

Practice vs. Prescription - An Examination of the Defined Roles in the NZ BIM Handbook

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ABSTRACT

The emergence of formal BIM-specialist roles was one of the earliest and more obvious changes to industry practice resulting from the introduction of BIM, but literature suggests that the scope of tasks and responsibilities within such a role remains poorly defined. Following the lead of earlier international guides and handbooks, the recently developed New Zealand BIM Handbook provides a definition of the key roles required for successful BIM implementation in a project. A set of minimum responsibilities are prescribed for project, discipline and technical elements of each BIM-specialist role. This Handbook, however, is now being introduced into an industry in which BIM practice has been evolving over several years in a far less structured manner. In order to identify current practice within such roles, New Zealand BIM specialists across a range of disciplines were interviewed. The resulting analysis examines the prescribed roles and responsibilities, as set out in the Handbook, in the light of existing practice. The discussion encompasses skill sets, role development, reporting and accountability, and the background and training of specialists. Differences in practice between disciplines are identified, and wider concerns over the career trajectory of the BIM specialist are discussed.

INTRODUCTION

The role of BIM manager has been identified in the literature as an important factor in successful BIM project implementation. This is increasingly supported in industry with the development of formal BIM guidelines and handbooks which define the key elements of the role. Merschbrock (2012) suggests that co-ordination leadership requires an individual (or organization) with both the technological capabilities with the BIM tools and systems used, and the contractual or financial power to enforce a co-ordinated process. Without these elements, each party to the project follows their own individual processes with little incentive for a unified

approach. The widening adoption of BIM throughout the construction industry indicates that a lack of technological capabilities is becoming less of a barrier. One increasingly popular approach to instituting clear power relationships in BIM projects is the explicit definition of roles around BIM, commonly within a project BIM execution plan. Frameworks for establishing execution plans are a significant part of many of the BIM handbooks developed in recent years.

BIM HANDBOOKS AND BIM ROLE DEFINITIONS

BIM handbooks and guides have been developed internationally for a range of purposes. As noted by Wong et al. (2010), BIM development is often driven by client (commonly government) expectations and requirements; therefore many of the BIM guides and handbooks currently available have been written from a client perspective. Some of the leading US examples, such as the US Department of Veterans Affairs Office of Construction & Facilities Management (VA 2010) and US General Services Administration (GSA 2007) provide detailed advice on the client's project requirements, but offer limited information on the expected roles from the project team side. For example, the VA (2010) requires the project proposal to include "BIM qualifications, experience, and contact information for the following: BIM Manager; Technical Discipline Lead BIM Coordinators for all major disciplines (Architect, Civil, MEP, Structural, etc.)...the Construction BIM Manager and Lead Fabrication Modelers for all trades," but provides no definition of what these roles entail.

BIM guides developed by an industry-client coalition often offer a different view of the roles required on a BIM-mediated project. Depending on the emphasis of respective handbooks, more or less detailed definitions of BIM specialist roles are provided. Some, such as the Building Information Modeling Project Execution Planning Guide developed by Pennsylvania State University (2011) take a similar line to the client-led guides, requiring project roles to be defined in the development of a project BIM execution plan, but not specifying individual roles. Others, such as the COBIM (2012) documentation from Finland, the Singapore BIM Guide (BCA 2013), and NATSPEC National BIM Guide in Australia (NATSPEC 2011) take a more prescriptive approach and define specific roles and responsibilities that are required within a BIM project. This is the approach that has been taken in the development of a New Zealand BIM handbook, which has been based on the Australian NATSPEC documentation.

From a review of job advertisements in the United States, Barison and Santos (2011) identified *BIM manager* as the most common BIM specialist role; although in just 31 advertisements they found 7 different job titles across 6 different industry disciplines. The types of role indicated by titles such as *Director of BIM Technologies*, or *BIM Software Applications Support Engineer* fall outside the scope of any of the BIM guides reviewed, although other roles such as *BIM modeler* or *BIM consultant* could be identified within the frameworks. This array of roles and titles found in job advertisements is reflected in the handbooks reviewed, which contain variations on similar themes in the defined roles. Table 1 provides a summary of roles drawn from a selection of available BIM Handbooks.

Table 1. BIM roles as defined in selected handbooks.

Country	Project management	BIM manager	Technical coordinators	Fabrication & trades	Modeling experts
NZ – BIM Handbook (draft)	Project manager, Design team project manager	Architecture BIM manager, Construction BIM manager, Lead BIM coordinator			
Australia NATSPEC	- Project manager, Design team project manager	Architecture BIM manager, Construction BIM manager, Lead BIM coordinator	Architect, MEP, Structural, Interiors, Energy & sustainability		BIM modeling application expert
Finland COBIM	- BIM coordinator		Design discipline-based persons in charge		
Singapore BIM Guide v2	- BIM manager for project		BIM coordinators for consultants; BIM coordinators for contractors		
USA – Penn State University	Output/task definitions rather than role definitions				
USA – NA		BIM manager, Construction BIM manager	Discipline Lead BIM Coordinators for all major disciplines	Lead Fabrication Modelers	
UK - CIC	Information manager	BIM coordinator (design lead)			

Although the titles of BIM specialists vary, the frameworks incorporate largely the same set of responsibilities, commonly comprising an over-arching project coordination role supported by specialist coordinators or BIM managers from each of the design and construction teams or technical groupings. Some handbooks also define BIM roles for fabrication and trades, and for model authoring.

Succar et al. (2103) divide BIM competencies into abilities, activities and outcomes. All three of these types of competencies are used by the various handbooks to define BIM specialist roles, with some handbooks focusing on actions and responsibilities, and others also including abilities or skills requirements. The level of detail in the specification of roles also varies. For example, the Singapore BIM Guide

states that the Design BIM coordinator is responsible for a given set of tasks: “Define discipline-specific BIM uses including analysis; Coordinate between BIM modellers, design consultants and cost consultant; Coordinate with contractor and subcontractors; Ensure Modelling Quality Control” (BCA 2013; p25) while for the same role the NATSPEC (2011) guide is much more specific in defining expectations of the role: “These individuals shall have the relevant BIM experience required for the complexity of the project and shall have, as a minimum, the following responsibilities for their discipline: Coordinating technical discipline BIM development, standards, data requirements, etc. as required with the Design Team BIM Manager; Leading the technical discipline BIM team in its documentation and analysis efforts; Coordinating clash detection and resolution activities; Coordinating trade items into the Design BIM (depending on procurement plan).” (NATSPEC 2011; p7)

Howard and Björk (2008) identified the need for a specialized role in modeling and technology, applying standards and spatial coordination. These capabilities are now commonly specified in the various handbooks and guides, but the BIM specialist is now expected to move beyond a purely technical role and must also possess skills in leadership, communication, documentation writing, review and quality assurance procedures, in addition to discipline knowledge and proficiency in model authoring and coordination software.

AN EXPLORATION OF CURRENT PRACTICE

BIM in New Zealand is still relatively new, and practice has evolved in an unstructured fashion. It has been led by a few industry enthusiasts who have encouraged their employers and other companies they work with to develop BIM capabilities. Very few projects to date have used BIM in anything beyond a solo implementation (i.e., in-house use only, see Davies et al. 2013), and there is still a lot of uncertainty in the wider industry about what BIM actually is (Masterspec 2013). Despite this late and hesitant beginning, there is evidence that awareness of BIM is growing rapidly, and new projects are currently in development that take a more integrated approach to BIM use across the project parties.

In order to investigate current practice within BIM roles in New Zealand, semi-structured interviews were carried out with BIM specialists across a range of disciplines. Eight individuals participated in the interviews, from architectural, engineering (both MEP and structural), documentation specialist and facilities management backgrounds. Each of these individuals is identified by their employer as a “BIM manager”, although for many that is not their official job title. Several of these individuals have a reputation as industry champions and are involved in working and development groups for industry BIM initiatives. As such, they represent perhaps the leading edge of BIM specialist practice in New Zealand.

The interview findings reported here are from a pilot group of a larger industry study that is currently ongoing. When complete, the study will provide a representation of the development of BIM specialist roles across New Zealand, Australia and the United States, representing new, developing and established BIM

markets, respectively. It will encompass all project disciplines, including client-side representation.

Background and training. The eight individuals interviewed represent six distinctly different routes into the BIM manager role, and hold between them more than 10 different qualifications, including master's and bachelor's degrees, diplomas, postgraduate diplomas, and trades certificates. Half of them have international experience within the construction industry, although not with BIM. They describe their backgrounds variously as architect, architectural technologist, architectural draughtsman, engineer, engineering draughtsman and computer programmer. All of them had developed a strong interest in the potential of CAD and followed that route at an earlier stage of their careers. One of the architecture BIM managers saw this as the natural progression into BIM, "the vast majority of people who are currently in the role of BIM manager or model manager or something of that nature have evolved from CAD manager type roles, so you've got senior draughties or senior architects moving into that role".

None of the participants had had formal training for the BIM manager role, or even significant instruction in the use of BIM generally, although most reported ad hoc involvement in industry training events both locally and internationally. On the whole, BIM knowledge was self-taught through online resources and informal user groups. A significant part of the role for many was maintaining and advancing their own skills and knowledge, and they demonstrated an impressive awareness of international research and developments in the field. They also contribute their expertise to upskilling others both within their own organizations and in the wider industry context.

Skill sets and role development. BIM managers participate in a wide range of activities, and most are active in BIM, BIM-hybrid and non-BIM projects. The architecture and engineering participants are currently taking on elements of almost every role related to their discipline that is defined in the BIM Handbook, from top level management and coordination through to model authoring and modeling application expertise. This was seen by some as a potential problem as they become viewed as a "Jack of all trades" with no clearly established project role. Role development in this regard was considered to be part of the evolutionary process of BIM as a whole: as the industry uptake of BIM increases, a greater recognition of the various responsibilities and skills of the BIM manager and associated roles will develop.

There is no evidence of the project level BIM role occurring in the New Zealand market. Although there is a degree of social BIM occurring (inter-organisational/collaborative BIM; see Davies et al. 2013) with the development of execution plans and exchange of models between disciplines, the coordination seems to be very much based on interactions, negotiations and understandings between individual BIM managers, rather than with one party taking the lead either contractually or informally. Because of the need to continue working in hybrid, partial-BIM environments, several participants identified that BIM management for in-house BIM development involved a heavy workload, even without cross-

organization coordination, “you’re translating 2D into 3D for your in-house processes and then translating it back again for the client, yes, it is quite common.”

The core set of skills that participants identified as necessary to the role include discipline knowledge, software and computer skills, and management and communication skills. Several participants identified that their current responsibilities required more management expertise than they currently brought to the role, and believed that this requirement would only increase in the future. Several are investigating further education, with one considering an MBA as his next career move, another discussing a PhD, and a third already started in PhD study.

Differences in discipline. Peer recognition of the BIM manager role was one of the challenges for a number of the participants, who found that their contribution was often considered secondary, suggesting that “there is sometimes that tendency that you’re just the technician”, even when their qualifications and experience are equal to those of their peers. This seems particularly prevalent in the engineering field, with a distinction remaining between designers and draughters. In contrast, the architecture BIM managers noted that “there’s not really any such thing as a draughtsman any more. They’ve pretty much evaporated. Most of the senior operators are architects.” Whyte (2011) also noted this division in approach between architecture and engineering disciplines.

Another discipline difference in the BIM manager role was seen in the relationship with clients. The BIM managers in architecture firms were more likely to take a client-facing role, and saw educating the client or client’s representative as one of their responsibilities. Engineering BIM managers struggled to achieve this level of interaction, with one noting that because the client interactions were dealt with by managers who did not understand BIM, the project teams were often “dropped in it” with promises made that the firm did not have the technical skills or resources to deliver on.

Career trajectory. A leading concern of most of the participants was the lack of definition of the BIM specialist role. Within the wider industry context, there is poor awareness of the skills and expertise that a BIM specialist brings. As a result, there is currently only a limited career path within BIM and little opportunity for significant advancement. The development of the New Zealand BIM Handbook was welcomed as a move that would aid in recognition of their contribution, and that would create further demand for BIM specialists as uptake continues.

Even with wider adoption of BIM, however, the BIM specialist was not seen as a “destination” career, but was described by one participant as “currently a blind alley, career-wise.” Only one of the participants was in a senior role in their organization, and most considered that they would never be in a position to become part of upper management of their organization. Those who were concerned with their career advancement felt that they would need to leave their current organization and become part of a BIM specialist consultancy overseas to progress. In the longer term, the introduction of consultancies of this nature in New Zealand was seen as a likely development as the market matures, and a welcome widening of opportunity for those interested in a career in BIM.

PRACTICE vs. PRESCRIPTION

The principal difference between the BIM manager role descriptions as established in the handbooks and the day-to-day function of the BIM managers interviewed lies in the division of the role between time spent in project-focused work and that which is involved in company overhead activities. For all of the participants, an estimated 50% of their time was taken up with activities related to being the BIM champion. This involved training and troubleshooting with other staff, developing and documenting company processes, maintaining their own currency in authoring and other software, and participating in industry BIM initiatives. However, some of these activities have a degree of overlap with the defined role of BIM manager, since company processes are often transferred into project contexts when BIM execution plans are established.

Of the time spent on project work, many of the participants reported a high degree of involvement at the model authoring and documentation level. Most in this situation were trying to “get off the tools.” As expressed by one participant, “it’s one of those things, the people who fall into this role are usually the more senior people, so the first hole they fall into is ambulance at the bottom of the cliff, and then you end up with the jobs that have got to be done with small teams, very very quickly, so you end up doing it because it is just easier, but the problem is you never get time to do anything else. So, it’s a constant battle.”

As already noted, the majority of participants still work in projects that are hybrid-BIM implementations. This is a transitional stage that is likely to become less significant as BIM adoption increases. However, it is currently a major issue in BIM project implementations, and the time and effort involved in projects of this nature make it difficult for BIM specialists to cope with the full range of activities and management processes that the BIM handbooks expect.

CONCLUSIONS

The BIM manager role in practice is less clearly defined and more unstructured than the BIM handbooks suggest. Coordination of project roles between disciplines is limited, and even within their own organizations, the contribution of the BIM-specialist is often not regarded as significant. Unproductive activities include the need to translate between CAD drawings and BIM models within hybrid-BIM projects, and BIM specialists often struggle to find sufficient time to work on higher-level planning and management activities. As the market for BIM projects increases this is likely to improve, with greater awareness of the skills and responsibilities of the BIM specialist developing along with increased uptake of the technology and processes.

Currently the development and progress of the role in New Zealand appears dependent on the enthusiasm of the individuals involved, who take personal responsibility for their own BIM education and that of their organization and colleagues, and also participate extensively in BIM initiatives in the wider industry. The introduction of the New Zealand BIM Handbook is likely to support their efforts and make their contribution more explicit.

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