
5D BIM Implementations in Hong Kong and Mainland China

Dr. Julia GAO

Dept. of Real Estate and Construction

University of Hong Kong

Background

- Awareness of 5D BIM rapidly increasing in HK and mainland China
 - Focus on how to use and tap potential out of BIM
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Objectives

- Conduct case studies and interviews with professionals
 - Illustrate why, when, for whom, at what level of detail, with which tools, and how 5D BIM was implemented on a project
 - Explore important drivers and obstacles that shape 5D BIM implementations
 - Compare the current use of 5D BIM in Hong Kong with that in the Mainland China
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HK Case 1: 5D BIM (Client Perspective)

- Why (Modeling Purpose)
 - HA experimented 5D BIM on a new public rental housing development
 - Use BIM for cash flow forecast and payment simulation
 - Identify problems with current modeling approach
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HK Case 1: 5D BIM (Client Perspective)

- When (Timing of Modeling)
 - BIM consultant created building information model during construction stage

HK Case 1: 5D BIM (Client Perspective)

- Whom (Stakeholder Involvement)
 - Client: Housing Authority
 - QS team: 1 senior QS, 1 QS, 3 technical staff
 - GC: China State Constr. Engr.
 - Hired BIM consultant
 - BIM Consultant team
 - 2 responsible for creating models
 - 1 for quantity takeoff and cost estimation
 - HA issued a variation order (VO) to GC to carry out cash flow forecast & payment simulation by using BIM
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HK Case 1: 5D BIM (Client Perspective)

- What (Modeled Scope and Level of Detail)
 - BIM covered four work trades: piling, excavation, concrete works, & underground drainage
 - Four trades are the first few steps of construction even though concrete works are difficult to model and measure through BIM
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HK Case 1: 5D BIM (Client Perspective)

- Which Tools (Modeling Software)
 - BIM consultant developed a plug-in.
 - BIM consultant created material takeoffs in Revit and then handed it off to the cost estimator.

HK Case 1: 5D BIM (Client Perspective)

- How (Workflow) – BIM Consultant
 - Received the 2D drawings
 - Built BIM in Revit
 - Put down methodology of creating the model for four work trades, coupled with standardized guidelines based on the HKSM
 - Assisted quantity surveyors to extract quantities from BIM model
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HK Case 1: 5D BIM (Client Perspective)

- How (Workflow) – HA QS team
 - Found the discrepancies between BIM measurement and manual measurement (most painful task)
 - Identified ways to minimize discrepancies as far as possible.
 - Checked the quantities from BIM measurement but not able to check the model
 - Adjustments made to fit HKSMM still being pursued and no perfectness is achieved
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HK Case 2: 5D BIM (Contractor Perspective)

- Why (Modeling Purpose)
 - Client requirement
 - Complicated design structure could not be built without BIM

HK Case 2: 5D BIM (Contractor Perspective)

- When (Timing of Modeling)
 - Contractor first thought BIM could be built before stage of construction drawings
 - Contractor later found what they expected was hard to be realized
 - Reason: design was changing all the time.
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HK Case 2: 5D BIM (Contractor Perspective)

- ▣ Whom (Stakeholder Involvement)
 - ▣ Contract – BIM requirement: 1 BIM manager & 4 Modelers
 - ▣ Modeling work outsourced to BIM consultant
 - ▣ Contractor's 5D BIM team: QS, Engineers, BIM adviser, & modelers

HK Case 2: 5D BIM (Contractor Perspective)

- What (Modeled Scope and Level of Detail)
 - LOD evolved as project progressed
 - Tender stage: LOD 100 (mass and form concept model for pricing)
 - Pre-construction stage: LOD 200 with major systems modeled
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HK Case 2: 5D BIM (Contractor Perspective)

- Which Tools (Modeling Software)
 - Software selection criteria: quantity takeoff and scheduling function
 - Approach: through “Application Programming Interface” (API) to estimating program (direct link between costing system and Revit)
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HK Case 2: 5D BIM (Contractor Perspective)

- How (Workflow)
 - Contractor developed modeling guidelines based on an international modeling standard (specifies how to build model to suite for cost breakdown structure)
 - BIM consultant built BIM in Revit following contractor's guidelines
 - BIM consultant published Revit models to a 5D BIM management tool to generate construction-caliber quantities
 - Contractor calculated costs by combining model-derived quantities with the contractor productivity rates by trade and standard formulas for deriving labor and material resource requirements
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Motivators of 5D-BIM in Hong Kong

- ▣ Client's requirements (mandate requiring BIM)
 - ▣ Self-motivated
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Obstacles of 5D-BIM in Hong Kong

- Inconsistency with current HKSMM
 - Lack of Standard Approach for Modeling (SAM)
 - Interest conflicts between QS and its upstream partners
 - Human resource problem
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5D BIM in Mainland China

- When (Timing of Modeling)
 - Traditional design-bid-build contract
 - BIM often built after the tender awarded



5D BIM in Mainland China

- ▣ Whom (Stakeholder Involvement) - Initiator
 - ▣ Not like Hong Kong, government not the **initiator** in implementing BIM
 - ▣ Major contractors initiate 5D BIM R&D on their own projects, e.g., residential & institutional buildings.

5D BIM in Mainland China

- What (Modeled Scope and Level of Detail)
 - 90% of quantity takeoff for architecture and structure can be realized by the approach of 5D-BIM.
 - 20%-30% of MEP components needed for quantity takeoff can be reflected in current models.
 - Reason: many small MEP components not modeled
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5D BIM in Mainland China

- Which Tools (Modeling Software)
 - Glodon and Luban: two primary domestic 5D-BIM software companies in Mainland China
 - Foreign software companies have little market share
 - Difficulty lies in localization: different provinces with different standards
 - Software companies have to localize QTO software to suit QS standards at provincial level
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5D BIM in Mainland China

- How (Workflow)
 - Approach 1: add required information for cost estimation into model
 - Approach 2: exact cost-related data from BIM to existing cost management system
 - BIM consultant often reply on Approach 2
 - Constraint:
 - Models built before construction not take QS requirements into consideration
 - BIM-based QS not started until construction
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Obstacles of 5D-BIM in China

- BIM created without reflecting appropriate information related to construction method, construction procedure, site constrains, etc. .
 - Many professionals in Mainland China not gained sufficient insights into how to implement 5D-BIM beyond fancy presentation
 - A standard on material coding not been in place yet.
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Compare 5D-BIM in Hong Kong and Mainland China

- Early R&D experiment stage: few projects used
 - Early adopters
 - HK: HA & contractors working for public clients
 - China: major general contractors
 - Technology-driven: 5D BIM tools customized to needs on local projects without little disruption of existing work practices
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Recommendations

- Standard Approach for Modeling (SAM)
 - BIM design (create BIM and directly produce 2D drawings from BIM)
 - BIM at early stage
 - QS professionals participate in creating BIM models
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