

# Visualization Technology for Construction projects

Prof Bonaventura H.W. Hadikusumo

*Professor, Department of Construction Engineering and Infrastructure Management, School of Engineering and Technology, Thailand*

Construction project has two important phases; Design phase and Construction phase. In design phase, many design disciplines involve such as Architect, Structural engineer and MEP engineer. In construction phase, main contractor with subcontractors need to work together to construction the project according to the design drawings. When challenges are considering in construction projects, Design drawings issued by several designers must be accepted by the project client/owner and not have any conflicts among the drawings. In the past, these issues were managed by making a mock up, making Styrofoam architect model. But they still have many limitations. Mock up can only be used for typical units and Styrofoam model is too small (in terms of size) and limited views. Using fast growing development of computer technology (particularly computer graphic) create opportunities for digital visualization and can be used as a solution for overcome above limitations. 2D drawings, 3D model, Building Information Model (BIM), Virtual Reality and Augmented Reality are some present technologies.

When considering those technologies, AUTOCAD which was released in 1982, is famous for 2D drawing. Nowadays, many projects use AutoCAD for computerized design drawings. In 1996, AutoCAD release 3D drawing functions. However, the 3D drawing is only lines

without any embedded information in object.

In the year 2000, there were many releases of 3D modeling software such as 3D Studio Max. Many complex construction projects were modeled in 3D prior to construction phase using some software like Bentley Microstation and AUTODESK. In construction project, we need to see the simulation of construction activities and equipment movements. This is very useful to analyze adequacy of working area/space for equipment movements and optimizing construction production scheduling. Some software has the capability to show the 3D model simulation from 3DS Max and WorldUp. There are several benefits from 3D simulation such as

1. Viewing and analyzing digital 3D model
2. Planning construction sequence
3. Planning equipment movements
4. Site analysis for space adequacy, movements, safety

BIM is enhancement of 3D model by adding more information in objects and there is standard information of data/objects which can be processed by any software using this standard Industry Foundation Classes (IFC). There are many applications of BIM. In the design phase, 3D model visualization and analysis of design clashes which can be reported by BIM function can

be identified. In construction phase, Design detailing (show drawing), 4DCAD (3D model + Schedule simulation), Site analysis are also application in BIM. Furthermore, specific application can be developed in BIM such as BIM for safety risk visualization and BIM for cost control. Virtual Reality (VR) technology also can be used in construction projects for several purposes; Display digital 3D design and walkthrough inside the virtual world.

There are two different types of VR technology. One is using Headset/goggle and other one using a cave which can be walked through. Augmented Reality (AR) can be used in construction field to see the “will-be” construction elements such identifying the building elements like piles, beams and columns, hidden construction elements such as underground pipe and utility networks, status of maintenance and for operation training.