International Scientific Conference Urban Civil Engineering and Municipal Facilities,
SPbUCEMF-2015

Challenges of BIM for Construction Site Operations

Hans-Joachim Bargstädt*

Professor for Construction Engineering and Management at Bauhaus-Universität Weimar, 99421 Weimar, Germany

Abstract

Building Information Modeling is a powerful tool for the design and for a consistent set of data in a virtual storage. For the application in the phases of realization and on site it needs further development. The paper describes main challenges and main features, which will help the development of software to better service the needs of construction site managers

Keywords: BIM, Building Information Modeling, site management, construction site.

1. Introduction

BIM (Building Information Modeling) is a powerful tool, which has taken almost two decades to be developed to the current status. In the last few years the application of BIM tools has been pushed by a large number of architects, engineers and consultants (AEC industry) such that now also construction companies start to accept these innovative ways of improving work performance [1].

Nevertheless, the scope of BIM tools in the first place has been governed by design features and by the ability to show the client the final project by the use of animations and nice renderings [2]. This is different from what information construction companies need for their building processes.

Students and young site engineers must be trained in the use of BIM tools for construction processes. This is a different application than generating a model. It is more concerned with adding specific information to the model.

_____

* Corresponding author. Tel.: +49 (0) 36 43/58 23 23; fax: +49 (0) 36 43/58 23 75
   E-mail address: hans-joachim.bargstaedt@uni-weimar.de

But also data mining gains importance because a main reason for applying Building Information Models is the ability to keep large amounts of data in a consistent digital environment.

2. Improvement of work processes by Building Information Modeling

2.1. Definition of BIM

Building Information Modeling is a modeling technology and associated set of processes to produce, communicate, and analyze building models. Building models are characterized by

- Building components that carry computable graphic and data attributes, as well as parametric rules …
- Components that include data that describe how they behave, …
- Consistent and non-redundant data such that changes … are represented in all views …
- Coordinated data such that all views of a model are represented in a coordinated way.

This basic definition, given by Eastman et alii [3], does not enumerate, in the first row, the many stakeholders in a project, which can commonly be found to be involved. However, these stakeholders are identified as different partners on a building project, and the roles and duties of these partners are well addressed in the same literature.

Within the last two decades two powerful applications have been found in realization of BIM. One is the generation of marketable visualizations, derived from digital models, in which different alternatives of finishing, of coloring and other selected topics have been displayed. The other strong application has been developed from industrial companies, who rather work on the automation of production processes, mainly in the prefabrication area, and who directly control their machines from the set of geometric data.

2.2. Software development issues

The development of more powerful hardware as well as the growing dissemination of easy-to-install end appliances, both have made possible that the AEC industry more and more applies sophisticated software with large amount of data storage. Designing a new building and the following processes of tendering, cost estimate, contracting, the long phases of realization of a building and finally the handover generate a vast amount of information which has to be controlled by the involved architects and engineers.

Many engineering companies have mastered this challenge by developing and setting their own in-house standards. For example architects provide standard design books for repeating construction details. The demand for standards for a lot of detailing issues like construction details, standard pricings and legally checked descriptions of tasks have opened the market for specialized construction software, which still is very successful for small and medium enterprises in the AEC industry. Even the traditional way of doing construction for public clients is still working on this ground in Germany.

Some current features, which are not yet sufficiently solved, are the different uses of the same data storage. Concepts to merge different partial models on the basis of an integrator program [4] or on the basis of a multi model storage container [5] are appropriate answers to the different phases and actors in planning. For the phases of realization, starting from tendering, contracting, work planning approval, until as-built realization, more complex systems of access to data are needed. These must consider the different roles and, more important than others, also activate the role of the construction companies as authors of additional information to the Building Information Model.

These challenges are innovative in certain aspects, since they are not common in other industries. No other industry has to manage so many changes by so many different partners during the phases of tendering, of provision, and of realization as the construction industry does. Just to emphasize: according to construction standards, as for example the German VOB/B [6] states in § 1 (3): "The client reserves the right to order alterations to the design".