Chapter 17
BIM Integration with Geospatial Information within the Urban Built Environment

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ABSTRACT

In the construction industry, BIM is enabling the information sharing and integration practise culture to emerge. Consideration of the geo-location is essential at the design and planning stage for building construction. It is important to integrate BIM with surrounding geo-spatial information which will not only benefit the construction industry in getting site information, but also help urban management in getting building details in the city. This chapter reports the emerging efforts on BIM integration with geospatial information within the urban built environment. The authors have been working on the design and development of the integration framework of BIM and geospatial information. In this framework, a BIM web service, Building Feature Service (BFS), is defined to retrieve building objects and elements information based on OGC's Web Service. This framework can extend the scope of BIM to the urban built environment to support life cycle information services for both city management and the construction industry.

1 INTRODUCTION

In the construction industry, Building Information Model (BIM) is enabling the information sharing and integration practise culture to emerge (Pressman 2007). Research and development work has been carried on using BIM to improve information flow for construction projects to enable better product quality and value for money investment. In previous chapters of this book, the concept of BIM has been defined and the BIM's impact on facilitating information exchange and interoperability in digital format during the entire building lifecycle has been discussed from different perspectives. However, considering the context of construction sites (e.g. location, traffic etc.) is essential at the design and planning stage of the building life cycle.

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The AEC and real estate worlds often need to use building information in the context of map layers such as the cadastre, communications, demographics, environmental hazards, land use and zoning, land cover, soil, transportation, utilities, hydrography and elevation (Bacharach 2006). Actually, on the one hand, all construction industry (e.g. BIM) benefits from the geospatial context; on the other hand, the geospatial domain also benefits from the construction industry.

From the urban management perspective, urban built environment includes not only the building information but also the surrounding environmental information in order to meet the needs of sustainable development, maintenance and facility management in urban context. Since buildings are the most important elements in the urban environment, most urban planning tasks are closely related to buildings. To make holistic decisions, there is an increasing need to seamlessly integrate the relevant datasets at both building and urban scales.

BIM can be seen as the effort from construction industry of information sharing and integration for building life cycle. To extend the scope from building life cycle into a wide urban built environment, it is necessary to include relevant urban context information. Research shows 80% of municipal information could be geo-referenced (Stillwell 1999; Lemments 2001). Indeed, geo-location is often the only factor that different urban datasets have in common. Geospatial Information (GI) provides the structure for collecting, processing, storing and aggregating various datasets.

Therefore, seamless integration of building and geospatial information will be able to benefit both construction industry and the urban management. It helps with design visualization and coordination, owner/tenant communication, construction sequencing, energy simulation, traffic/egress simulation, facility management and other activities. Emergency and disaster management also requires the ability to share data across organizations at all levels (Bacharach 2006).

This chapter will present our research efforts on extending single building BIM to urban BIM which includes buildings and surrounding urban context. The focus will be on the integration of BIM and geospatial information. The contents of this chapter is organised as following: In section 2, the BIM and urban built environment are introduced. In section 3, the relevant work in BIM and Geospatial Information System (GIS) integration is introduced. Section 4 describes the design of BIM and geospatial information integration framework. In Section 5, a BIM web service, Building Feature Service, is defined within this integration framework. Section 6 introduces the prototype implementation based on this integration framework. The research work carried out by the authors is summarised in the final part of this paper.

2 BIM AND GEOSPATIAL INFORMATION IN THE URBAN BUILT ENVIRONMENT

Building Information Modelling can been seen as the latest generation of Computer Aided Design (CAD) systems in which all of the intelligent building objects that make up a building design can coexist in a single 'project database' or 'virtual building'. A Building Information Model (BIM) provides a single, logical, consistent source for all information associated with the building (Howell 2003). To extend the scope from building scale into the wide urban built environment, it is essential to consider the relevant geospatial information in the context of the urban built environment.

2.1 Urban Built Environment

The urban built environment consists of the man-made surroundings ranging from the large-scale civic surroundings to the personal places in an urban area. The creation or modification of urban built environments that are socially acceptable,