

Research on Engineering Project Management Process Which Based on BIM

Lijun Cao

School of Management Science and Engineering, Hebei GEO University, Shijiazhuang, China

Dongyang Geng and Xiangmei Yu

School of Management Science and Engineering Hebei GEO University, Shijiazhuang, China

Abstract—the emergence of BIM technology is the inevitable trend of the development of modern science and technology, but also the road to the construction industry. The application of BIM technology has become more and more mature in the long term engineering practice. Project management based on BIM technology has been put into practice in the global engineering construction, and has gradually been recognized and accepted by the vast number of construction project practitioners. BIM technology brings more and more benefits to the project construction.

Index Terms—BIM, engineering project management, process

I. INTRODUCTION

The BIM technology theory determines that the employer will benefit the most from all participants in the project and at the same time, the responsibility of the owner in the BIM based project management process will be more important. In addition to the original duties and tasks, the owners should play a leading role in the new management process. BIM technology, visualization and integration of information, transparency, the owners need not have high professional knowledge can also get the information they need clearly, such as the project schedule control, cost control, not only that, model and information projects are concentrated in the data platform, which makes the owners of the project life cycle management is also possible. Especially on the project operation and maintenance phase, the construction phase of the project owners through the collection of information, a full range of project management, including management, space and facility operation and energy management, facilities maintenance, rental management etc.. BIM promotes collaboration among project participants, reduces errors and field changes, makes case delivery more efficient and reliable, and reduces the time and cost spent on the project.

II. DESIGN PROJECT MANAGEMENT BASED ON BIM

The design is team work, involving owners, professional designers, and increasingly associated with other manufacturers and assembly plants in the project. The degree of coordination and cooperation involved in the implementation of a project is staggering.

Coordination and cooperation involve multifaceted communication. At some level, it involves communication among people of values, intentions, backgrounds, procedures, and so on. At other levels, it involves different software interactions and requires the flow of information between software. Different members of a professional team use different software to handle their work. And BIM's greatest benefit for design work lies in this. The architectural information model is revolutionary in history. It increases the form of architectural performance from drawings to 3D virtual building models. It fundamentally changes the construction, presentation and thinking patterns of the previous line layout, and leads to the mode of Produce, refine and evaluate had changed in design concept.

A. Making a BIM plan

Like other new technologies, if the experience is insufficient, or the application strategy and plan are not perfect, the design team application BIM may bring some additional project risk. In fact, the project team did not plan the BIM application well, which led to the increase of modeling investment, the delay of design work due to missing information and the lack of BIM application benefit. Therefore, the premise of the successful application of BIM is detailed planning, and it should be combined with the design process to truly assist the design team to realize the value of BIM application.

A detailed and comprehensive engineering design BIM application plan (hereinafter referred to as the BIM program) enables the professional engineers involved in the design to clearly recognize their respective responsibilities and obligations. Once the plan, project group will accordingly successfully integrate BIM into the design of the workflow, and the correct implementation and monitoring, bring benefits for engineering design such as: through efficient building lifecycle performance analysis, improve the quality of design; modeling applications through innovative design parameters, increase. After the project enters the construction stage, the valuable BIM model can also be used for construction deepening, 4D schedule control, construction cost control, etc., so as to improve the controllability and effectiveness of the project in general.

There is no optimal method or plan applicable to all projects based on the personalization of Engineering projects. Each design team must develop a BIM plan

targeted to the needs of the project. At each stage of the project lifecycle can be applied to BIM, but must be considered in the range of BIM applications and depth, especially the BIM support, the design team itself, skill level, relative to the benefits of BIM application costs, these factors on BIM application effect should be reflected in the BIM plan.

The major personnel of the project design should actively participate in the formulation process of the BIM plan. The conditions and goals of the project are different, so each design team should customize a BIM plan for the project according to its actual conditions and capabilities. The BIM program can refer to the following process: clear BIM application value goal project brings, and will be applied to the BIM; the application of BIM graph, the design of BIM application process; the definition of BIM application in the process of information exchange requirements; including clear BIM application conditions: the terms of the contract, and the way of communication technology and quality assurance.

The formulation and implementation of a project BIM plan is not an isolated process, but should be integrated with the overall plan of the engineering design. The formulation of the BIM plan is not made by an individual or an organization alone, but is the result of cooperation between the various professional disciplines of project design. The BIM plan enables all members of the design team to clearly understand the overall situation of the BIM application and the relationship between them.

B. Design flow of engineering project management based on BIM

The project management design process based BIM is as follows, in the pre project and planning stage, through the owners to provide architectural planning documents, the design team in accordance with the foregoing to develop their own BIM plan. Then enter the design stage, the design side of the design proposal, through the project concept model and project cost estimation, the owner audit program is consistent with the requirements and requirements. In the design, began preliminary design phase of the project, the design in accordance with the development plan of BIM electrical construction model, structure model, project installation model (MEP model, landscape design, and according to the preliminary design of the model by the professional model of project coordination, energy consumption analysis, project cost estimation etc..

III. PROJECT MANAGEMENT OF CONSTRUCTION PARTY WHICH BASED ON BIM

A. The application environment of construction party's BIM

At present, the construction of computer software and hardware environment in our country is based on two-dimensional drawings. It mainly supports the information expression and engineering application of two-dimensional drawings. At this level of software and hardware, the transfer of engineering information is scattered and easily lost. BIM technology provides a

three-dimensional model with data information, in which the engineering data information is complete and unified, and has very convenient readability and negotiability. But at the same time, the construction of BIM based engineering projects requires a higher level of computer hardware and software environment.

B. The implementation system of construction party's BIM

To establish a implementation system of engineering BIM, the application of BIM in construction stage, the introduction of BIM software, to provide support for the general contracting management of construction project, enhance the fine management level of project implementation, synchronous delivery engineering entity and digital model, the late operation and maintenance for the owners of the property.

By using the characteristics of 3D visualization of BIM technology, some complicated nodes and complicated construction technology problems in construction can be simulated or solved effectively. At the same time, for the whole construction process can be simulated by the model, discover problems and adjust the design, avoid the construction waste, to reduce the risk; application of BIM software, the implementation of the project construction contract management, implements the multi-disciplinary, multi participant; based on the mobile terminal equipment BIM software APP, query, whenever and wherever possible download or upload the project information, greatly improve work efficiency, which makes the construction quality, safety, progress can be ensured; engineering accurate basic data obtained by BIM, the engineering foundation data to the component level, material level, effective control of the construction cost, realize the whole process cost management through the project data management; the software realization of the construction phase of each participant in the BIM data sharing, making communication more convenient, closer cooperation, management more effective.

CONCLUSION

In the case of the owners provide construction drawing design model, making the model deepening, updating and maintenance, and integrated management, coordination, professional contracting units (such as BIM owners can provide construction drawings, will organize various specialized subcontracting in construction drawings for the creation of their own construction design model, and then complete the construction of the professional design model); deepen the application of construction design model for simulation and optimization of construction organization design and construction scheme, construction process model; model construction process, according to the scope of work submitted construction each stage BIM results for professional contractor BIM results were checked and adjusted to ensure that the BIM results and the participants the construction drawings and documents; the construction phase determines the information was added or updated in the construction

process of the model, and the construction of the contents of the change, Accordingly, the BIM model and information are updated to form the final model.

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REFERENCES

- [1] Qiang Meng,Zhiyuan Liu. Mathematical models and computational algorithms for probit-based asymmetric stochastic user equilibrium problem with elastic demand. *Transportmetrica* 2013(8). pp. 20-23
- [2] Zhong Zhou, Anthony Chen,Shlomo Bekhor. C-logit stochastic user equilibrium model: formulations and solution algorithm. *Transportmetrica* . 2012 (1) . pp. 49-81
- [3] Qiang Meng,William H. K. Lam,Liu Yang. General stochastic user equilibrium traffic assignment problem with link capacity constraints. *J. Adv. Transp.* . 2008 (4) . pp.30-35
- [4] Shlomo Bekhor,Tomer Toledo. Investigating path-based solution algorithms to the stochastic user equilibrium problem. *Transportation Research Part B* . 2004 (3) . pp. 27-34
- [5] Francesco Russo,Antonino Vitetta. An assignment model with modified Logit, which obviates enumeration and overlapping problems. *Transportation* . 2003 (2) . pp. 51-56
- [6] Qiang Meng,Zhiyuan Liu. Mathematical models and computational algorithms for probit-based asymmetric stochastic user equilibrium problem with elastic demand. *Transportmetrica* . 2012 (4) . pp. 62-67
- [7] Zhong Zhou,Anthony Chen,Shlomo Bekhor. C-logit stochastic user equilibrium model: formulations and solution algorithm. *Transportmetrica* . 2012 (1) . pp. 31-65
- [8] Qiang Meng,William H. K. Lam,Liu Yang. General stochastic user equilibrium traffic assignment problem with link capacity constraints. *J. Adv. Transp.* 2008 (4) . pp. 66-68
- [9] Shlomo Bekhor,Moshe E. Ben-Akiva,M. Scott Ramming. Evaluation of choice set generation algorithms for route choice models. *Annals of Operations Research* . 2006 (1) . pp. 40-46
- [10] Shlomo Bekhor,Tomer Toledo. Investigating path-based solution algorithms to the stochastic user equilibrium problem. *Transportation Research Part B* . 2004 (3) . pp. 65-68