers. It breaks the information presentation into several sessions so that frequent learning activities can take place to foster deeper processing of content. The key is to activate thinking and encourage participation. It is effective in building up subject knowledge. A diverse range of activities, such as brainstorming, case study, open-end discussion can be integrated into the lecture. The lectures were also specifically used to assist preparation for the workshop including as briefing of workshop, appointment of group leaders and demonstration of VM techniques such as function analysis and weighted evaluation techniques.

Teaching is a complex process involving many components. Lecturers need to know their subject matter but also need pedagogical content knowledge – knowledge of how to translate this content into forms that are understandable to students. Knowledge of teaching and learning, which addresses relationship between lecturers' action and student learning, needs to be combined with strategies aimed at specific goals. From our own experiences, students are more motivated and learn more in classes where the lecturer involves them in the learning process. Research into the ways students learn supports this contention (Kauchak and Eggen, 2007). Students learn more and retain information longer when they are put in active roles than they do when passively receiving information from others (Eggen and Kauchak, 2007).

Problem-Based Learning (PBL) is a pedagogical approach and curriculum design methodology which has taken its prominence in tertiary education in recent years (Yeo, 2005).

As described by Torp and Sage (2002), the flow of a PBL experience involves the following series of student-centered activities:

1. Students assume the role of stakeholder in the problem scenario;
2. Students are immersed in an ill-structured problematic situation;
3. Students identify what they know, what they need to know, and their ideas;
4. Students define the problem to focus further investigation; and
5. Students generate several possible solutions and identify the one that fits best.

PBL is usually developed within a group setting, involving a team of students and a lecturer. Combining PBL and group work facilitates the investigation of more complex problems and promotes development of the students' interpersonal and communication skills. Since PBL engages the students in defining, investigating and solving problems, the principal roles of the lecturer are to coach and challenge student inquiry and to facilitate group interactions. The emphasis of PBL on student independence and ownership of learning is consistent with constructivism (Savery and Duffy, 1995). The constructivist view is that learning develops through hands-on activities, new experiences, and reflection on prior knowledge and conceptions. Previous research argue that as an alternative to traditional classroom experiences in which students receive information, the constructivist approach promoted deeper learning because students had to uncover and develop an understanding of the knowledge and problem-solving processes involved in real-world practices.

Based on the theory of problem-based learning to achieve the learning outcomes, the subject lecturer determine to conduct VM workshops with the students towards the end of the semester after completion of the lectures. At about one month before the workshop, the students were instructed to organize and participate in a 1.5 day VM workshop with a brief

describing the requirements of the workshop and scenario of a real life project. The scenario of the cycling track project is summarized in Table 2.

Insert Table 2

The students were divided into two groups. There were 30 and 27 students in Group A and Group B respectively. A project manager was nominated in each group to responsible for the coordination of the team. During the pre-workshop phase, the students were asked to identify the participants of the workshop and assign each of them a role in the project. They acted on behalf of the organization and searched information regarding their role and information of the project. The students were required to prepare and submit an individual background paper before the workshop. Presenters in the information phase were nominated and they prepared the PowerPoint slides for the presentation. The facilitators prepared the agendas of the workshops (Table 3 - 5) and distributed to the students for advance information. A pre-workshop meeting was held so that the students could raise their concerns and queries and guidance was provided for running the workshop.

Insert Table 3 - 5

The students were led by facilitators into the job plan of the VM methodology i.e. information, function analysis, creativity, evaluation and development phase of the VM workshop. During the information phase, the students representing their roles of the project were asked to present the requirements of the project such that information was exchanged and balanced between the participants of the workshop. A Q&A session followed to provide chance for the stakeholders to raise queries regarding the project.

Function analysis is an important element of the VM process. In this phase, students were facilitated to identify the functions of the education centre. The functions were described in the form of a verb and a noun, e.g. attract tourists. After listing all the functions, they were led to create a functional hierarchy with the mission statements, basic functions and supporting functions in a logic way.

In the creative phase, the students were led to brainstorm ideas to satisfy selected functions which were identified in the function analysis phase. The students were provided with the brainstorming rules. They were divided into small groups and each group came up with different ideas to satisfied different selected functions of the education centre.

During the evaluation phase, the ideas brainstormed in the creativity phase were categorized into realistically possible (P1), remotely possible (P2) and fantasy (P3). The P1 ideas were then sorted out and a scoring exercise was carried out based on agreed criteria with the students. The top five highest score ideas were obtained eventually (Table 6).

Due to the limitation of time, development of the top five highest score ideas into detailed proposal was not carried out in this workshop. Instead the students were asked to prepare the action plan for the top five P1 ideas (Table 7) in the development phase. A table with actions, by whom and by when was completed by the students as a group.

Feedback and comments were given to the students at the end of the workshop. The students were instructed to submit a group VM workshop two weeks after the workshop in the post-workshop phase. After active participation in the VM workshop activities, students are able to

familiarize with the VM methodology and job plan. They have better ideas of how VM workshops are organized, held and facilitated by the facilitators. Apart from the students were expected to familiarized with the VM methodology, they were required to develop team building skills, intellectual skills, communication skills and professional competence.

This workshop is considered as an important element of the subject and the students' attendance to the workshop is compulsory. The preparation of the workshop including submission of an individual background paper contributes towards 30% of the coursework assessment while the VM group report contributes 30% and the remaining 40% is based on the individual performance of the student in the workshop.

What was the Feedback from the Students?

A feedback questionnaire was administrated to collect individual views and recommendations from the students who participated in the workshops in 2008. The results of the feedback from Group A and B are summarized in Table 8 and 9. On the whole, the students were satisfied with the execution of the workshops as well as the techniques of VM used in each phase of the workshops. The means for the overall satisfaction with the VM workshop were 4.21 and 4.15 for Group A and B respectively. The students welcomed the addition of VM workshop in the curriculum which facilitates their understanding of the VM concept and methodology. They appreciated the benefits of the VM after participation in the workshops (means range 3.72 to 4.26. They agreed that these workshops should continually be conducted for the value management subject in the subsequent academic years. They also recommended that the timing of the workshops should be extended to two days such that they could have more experience with the VM process. The students faced difficulties in the function analysis phase. A verb-noun dictionary will be useful to students in identifying, clarifying and presenting the

functions of the projects. More time shall be allowed to explain functions and demonstrate how to produce functional hierarchy in the future workshops.

Insert Table 8 and 9

In addition, a comparison of the differences in the results of the student feedback between Group A and B were carried out (Table 10). Basically, the results were consistent except with significant differences were found in items such as “satisfied with the performance of facilitators”, “client representatives participate actively in the workshop”, “the workshop is fully supported by relevant participants”, “satisfied with interaction between participants in the information phase and function analysis phase”. The performance of the facilitators, the participation of client representatives and relevant parties, and interaction between participants in the information phase and function analysis phase were significantly improved in Group B. These improvements may be attributed to the addition of ice breaking and team building exercises in Group B since the facilitators were not satisfied with the interaction and commitment of the Group A. According to literature, team building helps a group function as a unit – it fosters morale, trust, cohesiveness, communication and productivity (Quick, 1992). The group learns how to share ideas, how to praise and encourage one another, how to support one another, and how to start becoming a team. Each participant will feel that he or she is part of the team, and a sense of commitment will evolve (Midura and Glover, 2005).

Insert Table 10

The team building exercises were introduced in the welcome and introduction session as well as before the creativity phase. In the welcome and introduction session, the participants were

requested to introduce and present the role and interest of the one sitting on their right hand side. Sketches were used to facilitate the presentation using the visualizer. After the presentation and fun, the facilitators asked the participants to list out three key elements of a successful VM workshop. As for the last exercise in this session, the participants were required to count as quickly as possible the number of “F” in a given statement. After these exercises had been carried out, the participants were warmed up and got ready to go into the information phase. Just before the creativity phase, the facilitators led the participants to play another game. They were asked to form three small groups and line up. The facilitators wrote a set of numbers in a paper and just let the three participants standing in the front to look at the numbers. The teams were required to communicate the set of numbers to the last one without talking. The groups were allowed to discuss their methods before the game started. The group which was the fastest and most accurate would win the game. The students enjoyed doing the team building exercises and they collaborated and worked well together. In the subsequent phases, the students were more willingly to share information with other members of the team. As in the creativity phase, Group B brainstormed more ideas than Group A.

On the whole, the VM workshops were very interesting experience for the students. They were challenged by every step of the way, from information gathering and preparing their presentations, to brainstorming, and coping with working in new teams within the time limit. Experience in the workshop provided the students with appropriate skills of communicating, questioning, analytical and interpretation through facilitating and peer sessions in both large and small groups in workshops. They were able to exchange ideas, share their own experiences about the project and learn from experienced facilitators about practices of value management. As well as the valuables experiences the students gained from participating in

the development and presentation of the workshop, this teaching activity contributed to the development of their all-roundedness in many different ways such as language and interpersonal enhancement.

Conclusions

Intended learning outcomes are needed to initiate students' learning and to maintain students' engagement with the subject. Students are more motivated and learn more in classes where the lecturer involves them in the learning process. Under the new outcome based curriculum in the Hong Kong Polytechnic University, the learning outcomes of the Value Management subject at postgraduate level at Department of Building and Real Estate have been established. In order to achieve the learning outcomes, the subject lecturer conducts VM workshops with the students towards the end of the semester. The results of a questionnaire survey among the students on the performance of the VM workshops are provided in this paper. The students believed that Value Management workshops are essential elements in the subject and they are satisfied with the approach in conducting the workshops. They expressed that it was a valuable experience for them to participate in the VM workshop which enabled them to have a better understanding of the subject. Improvements such as the increasing the timing of the workshops and addition of team building exercises will be incorporated in the future VM workshops.

It should be pointed out that the results presented in this paper were based on a small set of data collected from one postgraduate class. It is anticipated that differences in terms of students' technical and cultural background may exist between different classes and different universities. Therefore a wider research (such as cross institutions and/or cross disciplines) should be carried out to study the effect of technical and cultural background in teaching

value management. Nevertheless, the findings of this research are indicative and useful for construction management academics and students and can serve as a good reference for other fields of studies.

References

Construction Industry Review Committee (2001). *Construct for Excellence – Report of the Construction Industry Review Committee*, Printing Department, Hong Kong Special Administrative Region Government.

Eggen, P. and Kauchak, D. (2007). *Educational psychology: Windows on classrooms*, 7th Ed., Upper Saddle River, Prentice Hall, NJ.

Fong, P., Shen, Q.P., Chiu, E and Ho, C. (1998). *Applications of Value Management in the construction industry of Hong Kong*, The Hong Kong Polytechnic University.

Kauchak, D. and Eggen, P. (2007). *Learning and Teaching: Research-Based Methods*, 5th Ed., Pearson Education, USA.

Loughran, J. (2006). *Developing a Pedagogy of Teacher Education: Understanding teaching and learning about teaching*, Routledge, London and New York.

Midura, D.W. and Glover, D.R. (2005). *Essentials of Team Building: Principles and Practices*, Human Kinetics, USA.

Miles, L.D. (1972). *Techniques of Value Analysis and Engineering*, 2nd Ed., McGraw-Hill, NY.

Norton, B.R. and McElligott, W.C. (1995) Value Management in Construction – A Practical Guide, Macmillan Press, Great Britain.

Parkes, J. and Harris, B. (2002). "The purposes of a syllabus." *College Teaching*, 50(2), 55-61.

Quick, T. L. (1992). *Successful Team Building*, AMACOM, New York.

SAVE International (2001). "Value Methodology Standard." <http://www.value-eng.org/manuals/funcmono.pdf> (Apr. 15, 2008).

Savery, J.R. and Duffy, T.M. (1995). “Problem based learning: an instructional model and its constructivist framework.” *Educ. Tech.,* 35(5), 31-38.

Torp, L., and Sage, S. (2002). *Problems as possibilities: Problem-based learning for K-16 education,* 2nd Ed., Association for Supervision and Curriculum Development, Alexandria, Va.

Thiry, M. (2001). “Sensemaking in value management practice.” *International Journal of Project Management*, 19(2), 71-77.

Watkins, C. and Mortimore, P. (1999). “Pedagogy: What Do We Know?” *Understanding Pedagogy and its impact on learning*, P. Mortimore, ed., Paul Chapman Publishing Ltd., London, 1-19.

Wlodkowski, R. (1999). *Enhancing adult education to learn: A comprehensive guide for teaching all adults*, Jossey-Bass, San Francisco.

Works Bureau (1998). Technical Circular No. 16/98, Planning, Environment, & Lands Bureau Technical Circular No. 9/98, *Implementation of Value Management in public works projects*, September, HKSAR.

Van Manen, M. (1999). “The language of pedagogy and primacy of student experience.” *Researching Teaching: Methodologies and Practices for Understanding*, J. Loughan, ed., Falmer Press, London, 13-27.

Yeo, R. (2005). “Problem-based learning: a suitable approach in tertiary education?”, in Tan, K., Mok, J., Lee, M. and Ravindran, R. (Eds), *Problem-based Learning: New Directions and Approaches, Temasek Centre for Problem Based Learning,* Temasek Centre for Problem Based Learning Singapore, 93-113.

List of Tables

Table 1. Learning Units for the VM Subject

Learning Unit	Description
1	Historical Development, Definitions, Concepts of VM
2	The Value Management Methodology
3	VM Job Plan
4	Managing VM Studies
5	Teamwork and Group Dynamics
6	Group Facilitation and Creative Thinking
7	IT Applications in VM
8	VM Applications, Limitations and Case Studies

Table 2. Scenario for VM Workshops

The Client, Civil Engineering and Development Department (CEDD), wishes to conduct a value management workshop for a cycle track project in the New Terroritories. The scope of work for this project includes:

1. Construction of new cycle track sections linking up local tracks networks in Shatin, Tai Po, Fanling/ Sheung Shui, Yuen Long and Tuen Mun;

2. Improvement works to selected artery sections in each of the existing local cycle track network in Shatin, Tai Po, Fanling/ Sheung Shui, Yuen Long and Tuen Mun;

3. Construction of associated supporting facilities which include entry/exit hubs, resting stations and one education centre.

The tentative objectives of the VM workshop are:

1. to create a structured forum whereby views from all stakeholders on what improvement works should be provided to enhance the attractiveness of the existing local cycle tracks;

2. to create a structured forum whereby views from all stakeholders on the construction of new cycle track sections to create a cycle track network;

3. to discuss and decide on what supporting facilities should be provided to enhance the tourism value of the existing and new cycle track network;

4. to identify and agree on the functions for the education centre.

The workshop will be facilitated by the Dr. Ann Yu and Mr. Jacky Chung and you are required to actively participate in the value management study including the pre-workshop, workshop and post-workshop phase. You are required to split into group A and B (about 30 students in each group) and in each group assign each of you a role of the project team members and act as a team of professionals which may client's representatives, project manager(s), architect(s), engineer(s), quantity surveyor(s), landscape architect(s), government representative(s), other key stakeholder(s) and recorders to participate in one 1.5 day value management workshops for CEDD.

Date of Workshop

Group A: 5, 6 April 2008

Group B: 12, 13 April 2008

Table 3. Workshop Agenda of Group A (Day 1)

Time	Activity	By
9:00 – 9:30	1. WELCOME AND INTRODUCTION	
	• Welcome and programme of the day	Facilitators
	• Facilitator role and rule of the game	
	• Introduction to the VM process	
	• Participants self-introductions	Whole team
	• Confirmation of VM study objectives	Facilitators
9:30 – 10:45	2. INFORMATION PHASE	
	• Presentations by key stakeholders	
	• Clarification questions	
10:45 – 11:00	Tea and Coffee	
11:00 – 12:00	• Issue Analysis	Whole team
12:00 – 13:30	Lunch	
13:30 – 14:00	• Client Value System	Facilitator & Client
14:00 – 15:30	3. FUNCTION ANALYSIS PHASE	
	• Identify functions of Education Centre	Whole team
	• Sort out functions	
	• Construct Fast Diagram	
15:30 – 15:45	Tea and Coffee	
15:45 – 17:30	4. CREATIVITY PHASE	
	• Introduction	Facilitators
	• Identification of key areas for the achievement of our objectives	Team A/B/C
	• Generation of ideas for the achievement of our objectives	

Table 4. Workshop Agenda of Group B (Day 1)

Time	Activity	By
9:00 – 10:30	1. WELCOME AND INTRODUCTION	
	• Welcome and programme of the day	Facilitators
	• Facilitator role and rule of the game	
	• **Team Building Exercises**	Whole team
	• Participants self-introductions	
	• Confirmation of VM study objectives	Facilitators
10:30 – 10:45	Tea and Coffee	
10:45 – 12:30	**2.** INFORMATION PHASE	
	• Presentations by key stakeholders	
	• Clarification questions	
12:30 – 14:00	Lunch	
14:00 – 14:30	• Client Value System	Facilitator & Client
14:30 – 15:30	3. FUNCTION ANALYSIS PHASE	
	• Identify functions of Education Centre	Team A/B/C
	• Sort out functions	
15:30 – 15:45	Tea and Coffee	
15:45 – 16:00	• Construct Functional Hierarchy	Facilitators Team A/B/C
16:00 – 16:30	• **Team Building Exercise**	Facilitators Team A/B/C
16:30 – 17:30	4. CREATIVITY PHASE	
	• Introduction	Facilitators
	• Identification of key areas for the achievement of our objectives	Team A/B/C
	• Generation of ideas for the achievement of our objectives	

Table 5. Workshop Agenda of Group A and B (Day 2)

Time	Activity	By
9:00 – 10:45	5. EVALUATION PHASE • Review information • Put ideas in P1, P2, P3 categories • Cluster related P1 ideas together • Develop criteria for evaluation • Assign weighting for all criteria • Evaluate and select clustered ideas • General discussion	Team A/B/C
10:45 – 11:00	Tea and Coffee	
11:00 – 12:00	6. REPORTING PHASE • Preparation of Action Plan • Resolution of outstanding issues • Review of workshop objectives	Whole team
12:00 – 12:30	7. WORKSHOP CLOSING • Sum up • Feedback • Questionnaire survey	Facilitators Whole team

Table 6. Top five highest scoring ideas (Group A)

No.	Top five P1 ideas	Criteria: Within Budget	Environmental Friendly	Completion On Time	Fit for Purpose	Safety	Total Score
	Weighting	3	8	1	7	11	
A5	Provide sufficient lighting along cycle track	5	2	3	5	5	124
A2	Provide cycle track in smooth slope when necessary	4	1	3	5	5	113
A4	Provide sufficient no. of safety barriers on cycle track	4	1	3	5	5	113
A9	Provide reflected mirrors at dangerous corners along cycle track	4	1	3	5	5	113
A8	Use non-slippery materials on cycle track surface	3	1	3	5	4	110

Table 7. Action Plan of Top 5 P1 Ideas (Group A)

No.	Description of Action	By	When
1.	Design layout of cycle track connecting the new track to existing track	Architect/ Civil Engineer	1 Month
2.	Design the details of the cycle track including surface materials and slope	Architect/ Civil Engineer	2 Weeks
3.	Design lighting along cycle track	Architect/ E&M Engineer	2 Weeks
4.	Design reflective mirrors, directional signages for the cycle track	Architect/ Landscape Architect	2 Weeks
5.	Design safety barriers along the cycle track	Architect/ Civil Engineer	2 weeks

Table 8. Results of Feedback Questionnaire for VM workshop (Group A)

No.	Question (paraphrased)	Max.	Min.	Mean	SD.
	General statement about the workshop				
1	Satisfied with the time of the workshop	5	2	3.97	0.626
2	Satisfied with the venue of the workshop	5	3	4.07	0.371
3	The workshop has clear objectives	5	4	4.38	0.494
4	Familiarized with how the workshop was conducted	5	2	3.76	0.830
5	Satisfied with the performance of facilitators	5	2	4.14	0.743
6	Client representatives participate actively in the workshop	5	2	3.69	0.660
7	The workshop is fully supported by relevant participants	5	3	3.76	0.739
	Information Phase				
8	Satisfied with the techniques used	5	3	3.90	0.557
9	Satisfied with interaction between participants	5	2	3.86	0.789
10	Satisfied with clarification of client's objectives	5	3	3.86	0.693
11	Clear about the given/assumptions of the project	5	3	3.93	0.651
	Function Analysis Phase				
12	Satisfied with the techniques used	5	3	4.03	0.566
13	Satisfied with interaction between participants	5	2	3.83	0.658
14	Functions are clearly identified	5	3	3.90	0.557
	Creativity Phase				
15	Satisfied with the techniques used	5	3	3.97	0.626
16	Satisfied with interaction between participants	5	3	4.00	0.707
	Evaluation Phase				
17	Satisfied with the techniques used	5	3	3.83	0.602
18	Satisfied with interaction between participants	5	3	3.97	0.680
	Development Phase				
19	Satisfied with the techniques used	5	3	3.86	0.516
20	Satisfied with interaction between participants	5	2	3.72	0.841
	Benefits of VM				
21	Identification and clarification of client requirements	5	3	4.14	0.581
22	Improve communication and understanding	5	3	4.07	0.593
23	Brainstorming ideas, options and alternatives	5	3	4.14	0.639
24	Considerations of options	5	3	3.83	0.711
25	Expedition of decisions	5	3	3.72	0.649
	Overall				
26	Satisfied with the VM workshop on the whole	5	3	4.21	0.491

(n = 29, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly disagree)

Table 9. Results of Feedback Questionnaire for VM workshop (Group B)

No.	Question (paraphrased)	Max.	Min.	Mean	SD.
	General statement about the workshop				
1	Satisfied with the time of the workshop	5	3	4.22	0.577
2	Satisfied with the venue of the workshop	5	2	4.26	0.764
3	The workshop has clear objectives	5	3	4.41	0.572
4	Familiarized with how the workshop was conducted	5	2	4.11	0.698
5	Satisfied with the performance of facilitators	5	3	4.56	0.577
6	Client representatives participate actively in the workshop	5	3	4.07	0.550
7	The workshop is fully supported by relevant participants	5	3	4.26	0.526
	Information Phase				
8	Satisfied with the techniques used	5	3	4.11	0.577
9	Satisfied with interaction between participants	5	3	4.30	0.542
10	Satisfied with clarification of client's objectives	5	3	3.96	0.587
11	Clear about the given/assumptions of the project	5	2	3.89	0.751
	Function Analysis Phase				
12	Satisfied with the techniques used	5	3	4.11	0.577
13	Satisfied with interaction between participants	5	3	4.15	0.456
14	Functions are clearly identified	5	3	3.89	0.506
	Creativity Phase				
15	Satisfied with the techniques used	5	2	4.00	0.620
16	Satisfied with interaction between participants	5	3	4.19	0.483
	Evaluation Phase				
17	Satisfied with the techniques used	5	2	4.00	0.620
18	Satisfied with interaction between participants	5	3	4.07	0.385
	Development Phase				
19	Satisfied with the techniques used	5	2	4.04	0.706
20	Satisfied with interaction between participants	5	3	4.07	0.474
	Benefits of VM				
21	Identification and clarification of client requirements	5	2	3.93	0.730
22	Improve communication and understanding	5	3	4.22	0.506
23	Brainstorming ideas, options and alternatives	5	3	4.26	0.594
24	Considerations of options	5	3	3.93	0.474
25	Expedition of decisions	5	2	3.81	0.622
	Overall				
26	Satisfied with the VM workshop on the whole	5	3	4.15	0.456

(n = 27, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly disagree)

Table 10. Analysis of the Difference in the Results of Feedback Questionnaire between Group A and Group B

No.	Question (paraphrased)	Mean (Gp A)	Mean (Gp B)	Mean Difference	t	Sig. (2-tailed)
	General statement about the workshop					
1	Satisfied with the time of the workshop	3.97	4.22	-0.257	-1.592	0.117
2	Satisfied with the venue of the workshop	4.07	4.26	-0.190	-1.171	0.249
3	The workshop has clear objectives	4.38	4.41	-0.028	-0.197	0.845
4	Families with how the workshop was conducted	3.76	4.11	-0.352	-1.713	0.092
5	Satisfied with the performance of facilitators	4.14	4.56	-0.418	-2.337	0.023*
6	Client representatives participate actively in the workshop	3.69	4.07	-0.384	-2.359	0.022*
7	The workshop is fully supported by relevant participants	3.76	4.26	-0.501	-2.935	0.005*
	Information Phase					
8	Satisfied with the techniques used	3.90	4.11	-0.215	-1.415	0.163
9	Satisfied with interaction between participants	3.86	4.30	-0.434	-2.383	0.021*
10	Satisfied with clarification of client's objectives	3.86	3.96	-0.101	-0.586	0.561
11	Clear about the given/assumptions of the project	3.93	3.89	0.042	0.225	0.823
	Function Analysis Phase					
12	Satisfied with the techniques used	4.03	4.11	-0.077	-0.501	0.618
13	Satisfied with interaction between participants	3.83	4.15	-0.321	-2.103	0.040*
14	Functions are clearly identified	3.90	3.89	0.008	0.054	0.957
	Creativity Phase					
15	Satisfied with the techniques used	3.97	4.00	-0.034	-0.207	0.837
16	Satisfied with interaction between participants	4.00	4.19	-0.185	-1.136	0.261
	Evaluation Phase					
17	Satisfied with the techniques used	3.83	4.00	-0.172	-1.056	0.296
18	Satisfied with interaction between participants	3.97	4.07	-0.109	-0.727	0.470
	Development Phase					
19	Satisfied with the techniques used	3.86	4.04	-0.175	-1.064	0.292
20	Satisfied with interaction between participants	3.72	4.07	-0.350	-1.935	0.059
	Benefits of VM					
21	Identification and clarification of client requirements	4.14	3.93	0.212	1.207	0.233
22	Improve communication and understanding	4.07	4.22	-0.153	-1.036	0.305
23	Brainstorming ideas, options and alternatives	4.14	4.26	-0.121	-0.734	0.466
24	Considerations of options	3.83	3.93	-0.098	-0.613	0.543
25	Expedition of decisions	3.72	3.81	-0.091	-0.533	0.596
	Overall					
26	Satisfied with the VM workshop on the whole	4.21	4.15	0.059	0.463	0.645

(***** significance less than 0.05 indicate significant difference of means statistically)