Half-Day Seminar on "Value Management in Construction Projects"

by *Ir. Tee Hoi Eng*

THE Project Management Technical Division (PMTD) of the Institution of Engineers, Malaysia had organised a half-day seminar on "Value Management in Construction Projects" on 16 November 2009. The seminar was attended by 22 participants.

The scope of project management encompasses one of the vital processes, i.e. value management (VM), which is established from value planning, value engineering and value analysis. The seminar was delivered by Assoc. Prof. Sr. Dr. Mohd Mazlan Bin Haji Che Mat. He explained the essential concept of VM in construction projects and its application.

DEFINITION AND INTERPRETATION OF VM

The speaker defined VM as a rigorous, systematic and innovative methodology with a multi disciplinary approach to achieve better value and cost optimisation for projects, products, facilities, systems and services without sacrificing the required performance levels.

The fundamental approach of the VM process is to challenge everything and take nothing for granted; including the necessity of actually doing what is being proposed or what is currently being done. VM can also be simply defined as: "an organized effort following a structured job plan that is directed at analyzing the functions of systems, equipment, facilities, services and supplies for the purpose of achieving the essential functions at the lowest lifecycle cost consistent with the delivery of required safety, performance, reliability and quality".

THE CONCEPT OF VALUE, WORTH, COST…WHICH WAY TO TURN?

The traditional VM process examines the relationship between worth and cost in obtaining the required function. This relationship between worth and cost determines value. In simple terms, Carlos Fallon expressed the following equation:

Value = Worth / Cost

Worth = The least cost of providing the needed function and the required performance is found by means of comparison of costs of units which are functionally equivalent.

Cost = The lifecycle cost of the product/project.

Another related relationship given by Dell Isola can also be applied (by standardising the units to assigned weightage):

Value = (F + Q) ÷ C

Where (F) Function = The specific worth that a design/item must perform

(Q) Quality = The owner's or user's needs, desires and expectation

(C) Cost = The lifecycle cost of the product/project

Therefore, Value = The most cost effective way to reliably accomplish a function with quality that will meet the user's needs, desires and expectation. As such, value can be increased by the following approaches:

$$\textbf{Value} = \frac{F+Q}{C} \quad \frac{\rightarrow}{\downarrow} \quad \frac{\uparrow}{\rightarrow} \quad \frac{\uparrow}{\downarrow} \quad \frac{\uparrow}{\uparrow}$$

Approach (a) Approach (b) Approach (c) Approach (d)

(a) Cost reduction approach
(b) Function increase approach
(c) Compound approach
(d) Expanded growth approach

The above approaches show that the value of the final product can be enhanced by means of accomplishing a better function and quality or even by increasing the initial cost of a product/project but achieving better function and quality.

COST MANAGEMENT VS VALUE MANAGEMENT

The speaker highlighted that the traditional cost planning approach to a project aims to ensure that the budget is not exceeded, but such an approach does not specifically address the real problem of ensuring that true value is being designed into the project. VM is not simply a cost cutting exercise, but identifies and eliminates the unnecessary cost (that is cost that does not contribute to a function), which is inherent in all construction projects.

Lifecycle cost is the total amount of funds required to acquire, utilise, maintain, and ultimately dispose of the required functions. For the provider of the goods or services, cost is the total expense associated with the production of the required function, which includes not only the initial purchase price, but also the total costs for start-up, operations and maintenance throughout the usable life. Also included is the cost of disposal when the function no longer serves a useful purpose. Therefore, the total lifecycle cost for a function includes both direct and indirect costs and contains a proportionate share of the overhead costs.

It is the comparison of the true cost of an activity, process, product, project, feature or program to its worth as viewed by those involved (owners, users and/or stakeholders). Optimum value is achieved when all criteria are met at the lowest overall cost. Although worth and cost can each be expressed in monetary units, they can also have important non-monetary components.

(To be continued on page 32)

For this reason, value is considered to be a dimensionless expression of the relationship of the two.

FIVE STEPS ON THE VM JOB PLAN

Due to time constraint, the speaker did not elaborate on the five steps of the VM job plan except to briefly highlight the following:

Information →→ Speculation →→ Judgement →→ Development →→ Recommendation & Action

FUNCTION AND COST ANALYSIS – THE KEYS TO VM

This aspect of VM was briefly explained and worth noting down. The most important element of the VM Job Plan is the performance of the function analysis. The VM process places the results of the function analysis into a FAST diagram created by closely examining each function and answering two questions: "**how**" and "**why**". The primary objective of function analysis is to facilitate the discovery of alternative means of achieving the desired performance.

Cost analysis in VM normally includes some type of economic analysis. The objective largely determines the type and degree of the analysis undertaken. Economic analysis is used to identify areas of VM opportunity and provides a monetary base from which the cost impact of the effort can be determined.

BENEFITS OF VALUE MANAGEMENT

The benefits of VM are usually major and often surprise those who have been involved in business. They include:

- Major enhancement in value for money
- Considerable improvements in function, performance and quality
- Improved business procedures, processes and project lead times

During the Q&A session, Dr Mazlan answered all of the questions raised by the participants. PMTD Chairman First Admiral Dato' Ir. Hj. Ahmed Murad bin Hj. Omar (Rtd) then presented a certification of appreciation to the distinguished speaker. The seminar ended at 12.00 p.m. ■

Report on PMTD's Technical Visit to China

by ***Ir. Yam Teong Sian***

THE technical visit to China was organised by the Project Management Technical Division in a joint effort with The Institution of Engineers, Malaysia, to expose our members to the project management of large scale development projects in Beijing, as well as to participate in the World Congress on Information/Communication Technology in Development (WCID) from 9-13 September 2009. The original plan for this visit was in 2008 to coincide with the construction phase of the Olympic structures. However, due to various reasons, the visit did not materialise and was put on hold.

In 2009, IEM received an invitation from China's Association of Science & Technology (CAST) to attend the WCID, thus rekindling the visit which was then brought forward from December 2009 to September 2009 so as to coincide with the WCID. It was regrettable that the date fell on the holy month of Ramadhan, but the decision of the committee was to proceed as the invitation from CAST would be beneficial to our engineers and the IEM.

On day one, 9 September 2009, the participants, comprising 20 engineers and some of their spouses, departed from KLIA at 0020 hrs. On arrival at the Beijing International Airport, our group was received by our Chinese local travel guide Jane Zhang, who then briefed us on the dos and don'ts when travelling and moving around in Beijing. The weather in Beijing was cool and sunny and everyone was in high spirits, albeit tired and hungry. The entourage was joined by President Dato' Ir. Prof. Dr Chuah Hean Teik, who also had to travel to Beijing to attend and deliver a paper for IEM at the WCID Conference.

SUMMER PALACE

After breakfast and checking in to our hotel rooms, we were ready for our first visit to the Summer Palace. The Summer Palace (or 'Yi he Yuan') is situated about 15km northwest from the city centre in the district of Haidian. Comprising mainly of Longevity Hill and the Kunming Lake, the Summer Palace occupies an area of 294 hectares of which three quarters are covered in water. Being the largest royal garden and is the archetypal Chinese garden, it is listed as a World Heritage Site by UNESCO in 1998.

The Summer Palace comprises of over 3000 structures including pavilions, towers, bridges and corridors, and can be divided into four parts, the court area, front hill area, front lake area and the rear hill and back lane area. Our guide gave us a brief commentary on the various parts of the gardens; most are filled with historical events, and among the notable areas were the Long Gallery, Hall of Dispelling Clouds, Seventeen Arch Bridge and Bronze Ox. Our short walk through these

(To be continued on page 34)

magnificent gardens left us awed at the ability of the ancient people to construct the structures as well as the lake which was hand dug.

HUTONGS

Our next destination was a visit to the 'hutongs' in Shichahai, Beijing. 'Hutongs 'are ancient city alleys or lanes and are typical of old Beijing, where 'hutongs' run into several thousands. Surrounding the Forbidden City, many were built during the Yuan, Ming and Qing Dynasties. At the prime of their dynasties, the emperors planned the city and arranged the residential areas according to an etiquette system in order to establish supreme power for themselves.

The centre of the city of Beijing was the royal palace - the Forbidden City. We were taken around the area in a 2-seater rickshaw peddled by a single cyclist. While on this ride, we were able to understand why Beijingers were so trim, slim and fit, as the rickshaw tour took almost 30 minutes to complete.

The main buildings in the 'hutongs' were almost all quadrangles - a building complex formed by four houses around a quadrangular courtyard. Living units were self-contained, comprising living rooms, bedrooms and a kitchen, whilst the courtyard was the common area where the residents mingle and socialise. The quadrangles varied in size and design according to the social status of the residents. High-ranking officials and rich merchants have bigger quadrangles with high beams and pillars which are beautifully painted and carved, with front and back yards.

Some of the 'hutongs' have been converted and come with modern amenities, to be rented to tourists who want to experience the lifestyle of ancient Beijing. Some high-ranking officers are still living in the area as evident by the size and security of the quadrangle buildings. The rest of the rickshaw tour traversed the commercial area of the Shichahai district, where modern bars and restaurants have now flourished to cater for foreign tourists.

WCID

On day two, the participants were taken to the Beijing Friendship Hotel, located in the city's Silicon Valley, to attend the opening ceremony of the World Congress on ICT for Development (WCID 2009). WCID 2009 is jointly sponsored and organised by the World Federation for Engineering Organizations (WFEO), China Association for Science and Technology (CAST), the Global Alliance for ICT and Development (UN-GAID), International Telecommunication Union (ITU), UNESCO and the International Center for South-South Cooperation in Science, Technology and Innovation (INSTIC).

We were welcomed by our hosts from CAST, Madam Cheng Donghong and her assistant Ms Chen Lei. The welcoming address was presented by Mr. Bill Greer, the president of WFEO. The IEM's Past President, Engr. Lee Yee Cheong, also presented his speech on behalf of ISTIC. Our President was to present a paper at this Conference the following day. After the official liaison with officials of CAST, the IEM participants resumed our visit to the National Aquatics Center, famously known as the Water Cube.

THE WATER CUBE

The entourage was received at the VIP entrance of the facility where we were led into the complex and was briefed by Mr. Li Yunfeng, the Manager for the Engineering Department of the Beijing National Aquatics Center Company Ltd, the operator of the Water Cube. The building was the main venue for swimming, diving and synchronised swimming for the Beijing Olympics and has an area of 79532m^2. It has a permanent seating of 4000 seats, removable seats of 2000, and temporary seating of 11000. It has one Olympic sized competition pool, one diving pool and one recreation pool for the public.

The Water Cube design is the first time that Kelvin's 'Bubble Theory' is applied in architectural history. The Water Cube is derived from the unique architectural image of a 'cube filled with water' and the result is the largest public building wholly enclosed by ETFE (Ethylene tetrafluoro-ethylene) air supported membrane structure in the world. The ETFE cladding outer skin allows more light and heat penetration, hence resulting in a 30% decrease in energy costs.

Mr. Li briefed us on the mechanical aspects of the maintenance of the complex and showed us the control room which houses the tanks and mechanical equipment that controls the water quality of the pools during the Beijing Olympic. The concourse of the building houses a souvenir store where our members were given some time to shop for souvenirs, and most participants bought light blue transparent 'ETFE' plastic bags as they wanted to have a piece of the Cube to take home.

THE BIRD'S NEST

After lunch, we proceeded to the National Stadium or colloquially known as the Bird's Nest. The National Stadium is the centre of the 29th Olympic Games and located within the Olympic Green. The events held here were the spectacular opening and closing ceremonies, track and field events, football finals as well as others. We were told that the design of the stadium was awarded to a Swiss architecture firm and the design had strong elements of Chinese characteristics.

As this is a very important stadium, the design needed to be " 'porous' while still being a collective building, a public vessel". This thinking led the designers to study Chinese ceramics and this line of thought led the designers to the "nest scheme". The stadium consists of two independent structures, a red concrete seating bowl and a steel frame around it.

(To be continued on page 36)

The outer skin consists of large steel columns surrounding the seating bowl, interlaced seemingly at random with additional steel to hide (but later discarded) a retractable roof. These random bracings created the 'bird's nest' effect. Despite the random appearance, each half of the stadium is nearly identical. Built at a cost of US$423 million, steel utilisation (only made-in-China steel) was 110,000 tons making it the world's largest steel structure.

The National Stadium has a seating capacity of 80000, and was also the venue for the 2008 Summer Paralympics Games. The participants were awed by the intricacies of the steel structure, especially during construction. It would have been a credible project management challenge.

The PMTD Committee, led by President Chuah and Vice President Choo Kok Beng, separated from the group to attend a dialogue cum dinner with officials of CAST. The rest of our entourage returned to the hotel for dinner and some free time.

THE GREAT WALL OF CHINA OR THE LONG WALL OF 10000 LI

On day three, we were taken to Badaling where the participants were briefed on the historical significance of the Great Wall. The Great Wall is a symbol of Chinese civilisation and one of the wonders that the Chinese people had created. A state relic and protected by the Government, it was listed as one of the Seven Wonders of the World in 2007. The Great Wall was built over several centuries to act as a fortification barrier to protect China's borders from the intrusion of invaders.

The Wall and its branches are estimated to be more than 8000km in length and vary in thickness. The structure consists of huge bar stones and bricks, while the inside consists of earth and stones. Being a military fortification, the wall has holes for archers and observation towers, etc. Many parts of the Wall are now destroyed, but the Badaling Section is well preserved and hence popular with tourists.

The participants were challenged to trek to the top of one of the towers, which will take an estimated 45 minutes. The less endowed were more than satisfied to take a short stroll at the shopping area beyond the front entrance. Some of the participants were seen taking a camel ride.

It was once said that the Great Wall is so large, you could see it from outer space on a clear night. A bit far fetched perhaps, but having experienced the grandeur of this magnificent man made structure, one would not be too quick to dispel the claim. Just imagine the project management aspects of such a project.

Our first factory visit in China was to coincide with our lunch venue at the cloisonne factory.

CLOISONNE

The participants were introduced to the ancient technique of decorating metal ware known as cloisonne. This traditional metalwork and production of enamelware originated in Beijing during the Yuan dynasty and prevailed through the Ming dynasty. Cloisonne ware was used by the royal family and was a symbol of authority and status. Today, this art is appreciated by aficionados worldwide.

SHISANLING PUMPED STORAGE POWER PLANT

The power station project comprises of an upper reservoir with a capacity of 4.45M m3 constructed on top of the Mang Mountain and the existing lower reservoir of Shisanling. The maximum head is 481 meters, and the water flows through a powerhouse located inside the Mang Mountain, generating an output of 800MW.The power generated provides a reliable supply for peak load and emergency fault backup for the capital's power grid, and had served reliably as a power frequency regulator.

The power plant of this genre is a significant civil engineering challenge, and showcased Chinese civil engineering works at its best, entailing dam construction, tunnelling works and structural works. The quality of work is consistent with world standards.

Having enjoyed the wonderful view from Mang Mountain, we were then taken back to the city for dinner and the famous Chinese Acrobatic Show in one of the Chaoyang Theater in Beijing. As it was the peak hours, we experienced a typical Beijing traffic jam. Our guide briefed us that during the Olympics, in order to reduce the traffic load on the roads, it was legislated that vehicles with even number plates and odd number plates will use the city roads on alternate days during the week. This scheme had successfully reduced the traffic load during the Olympics, and the city council had now imposed these rules to the city daily.

CCTV (CHINA CENTRAL TELEVISION) OR ZHONG-GUO ZHONGYANG DIANSHITAI

On day four, we were invited by China State Construction Engineering Corporation (CSCEC) to visit two of their prominent projects, the CCTV and World Trade Center. We were welcomed by officials from CSCEC, led by Madam Chang Xinhua, CEO, Mr Gao Junfeng, Deputy Chief Engineer, Ms Wang Hui, Assistant General Manager, and were briefed on the design and construction aspects of this geometrically eccentric building. CCTV is a major television broadcasting station in

(To be continued on page 38)

China, and at the time of our visit, the building has not been fully commissioned even though TV broadcasts are already operational.

The building stands at 234 meters with a total of 54 floors, and was designed by Rem Koolhaas and Ole Scheeren of OMA Architects. The design is not that of a traditional tower, but consists of six loops of horizontal and vertical sections, covering 473000 sq meters. An irregular grid on the building façade with an open centre gives the building its unique and radical shape. We were told that the construction of the building is quite a structural challenge because it is in a seismic zone.

Our hosts then took us up the Tower to the 'cantilever level' as the upper floors were in operation and secured due to the National Day celebrations. We were shown the corner of this floor which had a glass reinforced opening that had a view of the 30 floors below. This was not for the faint hearted.

The CCTV Tower is still being retrofitted even though the façade was completed in 2008 before the Olympics. A setback to the entire completion of the complex was a fire to the annex building, the Television Cultural Center, which caught fire in 2009, had apparently posted a threat to the structural integrity of the building complex.

CHINA WORLD TRADE CENTER

Mr Gao Junfeng explained to the entourage that the China World Trade Center, located in the business district, is the top upmarket mixed use development in China. Construction commenced in 1985 and became functional in 1990. The CSCEC engineers briefed us on the construction aspects of Tower 3, which topped off at 330 meters in 2009. Tower 3 is a super tall skyscraper with 74 floors, four underground floors and 30 elevators. The tower was designed by Skidmore Owens and Merrill, the American architects that designed the Chicago World Trade Center, and consists of office space and hotel with retail at the base.

After an interesting technical Q&A session with the CSCEC engineers, we were taken to the roof of Tower 3, which is the highest spot in Beijing, to enjoy the view of this great metropolis. We could see the city as far as 50km away to the horizon, reinforcing our impression that Beijing is indeed one of the greatest cities of the world. Interestingly, we were delighted to be informed that the CWTC is substantially owned by Malaysian investors.

SILK MARKET OR 'XIUSHUI'

Next, we were taken to the Silk Market where the shopping-hungry in our entourage were let loose to satisfy their needs. From clothing to iPhones, and even spectacles, everyone had something to buy. The Silk Market is a multi storey shopping mall, located in the CBD Chaoyang District and is a popular shopping centre for knock off goods. It attracts 20000 shoppers on an average day and 50000 during the weekends. No visit to Beijing is complete without a visit to Silk Street. The entire premise is packed with traders and shoppers, seemingly chaotic, business is brisk and there is almost a carnival atmosphere to it.

On day five, we were to visit one of the most spectacular historical buildings in the world, the Forbidden City. Being a weekend and also due to the preparations for their National Day on 10 October 2009, we were advised that the crowd at Tiananmen Square and the Forbidden City would swell on that day. We agreed to walk from the drop off point near the National Center of Performing Arts, thence to Tiananmen Square and the Forbidden City.

THE NATIONAL CENTER OF PERFORMING ARTS OR THE EGG

As time was short, we were only able to enjoy the Egg from the outside. The Egg is the opera house and theater of Beijing. The shape is an ellipsoid dome made of titanium and glass surrounded by an artificial lake. This futuristic design had drawn much controversy due to its vicinity to Tiananmen Square and the Great Hall of the People.

TIANANMEN SQUARE

After going through the pedestrian tunnel and metal detectors, we were standing in Tiananmen Square, the heart of Beijing and one of the world's largest public square. It measures 49 hectares and can hold a million people. Tiananmen has great cultural significance as it was the site of several key events in Chinese history.

THE FORBIDDEN CITY

The Forbidden City was the Chinese imperial palace from the Ming Dynasty to the Qing Dynasty. The Forbidden City is home to the Emperor and his household for almost five centuries, and also the ceremonial and political centre of the Chinese government. The scale of this building complex is mind boggling. It consists of 980 existing buildings, 9000 rooms and covers 720000m^2 and exemplifies traditional Chinese palatial architecture and other cultural developments from East Asia. It houses the Palace Museum and is listed by UNESCO as having the largest collection of preserved ancient wooden structures in the world.

We walked through the palace complex and our tour guide told us that the Forbidden City was designed to be the centre of the ancient walled city of Beijing. Hence the significance of the meridian line through the complex that was to determine the location and orientation of the Olympic Green. We were awed by the many magnificent buildings within the complex, each has its own history to boast and story to tell.

It would take a discerning historian years of continuous learning to fully appreciate the grandiose of the Forbidden City. Engineers and architects would be astounded trying to comprehend the extent of the planning, design and construction of this complex. It would be interesting to discover if the ancient builders had innovative and scholarly project management skills.

FAREWELL BEIJING, HELLO KUALA LUMPUR

Time being a constraint, we returned to our coach, went for a quick lunch and then to the airport. We thanked our delightful English speaking tour guide, who had been most patient with us and had good time keeping to ensure that all our designated visits, meals and meeting schedules were met.

We flew back to Kuala Lumpur filled with amazement at the many fascinating modern projects achieved by China and also the historical structures and buildings that had served this culturally rich civilisation so well. ■