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An overview of BIM specialists

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Abstract

It is expected that the demand for highly skilled design specialists will outstrip supply over the next 20 years (Smith and Tardif, 2009). The Building Information Modelling (BIM) technology has now been adopted by many companies in the Architecture, Engineering and Construction (AEC) sector. These companies are trying to hire the most creative and technically-skilled design specialists available, particularly with regard to BIM. Since, in the short term, higher education institutions will be unable to meet this demand, there is a need for taking rapid steps to provide in-company training in BIM and Integrated Project Delivery (IPD) skills for the employees. This study provides a preliminary outline of the areas of responsibility of several BIM specialists. This should help to improve the job market for these new professions, making more clear which are the professionals required for performing BIM related functions in AEC companies.

Keywords: BIM, BIM manager, BIM specialist, BIM teaching, BIM skills

1 Introduction

Building Information Modelling (BIM) has now been adopted by many companies in the Architecture, Engineering and construction (AEC) sector. They are trying to hire BIM-proficient professionals, able to perform the many new tasks this technology introduced. The first step for companies to procure those specialists is to write their job descriptions, listing their specific tasks. Higher education institutions will be interested in this same information, as they need to adapt their curricula to meet this demand, the soon as possible.

The purpose of this paper is to identify the areas, functions and individual responsibilities of the *BIM Specialists* through a literature review.

2 BIM Specialists

Howard and Björk (2008) have found that the industries and companies that are using BIM technology are finding difficulties like, for example, the lack of communication between those involved in the design and in the construction. The companies should recognize the need for a new professional in the application of BIM technology, standards and modelling, that is also responsible for the special coordination required in BIM contexts. Therefore, there must be a special role in the project team: the *BIM Manager*. The hiring of this professional is a small investment if compared to the potential benefits of using BIM (Salazar et al., 2006). The *BIM Manager*, depending on their main functions, also have been named as: *Information Manager*, *Virtual Construction Manager*, *Virtual*

Architect/Engineer, *Digital Contractor*, *Digital Project Coordinator*, *BIM Champion*, *IDS Champion*, *BIM Administrator*, *4D Specialist*, *Building Modeller*, *Model Integrator*, *BIM Integrator*, *BIM Coordinator*, *BIM Leader*, *Modelling Manager„ among others*.

The *BIM Specialist* came to occupy the role of the *Building Modeller* that was investigated in 2004 (Gallello and Freeman 2004; Camps 2008). Currently, the *BIM Manager* is being employed by many companies and the market is open with good salaries, but their roles and responsibilities still are not very well defined (Foster, 2008).

The *BIM Specialist* may act in Owner Organizations, Design Firms, General Construction and Subcontractor Firms (Eastman et al., 2008). This specialist can make up the functional framework of companies, playing functions on the management and professional career axes or may act externally as a *BIM Consultant*, *BIM Researcher*, *Modelling Specialist* or *BIM Application/Software Developer*.

In the professional axis are the following specialists: *BIM Analyst*, *BIM Facilitator*, *BIM Modeller,* also named *BIM Operator, BIM Analyst and BIM Application Developer*. In the management axis are the *BIM Manager*, that can act at *Owner Organizations*, *Design Firms, General Construction and Subcontractor Firms* (Panushev and Pollalis 2006; Kymmell 2008; US GSA 2009).

In Design Firms the *BIM Manager* can be a *Chief BIM-Officer or a Project Model Manager,* that is also known as *Modelling Manager* (Eastman et al. 2008a; Panushev and Pollalis 2006). These two positions can also be named as *Technical Champion of Integrated Design Solutions* (*IDS*) and *Integration Champion IDS* respectively (Tatum, 2009). In the General Contractor and Subcontractor Firms, the *BIM Manager* can occupy two positions: *BIM Project Manager* or *BIM Construction Officer* (Eastman et al., 2008a).

3 Roles and responsibilities of BIM Specialists

The technical literature identifies many different BIM specialists, each with a specific set of responsibilities which are described below. In practice, a professional may execute the tasks of one or more of the specialists named here depending of the project and the company size he or she is working for.

3.1 BIM Modeller

The functions of a *BIM Modeller* are to create, to develop and to extract 2D documentation from BIM models (US GSA, 2009). The *BIM Modeller* can also be named *BIM Operator* (Kymmell, 2008)

The *BIM Modeller* may occupy the position of the *Draftsperson,* but not always a *CAD Specialist* will become a *BIM Modeller*, because the more experienced CAD users are more resistant to change. However, it is unclear whether the *Draftsperson* will be replaced by the *BIM Modeller* with the same disconnection that exists today between the *Draftsperson* and the *Designer* (Khemlani, 2006). Also, it is natural that a *BIM Modeller* migrates to the role of a *BIM Manager* (Kymmell, 2008).

The BIM modeller can have the following additional denominations, depending on his/her focus: *3D Modeller, Cost Modeller*, *Sequencing Modeller* and *Detailing Modeller* (Panushev and Pollalis, 2006). The *3D Modeller* creates the geometry in BIM models working in teams for developing different parts of the model. The *Cost Modeller* inserts information about the construction process and resources required. The *Sequencing Modeller* add phases to the resources and creates a building phasing file having as basis the planning provided by the general contractor (Panushev and Pollalis, 2006). The *Detailing Modeller* develop MEP or HVAC design (Aeorotek, 2009).

The functions of drawing, designing, specifying, sizing, verifying, documenting and detailing in the design process that once were separated, now become just about one: modelling. Therefore, a *BIM Modeller* must have knowledge of the design process because, with BIM, he or she must “design”. However, the use of BIM for the extraction of quantities and cost planning does not require a change in the job description of estimators: the *Cost Modeller* does not have to become a *3D Modeller*

(Broekmaat, 2009) but only is required to guide the *3D/Detailing Modeller* about what should be detailed, in order to correctly extract the quantities.

3.2 BIM Analyst

The function of the *BIM Analyst* is to perform analyses and simulations based on the BIM model (US GSA, 2009), e.g., building performance analysis, circulation and security analysis (Applied Software, 2009). This specialist can work in Design Firms, mainly MEP, and also as a Design Consultant.

3.3 BIM Application Developer or BIM Software Developer

A *BIM Application/Software Developer* (US GSA, 2009) is a specialist that develops and customize *software* to support integration and the BIM process (Applied Software, 2009), from small plug-ins to BIM servers, integrated project management tools and data repositories (ASHRAE, 2009).

3.4 Modelling Specialist

Modelling Specialists are IT professionals who contribute, along with experts in different areas of the AEC/FM industry, to the IFC standard, from initial requirements to the final characteristics of a software product (Weise et al., 2009). They are the proponents of IFC extensions, and have to be familiar with the IFC data structure and modelling concepts. They are also responsible for mapping of *Exchange Requirements* (ER) to IFC classes (Weise et al., 2009). Amor (2009) explains that BIM models are structurally very complicated and, in most cases, the use of IFC data exchange still requires that each company to have qualified people to ensure the integrity of the exchanged data.

3.5 BIM Facilitator

The function of a *BIM Facilitator* is to assist other professionals, not yet skilled in operating BIM software, in visualizing the model information. He usually works with who is going to physically construct the building, assisting the engineer's work to communicate with foremen or contractors (Kymmell, 2008). A similar function may exist for helping facility managers to extract information from BIM models for asset management, space planning and maintenance scheduling (CICRP, 2009).

3.6 BIM Consultant

Large and medium-sized companies that have adopted or are going to adopt BIM, and do not have an experienced expert to be part of the project team, can hire a *BIM Consultant* (Gallello 2008) to guide project designers, developers and builders in the BIM implementation.

There may be three types of *BIM Consultant*: *Strategic Consultant*, *Functional Consultant* and *Operational Consultant*. The *Strategic Consultant* generates strategies that are typically medium to long term and are based on a vision of achievement. *Functional Consultants* generate action plans in accordance with these strategies. The *Operational Consultants* are those who actually perform the process of implementation (personal information)[1]. *Registered Operational Consultants* are trained by a software supplier to develop implementation plans for their BIM products (ImplementBIM, 2009).

3.7 BIM Researcher

BIM Researcher is the expert that work in universities, research institutes or governmental organizations, teaching, coordinating and developing research on BIM. They will be leaders in the creation of new knowledge to benefit the industry, the community and the environment (ASHRAE, 2009). Many of them act as *BIM Educators,* too.

[1] SUCCAR, B., 2009. Personal e-mail message received on 3th October 2009.

3.8 BIM Manager

A BIM implementation plan should include the definition of *coordinator(s)* and, after the initial goal is set, the BIM coordinator for each one of the parties can develop and carry out the detailed implementation of BIM (CICRP, 2009). Therefore, the main function of a BIM Manager is to manage people in the implementation and/or maintenance of the BIM process.

The *BIM Manager* works within the company as responsible for coordinating the team and the production and use of the model. For this, he should examine and evaluate the goals of the BIM process and then to develop a plan to fit the demands and desires of customers, the experience of the project team and the availability of resources (Kymmell, 2008). The *BIM Manager* may serve various additional functions such as setting design templates, coordinating the integration of entity models, coordinating the access to the model, etc. But its most important function is to guide the team in decision making (Post, 2009).

3.8.1 *Project Model Manager, Modeling Manager or Model Manager*

The *Model Manager* focuses on the production model and interacts with the system and with the other project actors (Sebastian, 2009). The need for a *Model Manager* working within the firms is still a debated issue and their duties and responsibilities are still not uniformly defined across the AEC industry. Their duties vary according to the requirements and procedures of the project and are defined by the parties that contribute to the model (Foster, 2008).

This job's main function is to integrate information from different stakeholders of the construction which, according to Foster (2008), will ensure no dilution of responsibility between the project design team and the contractor. Is also the *Model Manager's* responsibility to plan the mechanisms of exchange and maintenance of project data, determination of the conventions to be followed for reviewing, and management of model versions. However, it is not his/her responsibility to make decisions about the design, engineering solutions and organizational processes (Sebastian, 2009).

The Model Manager's other specific functions are: helding calls/meetings with the client and modellers to identify which models will be required and who are the 'owners' of individual models and their responsibilities; dividing the project between groups of modellers; returning the models to modellers with Requests For Changes (RFC); discuss RFC with modellers; verifying if there are interferences and keeping the model updated and accurate (CICRP 2009; Foster 2008; Panushev and Pollalis 2006; Sebastian 2009).

Other functions of the Model Manager are: configure all new projects that require BIM standards; create a standard structure for modelling library objects, convert the objects delivered by staff based on that standard, modelling additional non-standard components, modelling complex geometries that require programming BIM tools and defining the structure and level of detail of the model (Panushev and Pollalis 2006; Sebastian 2009).

The Model Manager will also facilitate the management of information in terms of storage and data flow, maintenance of local file transfers, control of access rights, and compilation of information from smaller models of other members; make available the model files to the general contractor (Panushev and Pollalis, 2006), facilitate communication protocols, identification of communication errors and improve the Information and Communication Technologies (ICT) skills of the staff (Sebastian, 2009).

Working in MEP and HVAC Design Firms, the *Model Manager* can be called *BIM Detailing Manager* whose functions will be to manage the detailing team providing support to detailing modellers and helping in the establishment and implementation of BIM standards. This BIM expert should promote an integrated detailing effort interacting with pre-construction, engineering, construction and project management departments. He should also provide detailing budgets for cost estimates.

3.8.2 BIM Manager at Design Firms or Chief BIM-Officer

Working in Design Firms, the *BIM Manager* will be responsible for implementing BIM, for the coordination of project teams and for establishing the connections necessary for communication between multiple offices (Eastman et al., 2008). Therefore, he or she should attend the meetings of the development plan for implementing a BIM project (CICRP, 2009).

Other duties include planning training for employees to keep them updated on current and future versions of BIM software. For this, the *Chief BIM-Officer* should remain constantly informed about BIM trends and know the vision of other companies, attending conferences and participating in industry organizations.

The *Chief BIM-Officer* also should develop marketing materials to inform customers of the company's BIM capabilities, evaluation of new products and verification of technical problems and deficiencies in hardware, software and the net. Finally, the *Chief BIM-Officer* should ensure the commitment of everyone on the project by creating a procurement system so that each agent takes its responsibilities (Knight, 2008).

3.8.3 *BIM Manager at General Construction and Subcontractor Firms - BIM Construction Officer*

The identification of a *BIM Construction Officer* is the first step to implement the BIM process on a construction firm. Once identified, the *BIM Construction Officer* helps estimate the costs and time for implementation and use of BIM *software*. Then he/she will develop a plan that will start by formating a small group that, after receiving training, will perform some work with BIM. *BIM Construction Officer* should learn everything about all the tools used by the company and then provide support to the creation of a BIM department within the construction firm (Hardin, 2009).

This specialist will also be responsible for the management of resources (hardware, software and people) that are involved in developing the model and for choosing the right people for each project activity, recruiting qualified BIM modellers, providing training and to keep employees updated. Another function of this specialist is to promote confidence and credibility in BIM on the project team, internal team members, sub-contractors and customers, strive to achieve 100% customer satisfaction with BIM projects, as well as to maintain and expand various relationships and project partnerships (Hardin, 2009).

4 Conclusion

Focusing on the roles of BIM specialists, this article identified the positions that a BIM professional can take internally and externally to an organization and their respective functions and responsibilities.

BIM Consultants and *BIM Managers* have an important role in the transition form current practice to IPD and BIM, mainly being responsible for the implementation plan of BIM in organizations. The old *CAD Operator* might be able to work as *BIM Modeller* to acquire new skills and knowledge, but some tend to resist to change. A *CAD Manager* could become a *BIM Manager* if he/she acquires some new knowledge and skills. However, is not recommended that a *CAD Manager* carry out the plan of BIM implementation in the organization, because this task requires time and dedication.

We highlight the importance of investigating the complexity of the *BIM Specialists´* work in order to assist management of large companies that adopt management models by competencies as well as the small and medium design firms in selection and recruitment of BIM Specialists. It is recommended that future studies examine the competencies under an organizational approach, i.e., finding out which is the legacy of knowledge about BIM a team or AEC company must have to create a competitive advantage for the organization.

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