Moving forward in Building Information Modeling

by Ir. Sharifah Azlina Raja Kamal

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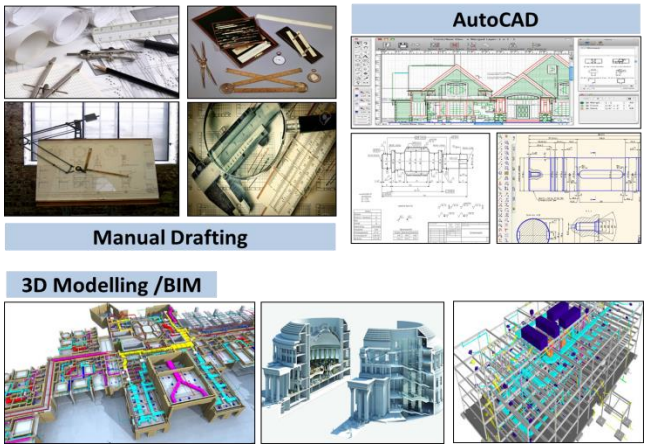
On 20th August, 2015, the Women Engineers Section of IEM conducted a course entitled **"An Introduction to Building Information Modeling (BIM) for Professionals"** which was attended by 34 participants. The course was delivered by Ir. Sharifah Azlina Raja Kamal, Chief Operating Officer of HSS Engineering Sdn. Bhd. (HSSE), and Mr. Paul Milward, Senior Manager of BIM Global Ventures Sdn. Bhd. (BGV) which is part of HSSE Group of Companies specializing in Building Information Modeling services.

During the duration of the one-day seminar, participants' perception and acceptance towards Building Information Modeling were also surveyed and appraised albeit the demographics of the participants was rather limited and far from representing the whole spectrum of the construction industry. Subsequent to this seminar, during several other talks and presentations by both HSSE and BGV in their course of rendering BIM services, similar and consistent feedback was received from the audience relaying the industry's understanding and perception of the implementation of BIM at all levels of construction.

What is BIM?

The majority of the participants and audience were familiar with the word 'BIM' and some even had varying levels of exposure to these 3-dimensional building plans. However, many have yet to realize that BIM goes beyond just a 3D representation of architecture or engineering detailing, and that it serves as a central repository that facilitates the process of developing, collating and managing information of an asset from its inception, through to the stages of design and construction, and thereafter during operation and maintenance. BIM collaborate human activities to produce digital representations of the physical and functional aspects of a facility through the usage of various BIM software. Simply said, BIM builds virtually before physical construction activities take place on site.



Now, why are we slightly behind compared to our neighboring country Singapore, or Vietnam within the same region? BIM, as earlier said, is a process. A process entails adopting new methodology and practices. It requires a change in the mindsets of project proponents from working independently within their own competencies to a collaborative approach. This includes the client as the asset owner, consultants (architect, engineers, quantity surveyor, BIM consultant, etc.) and contractors. Just as there are specifications, design codes, guidelines and need statements which have to be adopted or applied in the design process, it is less widely known that BIM activities are similarly governed by specifications/codes, process flowcharts, execution plans and blueprints.

Impediments or work culture shift?

Whilst the construction industry is becoming increasingly aware of the benefits that BIM can provide, several hiccups may be faced during the implementation of BIM due to the lack of understanding of the BIM process or the steadfast desire to achieve the BIM Execution Plan. Generally the main concerns are captured in the following questions:

- *Are BIM regulated by any standards or specifications?*
- *Are the BIM modelers accountable for the design adequacy and accuracy?*
- *How are changes in design addressed in BIM when the design is an on-going process?*
- *How accurate are the quantities taken off by BIM?*
- *How is BIM accommodated in the contract?*
- *What about changes during construction, who is responsible for the re-modeling?*
- *How are constructional changes recorded and accepted in the ultimate 'as-built' model?*

BIM practitioners are often delayed when information trickles in incomplete and in batches which slows down the process to generate the models. More often than not, first hand collaboration amongst disciplines (architecture, structure and M&E) is also absent resulting in mismatch of data in the fundamental design interface, and thus impeding the smoothness of the modeling process. As the modeler will only model information that is available, completeness of design information to an agreed

level or to a pre-determined phase is crucial, to ensure seamless progression from one phase of modeling to the next.

Notably, the responsibility of design or re-design is still vested on the designers (design architects, engineers, planners, etc.). BIM is an enabler to assist the designers to achieve their design objectives virtually prior to actual construction on site. The more complete the design is fed into the model, the more accurate will be the representation of the facility in the model. So is the case for the derivation of quantities. Once any clash is detected during the BIM clash-detection activity, resolution of the clashes must be initiated and agreed to by the designers, and often this will entail modification of the current design. This process requires close collaboration between the designers and the modeler and therefore sufficient time has to be allocated for this in the Implementation Schedule at the outset. Clients are assured that the additional time invested until the culmination of a clash-free model of the proposed facility will save them from potential variations later during construction that will not only impede the construction progress and project timeline, but will often result in escalation of costs.

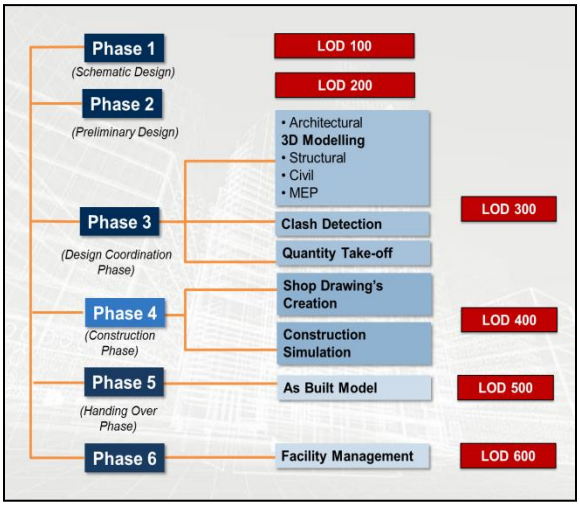
BIM Phases and Levels of Development

It is pertinent for the success of implementing BIM in a project for the proponents to fully comprehend the various stages of BIM and its co-relation with conventional design and construction practices. Establishing the BIM Execution Plan (BEP) is a paramount activity and requires utmost understanding, acceptance and collaboration from all project participants to the vision and expectations of the project driver. Whilst the formulation of the BEP is initiated by the BIM consultant, its acceptance and execution shall be a concerted effort by all stakeholders and must be agreed upon at the outset of the project. The BEP lays down the flowchart of activities at every stage, the pre-determined time frame for actions/responses required in modeling activity or 'request for information', the form and level of completeness of information, the format of BIM deliverables, and the workshop schedules and their durations.

With the endorsement and acceptance of the BEP, the BIM process moves to the subsequent stages of modeling of architectural, structural and M&E design termed as LOD 100- LOD 300, collaborating each and every element to the details provided by the design consultant of each discipline. Clash detection and resolution are conducted on the virtual model to eliminate the need for time-consuming changes and additional cost when the project is mobilized on ground. The model also reliably and accurately visualizes

the project at an early stage, hence providing a clear understanding of the design intent, and facilitates in any modifications to achieve its desired outcomes. Simulation using the BIM model can also address and resolve complex construction issues prior to initiation of site activities. BIM's ability to extract quantities from the model also facilitates the work of the Quantity Surveyor in preparing cost estimates, provides real-time cost evaluation and monitoring when design changes do occur; and optimizes the usage of materials, material handling and waste recovery during construction.

The process of updating the BIM model during construction, termed as LOD 400, due to site adjustments, design changes, change of materials, incorporation of suppliers'/manufacturers' specifications, etc, continues until the completion of construction. Again, the BEP would have stipulated the frequency of model updates, in line with the proper process of contract administration. Almost as soon as the construction period ends, the updated model is seamlessly converted to an LOD 500 or 'as-built' model, ready to be handed over to the asset owner.



BIM can do more than modeling the facility into LOD 100 to LOD 500 development. The contract can be administered by incorporating the 'time' element of the Master Implementation Programme into the model and gauged against the construction progress. A facility management tool can also be encrypted into the updated model to assist during the operation and maintenance stages of the facility. In summary, the BIM model holds complete information on the asset throughout its lifecycle from its inception to its end.

BIM Protocols

BIM protocols are pertinent in its implementation just as in any standard operating procedure in the construction industry. In the adoption of BIM, it is important to grasp the 'what' and 'how' to use BIM across the multi-disciplines throughout the various phases described earlier and ultimately the entire lifecycle of the facility. This includes not only model representations, but also all information to be captured into the rich model database and thereafter ensure it is retrievable across its value chain. File naming convention, drawings/information coordination and management process, archiving, line of

communication, compliance plans are among fundamentals that must be spelled out in clarity to all project proponents. Equally important is authorizing the tasks and duties of updating the models based on versions approved by the designers or clients at the different stages of the project lifecycle namely, design, construction and post handing-over.

At the completion of the construction stage, the asset owner is the ultimate owner of the BIM model. This model will continue to facilitate in the operation and maintenance phase of the facility up until its decommissioning. BIM is a cradle-to-grave process that spans well beyond planning, design and construction.

Moving Forward

In our local landscape, laudable initiatives have been taken by the Construction Industry Development Board (CIDB) in creating a conducive and sustainable environment as well as a common platform for BIM to thrive. This includes the formation of the National BIM Steering Committee in 2013 that has aggressively developed a strategic programme for implementation from 2016 until 2020. In the global scene, aligning BIM's strategic direction towards the International BuildingSMART initiative, through BuildingSMART Malaysia, has been a commendable step taken to accelerate the pace of BIM adoption that will be at par with world standards.

References:

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3) Building Information Management: A Standard Framework and Guide to BS 1192 (BSi).
4) BIM Management for Value, Cost & Carbon Improvement: A report for Government Client Group (BIM Strategy Paper, March 2011).