

Owner-Led BIM Project Management: Practice and Reflection—A Case Study of the Poly Yuzhu Project (Postprint)

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Abstract

Real estate is a capital-intensive industry. Ensuring that development projects outperform competitors in product quality, development efficiency, and cost control to achieve high premiums and rapid capital turnover represents a focal issue for real estate development enterprises. In recent years, the construction industry has progressively oriented toward informatization, prompting real estate developers to pilot the application of BIM (Building Information Model) technology in projects, with the expectation of leveraging BIM to enable more refined project management and thereby optimize management dimensions including product quality, development efficiency, and cost control.

Full Text

Preamble

Owner-Driven BIM Project Management Practice and Reflections: A Case Study of the Poly Yuzhu Project

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1 Introduction

Real estate is a capital-intensive industry, and developers consistently focus on how to surpass competitors in product quality, development efficiency, and cost control to achieve high premiums and rapid turnover. In recent years, the construction industry has gradually moved toward informatization, with real estate developers beginning to experiment with Building Information Modeling (BIM) technology in their projects, hoping to leverage it for more refined project management and thereby optimize management across quality, efficiency, and cost dimensions.

Early BIM applications primarily focused on design verification and MEP (mechanical, electrical, and plumbing) coordination, implemented through owner requirements imposed on designers or contractors, with owners mainly concerned about deliverables. This approach represented a “point-based” application of technical tools that had not yet formed a systematic framework.

Recognizing this limitation, some pioneering real estate developers have moved beyond treating BIM as merely a technical tool and are now attempting to integrate it with project management, exploring the establishment of an owner-driven BIM project management model that incorporates BIM technology into the project management system. Poly Real Estate (Group) Co., Ltd., through its subsidiary Guangdong Poly Real Estate Development Co., Ltd. (“Guangdong Poly”), has built upon BIM application experience from multiple previous projects to launch a new owner-driven BIM project management model using the A1 tower of the Poly Yuzhu project as its vehicle, achieving promising results. This paper introduces the practical implementation of this management model and summarizes and analyzes its key implementation points.

2.1 Project Overview

The full name of the Poly Yuzhu project’s first-phase north block is the Yuzhu International Timber Market Commercial Redevelopment Unit–North Block (AP0518004) Project. Located within the former Yuzhu timber market in Huangpu District, Guangzhou, the project covers a total land area of approximately 40,000 m², with a total construction area of about 330,000 m². The underground construction area is approximately 110,000 m² (three levels), while the above-ground construction area is about 226,000 m², consisting of six office towers and two commercial podiums, as shown in [Figure 1: see original paper]. The A1 tower stands 164 meters tall (36 floors) with a standard floor area of 2,100 m², forming a super high-rise commercial complex primarily for office use.

To ensure smooth project implementation, Guangdong Poly engaged BIM consultant Guangzhou Youbi Building Consulting Co., Ltd. to plan an innovative BIM-based project management model. Under owner leadership, the consultant, designers, contractors, and supervision parties jointly participated in BIM implementation. A distinctive feature of this project’s BIM application was owner-led and full-process participation, integrating BIM with project management and focusing not only on results but also on the process, thereby achieving effective application outcomes.

2.2 Implementation Process

The focus of BIM application in this project was project management, with the overall workflow illustrated in [Figure 2: see original paper]. Prior to construction bidding, Guangdong Poly established the BIM application objective—to implement BIM technology for management applications in commercial complex projects—and selected the BIM consultant (Guangzhou Youbi) through

a bidding process to conduct overall planning, quality control, and technical support for project BIM implementation. The construction bidding documents explicitly stated BIM application requirements for all contractors, ensuring that the winning bidders had clear understanding of the project’s BIM objectives and workflow requirements, thus avoiding common issues in previous projects such as additional costs or responsibility disputes caused by “retroactively added BIM requirements.”

Based on the owner’s objectives, requirements, and specific project conditions, Guangzhou Youbi developed the “Poly Yuzhu North Block A1 Tower Project BIM Technical Standards” and “Poly Yuzhu North Block A1 Tower Project BIM Implementation Details,” which planned BIM applications from both technical and management perspectives and specified technical requirements, workflow requirements, and deliverable requirements for various BIM applications during construction, laying a solid foundation for subsequent smooth implementation.

During implementation, a BIM workstation was established on-site, where various contractors built BIM models based on construction drawings and implemented diverse applications. BIM model quality was reviewed by the BIM consultant and could only proceed to guide on-site construction after approval. The implementation of BIM applications at the construction site was integrated with the owner’s project management priorities—quality control, schedule control, cost control, safety management, and coordination among all parties—making it a critical fulcrum of project management.

2.3 Implementation Results

The BIM project management in this project primarily functioned in the five areas shown in [Figure 3: see original paper]. The application points listed here are not beyond those of conventional projects; however, our emphasis lies in how the owner utilized BIM technology to achieve corresponding management functions. Each aspect is briefly introduced below.

2.3.1 Quality Management

For owners, quality management encompasses two dimensions: first, ensuring design intent such as appearance and spatial clearance height; second, ensuring construction quality. BIM technology can play a crucial role in quality management: through 3D visualization drawing review, design issues can be identified in advance to avoid secondary dismantling and rework; through 3D MEP coordination, spatial clearance height can be ensured; and through process simulation and detailing of complex nodes, construction quality can be improved.

As shown in [Figure 4: see original paper], each contractor’s BIM team built BIM models based on 2D design drawings, identified and documented drawing errors, omissions, and professional conflicts through the BIM models, and fed these issues back to the designers for timely resolution. BIM played an important role

in controlling clearance heights for various spaces. Through refined BIM MEP coordination, both the visual effect of MEP routing and spatial clearance height could be ensured. For areas affecting clearance height, all parties could conduct thorough discussions and research to propose reasonable optimization solutions that maximized building clearance height. Meanwhile, MEP coordination detailed construction drawings were produced directly from the BIM models to guide on-site MEP installation.

For complex nodes, BIM models were applied for node detailing. For example, the A1 tower utilized steel tube concrete composite columns from level -3 to level 26 (to reduce column cross-section by 30% and improve usable rate). The contractor conducted technical briefings through BIM models, while the supervision unit conducted on-site acceptance against the models, applying node detailing results into the management process.

After civil construction completion, a phase-shift laser scanner was used to scan the project. The scanned point cloud results were compared and integrated with the BIM model to review construction errors, control construction quality, and provide accurate data sources for MEP installation and interior design ([Figure 8: see original paper]). Laser scanning technology breaks through traditional single-point measurement methods, offering unique advantages of high efficiency and precision.

2.3.2 Schedule Management

Owner schedule management primarily focuses on whether key milestones are completed as planned and on avoiding major changes or rework that affect the construction period. The quality management applications of BIM described earlier have already eliminated many adverse factors affecting the construction period. Control of schedule plan key milestones is mainly achieved through 4D-BIM simulation and comparison.

4D schedule simulation is a notably beneficial BIM application during the construction phase, particularly for multi-workface and multi-trade 穿插 construction, as it enables more intuitive assessment of plan rationality and rapid response. As shown in [Figure 9: see original paper], linking the BIM model with a schedule plan compiled in Project enables 4D-BIM schedule simulation. Through regular collection of construction progress information and comparison between actual and planned progress ([Figure 10: see original paper]), progress completion status can be visually reflected, and early warnings can be issued for potentially delayed sections, significantly improving construction schedule management and making key milestone progress more controllable.

Ensuring the construction period requires not only controlling workface 穿插, mastering labor and material information for rapid response, but also ensuring that construction organization for complex processes proceeds without issues. Therefore, construction process simulation is required for complex procedures. Taking the A1 tower's basement roof slab as an example, different colors repre-

sented different elevations to strictly control construction sequence and organize construction in combination with concrete dispatching. This dynamic approach—simulation verification first, then on-site operation—enabled orderly construction.

2.3.3 Safety Management

BIM 3D models were used to create protective facilities for important high-formwork areas and edge/opening areas, with safety protection scheme simulation and comparison conducted in advance to avoid engineering safety risks and significantly reduce safety hazards, as shown in [Figure 12: see original paper] and [Figure 13: see original paper]. Using visualized BIM models for formwork installation briefings made it extremely easy for construction teams to understand, significantly improving briefing quality. Meanwhile, supervision was arranged to verify on-site consistency with BIM models, ensuring construction safety, as shown in [Figure 14: see original paper] and [Figure 15: see original paper].

2.3.4 Cost Management

For owners, cost management primarily focuses on discrepancies between actual consumption and bill of quantities and on avoiding unplanned cost changes. Therefore, dynamic control is critical—when changes or rework occur, quantities and prices can be immediately generated for decision-making based on cost-effectiveness ratios. While there is currently no simple and reliable technical path for direct quantity takeoff from BIM models, physical quantity statistics are very intuitive and convenient, offering high value for dynamic cost control.

Taking floors 4-6 of the A1 tower as an example, concrete quantities for structural walls, columns, and beam-slab systems were exported through the Revit model. Simultaneously, actual consumption for these three floors was statistically analyzed based on material lists, with deviations between calculated results and actual consumption ranging from -5% to +3% ([Figure 16: see original paper]). This project also verified reinforcement quantities by selecting a typical floor to build a complete entity steel model, using Revit to 统计 various steel grade consumptions, achieving detailed statistics to guide steel bar cutting ([Figure 17: see original paper]).

For MEP routing, material statistics tables for various trades were produced based on the project's BIM detailed design model using the software's built-in statistical functions, serving as references for on-site MEP procurement and rational arrangement of material usage ([Figure 18: see original paper]). Since the depth of routing coordination design had reached LOD350 for construction guidance, physical quantity accuracy was very high.

2.3.5 Coordination Management

Youbi CEO He Guanpei wrote in a blog post: “The visualization capability of BIM cannot be overestimated in value,” noting that “for people, BIM models have higher information visualization than CAD drawings, which helps improve human thinking, understanding, and communication efficiency and quality.” Although BIM visualization may seem like a relatively basic characteristic, it indeed significantly enhances communication efficiency and effectiveness among parties during project implementation. As mentioned earlier, in various processes such as conflict coordination, node detailing, construction briefings, and schedule arrangement, BIM model assistance enables rapid and intuitive understanding and communication among parties, playing an important role in project advancement. The industry often discusses how BIM application can be considered “grounded.” We believe that when parties encounter problems and immediately think of opening the model for discussion and solution-finding, at least half of BIM can be considered “grounded.”

3.1 BIM Intervention Timing

In the Poly Yuzhu A1 tower project, BIM intervention occurred after construction drawing completion but before construction bidding, focusing primarily on construction-phase applications where contractors directly built BIM models and implemented applications. Therefore, it did not involve the conversion process from design BIM models to construction BIM models. The industry has a term for this model—“Post-BIM”—which may not sound particularly sophisticated, but for construction process management, this model is simple, clear, and effective, and its value should not be simply dismissed.

Of course, this model did not provide timely effectiveness for front-end design quality control. Therefore, when conditions permit, BIM management should be 介入 during the design phase. Owners can propose explicit BIM requirements during the design bidding or contract negotiation process and 提前 consider application requirements for the construction phase, ensuring that design-delivered BIM models meet certain technical requirements in model organization, information entry, and component modeling methods to facilitate smooth handover to subsequent contractors.

3.2 Requirements for Project Participants

BIM modeling and implementation are primarily completed by various participants, so corresponding BIM requirements must be clearly stated during bidding or commercial negotiations and 固化 in contracts to ensure smooth implementation. Generally, BIM requirements for designers and contractors include: 1) BIM application scope, deliverable requirements for each 环节, and applicable technical standards; 2) BIM team configuration requirements; 3) BIM software and hardware configuration requirements; and 4) BIM implementation schedule. Specific requirements should be determined based on project-specific conditions,

with some requirements potentially 固化 into corporate standards to reduce management costs.

3.3 Requirements for the Owner

For owner-driven BIM applications at the project management level, simply making demands on designers or contractors is insufficient—the owner must also make corresponding investments and assume specific responsibilities: 1) The owner’s project manager should understand various BIM applications in each 环节 and have a comprehensive understanding of their benefits and input-output ratios; 2) The owner’s key technical staff should generally master basic BIM model skills such as browsing, querying, measuring, and annotating, with specialized technical personnel mastering advanced skills like 4D model task and schedule querying and physical 配备 specialized technical personnel to review the delivery quality of BIM models from all parties—this task has high technical requirements and workload and may also consider leveraging BIM consultant support; and 4) The owner’s project management personnel should use BIM models as basic engineering data 配合 drawings in all management 环节 including quality, schedule, cost, and safety, and use BIM models as the fundamental communication medium in various coordination processes. This is the key to whether BIM technology can fulfill its auxiliary project management functions.

3.4 Role of BIM Consultant

During the initial stage, BIM consultants can assist owners with BIM application planning, establishing BIM technical standards and management systems, and reviewing BIM models and application results submitted by all parties while providing technical support for various applications. When BIM project management becomes normalized and BIM technical standards and management systems have become corporate standards, the BIM consultant’s functions become similar to those of other professional consultants, focusing primarily on model review and technical control.

Currently, a relatively common industry practice involves third-party BIM consulting companies conducting modeling and BIM implementation. We believe this approach can only achieve the aforementioned “point-based” benefits for owners and makes it difficult to integrate BIM into the overall project management process. Therefore, it is recommended only for project trial stages. For continuous and mature application stages, it is preferable for each application party to conduct their own modeling, as this truly integrates BIM into the engineering process and achieves BIM technology “grounding.”

3.5 Discussion on BIM Collaboration Platforms

With the continuous development of BIM technology, the concept and demand for “BIM collaboration platforms” have been increasingly mentioned in the indus-

try, with some software vendors launching related products and even conducting customized platform development. These products' functions and effects vary significantly, yet all bear the name "platform." Their basic functions generally include lightweight cloud-based BIM model display, document sharing, multi-role access and interaction, and support for mobile and web interfaces.

We cautiously believe that transforming a "BIM lightweight cloud display platform" into a "BIM collaborative management platform" requires complete integration of management processes into the platform, necessitating deep customized development and data accumulation, which cannot be accomplished overnight. On the other hand, the realization of BIM management functions does not entirely depend on a "collaboration platform." Therefore, in the Poly Yuzhu A1 tower project, we adopted a hybrid "online + offline" model: offline, various BIM functional software such as Revit, Navisworks, Piming, and Glodon quantity takeoff were used to achieve corresponding functions, with results then published online; online, Glodon's Collaborative Platform was used to achieve basic functions including document sharing, model display, deliverable submission, and traceability of various communication and coordination activities. This combination enables both flexible application and collaborative management, representing a practical and feasible model at the current stage.

When mature management processes and data have been accumulated and requirements can be 固化, deep customization can then achieve good results. Owner-driven BIM applications differ significantly from designer or contractor-driven applications, focusing more on their role in project management and hoping to solve previous project management pain points through BIM technical means. In the Poly Yuzhu A1 tower project, Guangdong Poly, through thorough upfront planning, strong implementation execution, and continuous experience summarization, and with collaborative efforts from the BIM consultant Youbi Consulting, designer Guangdong Provincial Architectural Design Institute Shenzhen Branch, civil contractor China Construction Third Engineering Bureau First Company, MEP contractor China Construction Fourth Engineering Bureau, and supervision party Pearl River Supervision, achieved excellent results and played significant roles in quality, schedule, cost, and safety, laying a solid foundation for BIM project management in subsequent projects.

Note: Figure translations are in progress. See original paper for figures.

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