

Optimal Implementation Strategies of Building Information Modeling for Construction Projects of LH

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Abstract: The BIM-based architectural design can be the optimal method to improve all sectors of construction industry and reduce environmental impact through digital technologies. The goals and effects of BIM needs in LH to be newly planned based on the experience of public sectors, which will ultimately contribute to maximization of effectiveness. Referring the excellent case in the UK, the current BIM standards according to maturity level 2 handle the contents related to modeling, collaborative data production, data management and assure BIM data have to be used from building construction to operation and maintenance of buildings. Therefore the strategy for the utilization of BIM for construction projects in LH consisted of three steps; first, the minimization of defects via BIM; second, strengthening the competitiveness of construction and asset management; third, upgrading the system of building production and maintenance control. After this trial, LH can accumulate know-how for building construction to be more cost-effective and competitive.

Keywords: Building Information Modeling, Implementation strategy, Construction management, Knowledge-based system

I. INTRODUCTION

BIM has been utilized with various purposes and uses for the last 30 years. The purposes can be divided into three categories including design, performance and productivity. Those purposes have been applied in the public sector to decrease construction period and prime cost and to effectively satisfy needs. However, there were barriers that BIM-based construction spread in local market. Firstly, 75% of constructors do not have experiences on BIM. 7 out of 10 companies with experiences have short-term experiences according to the question investigation at May, 2014 by Korea Institute of registered architects. Furthermore, the average number of the BIM experts per company is one person who tends to be concentrated in conglomerates. Secondly, the market encroached by imported software is competitive for the constructors to make inroads. Approximately 86 programmes are utilized as BIM tools and all of them are foreign-made. Thirdly, the submission of results is a problem without respects of final users. The clients have difficulties to use delivered final files although 2D CAD file is normally transferred to format for delivery. The obstacle is not error occurred in the process of file transformation, but very badly drafted drawings in pursuance of switching CAD drawings to BIM modelling data. Therefore the alternatives are required that the clients are indeed able to use of the final works.

The goals and effects of BIM need to be newly planned based on the experiences of public sectors, which will ultimately contribute to maximization of effectiveness. The progress can be achieved by enlarging application of BIM to construction and maintenance processes. Land and Housing Corporation (LH) has adopted BIM to building the new headquarter in Jinju and accumulated the experience related to construction and process management. As a result, LH builds roadmap to apply BIM-based construction.

II. CONSTRAINTS OF UTILISATION OF BIM AT LH

LH has to push ahead application of BIM with the exact purpose. The preceding research, Cho(2014) illustrated that BIM can cause confusion on constructors when the clients have vague aims for the use. Similarly, the LH staffs pointed out the problems of the uncertain goals. Moreover, computer equipment did not smoothly operate BIM program. While there were lots of drawbacks on 3D drawings, the associated report was published in the state of being edited well. Since 2008, the main weaknesses on the 3D drawings among delivered 15 projects are as follows: 1) The errors are generated because of the links broken between the models and the confirmation of modelling is challenging as the visibility is set incorrectly. 2) Drawings are overlapped and modelling capacity increases as a result of compositeness of 3D modelling and 2D CAD drawings. 3) Use of modelling information is restricted due to incorrect description of absent properties. 4) Numerous interference problems are found on construction design and overlaps on the process of drawings. 5) Drawing that cannot be architecturally constructed is accomplished and the degree of completion in detailing is low.

The procedure of building LH's new headquarter did not have those problems regarding a final drawings for the construction. This is because the building process and BIM-based drawing were simultaneously proceeded and information required was derived from BIM and then applied to the construction. In this way, the headquarter was built. It can also be the case of application of IPD(Integrated Project Delivery) method though there was independently concept and detail design construction process. Main areas for BIM utilization can be classified into four as follows; 1) construction design error checking; 2) supporting the construction of 3D freeform design; 3) cost and schedule management using

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WBS(work breakdown structure); 4) application of cost-schedule integrated management algorithms.

III. BIM MATURITY LEVEL IN THE UK

In the case of the UK, defining the levels from 0 to 3 is to categorise types of technical and collaborative working and goals of the client. Level 0 and 1 are about managed CAD in 2D or 3D format without integration of finance and cost management. Level 2 is the phase BIM data can be used to many activities to realise and add value, and level of detail and how to complete BIM data stage by stage have been standardised. Through this stage, more people are using BIM than were in 2010. Level 3 opened in the near future contains fully open process and data integration enabled by 'web services' managed by collaborative model server. Now, level 2 has almost reached the end and the UK BIM industry working group is preparing to jump up to the level 3. The 7 plans of BIM in level 2 can be summarized as follows; 1) information management process: PAS1192-2 2013, PAS 1192-3 2014 2), 2) Information exchange throughout the lifecycle of a facility: COBie(Construction Operation Building Information Exchange)-BS 1192-4 2014, 3) BIM protocol: legal and contractual CIC documents 2013, 4) Policy : Government Soft Landings, GSL, 5) Digital plan of work : dPoW, 6) Classification : NBS(National Building Specification), National BIM Library 7) Security : PAS 1192-5(BSI, 2013;Hyun, 2014)

These standards comprehensively handle the contents related to modelling, collaborative data production, data management and assure BIM data have to be used from building construction to operation and maintenance of buildings. However, on the domestic side, standards are concentrated on the contents related to architectural 3D modelling files. Thus, the standards for actual performance should be established and BIM-used design will have successfully grown as the majority of new methods of working through government-civilian joint efforts. This strong multi-party collaboration can enhance the competitiveness in the world market. LH also has to establish implementation strategies depending on the substantial performance improvement.

IV. REVITALISATION OF BIM-BASED DESIGN OF LH

The strategy for the utilization of BIM includes three steps. The first stage is focused on the minimization of defects via BIM. The deficiencies involve 1) defects of construction design: legal status violation; 2) defects of construction: lack of thickness and interference between structures and equipment; 3) discrepancy of completion statement: inconsistencies between construction information among plans. To reduce the deficiencies, BIM construction statement has to contain structure and equipment and basic architectural factors and components' information. On the top of this, few important factors can be confirmed such as the constructability review through virtual building, building codes check for and free access to light and air, the distance and height between the buildings, and

compliance with the RFP via the size of each rooms and the number of rooms.

The second step is development stage by employing BIM to strengthen the competitiveness of prime cost. The way ensuring cost competitiveness will be effective utilisation of construction materials and period and growth of building performance. The other method will be selecting the best choice among the diverse alternatives resulted from the comprehensive analysis of economic aspects included construction expenses, period and performance. For the realisation of those methods, building modelling should comprise architectural information involving estimates and process management for the construction and material configuration. That is, the information needs to take account of thickness, texture and recycle, which will be used for the performance assessment.

As a final step, BIM can be employed for upgrading the system. The second step is categorising the BIM data according to the given purposes and efficiently utilising the data through designating of additional groups or file conversion. The range of data can be physically expanded to, for instance, urban information. Also, such information expansion may have impacts on the scope of work with automatized construction of real buildings from the data. In order to embody such method, knowledge-based construction platform, Seumteo, at the national level is required to be built. The open platform for information on the various building industry may enhance the effects. In other words, the strategy for the connection between different projects or operators, rather than focusing on the BIM data from only one project, may determine the efficiency.

V. CONCLUSION

This paper carried out current problems for using BIM in LH and BIM implementation strategies referred to BIM requirements of the stakeholders in the UK. The architectural design using BIM software is the optimal method to improve all sectors of construction industry and reduce environmental impact through digital technologies. Therefore, stakeholder's execution experience should be increased gradually. For activating the BIM application, the scope of it should be extended and more people cohere in the course of construction. For this purpose, this research was formed the BIM implementation strategies divided into three stages and phased objectives are as follows; Step1) minimizing construction deficiencies Step2) Strengthening the competitiveness of construction and asset management Step3) Upgrading the system of building production and maintenance control. After this trial, LH is guaranteed to accumulate know-how for building construction to be more cost-effective and competitive.

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