Chapter 16
Integrating BIM with Urban Spatial Applications:
A VEPS Perspective

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ABSTRACT

BIM as a developing concept is adding sophisticated data structures to 3D building models. From recent experience, it can be seen that BIM is enabling the sharing and management of building information. However, BIM is a building scale concept; to fully consider and assess the building information, BIM should be put in the larger geospatial information context, because buildings cannot be isolated from the context of their surrounding neighbourhood and city environment. A review of (3D-) GIS tells us that GIS adds an attribute database to geospatial data, and therefore greatly enables geographical analysis. Geo-spatial related decision-making now-a-days can hardly be done without the help of GIS systems. This chapter reviews recent research into integration of geo-spatial information and building information and in particular, it reviews the VEPS project, its scenarios and approaches, achievements and future development. This review shows the benefit of integrating BIM with the urban scale contextual data. More than that, this chapter also discusses the range of stakeholders such as building contractors, estate agents, city management, and public sector that will benefit from the integration of BIM and (3D-) GIS. Finally, there is a discussion of the way forward in the integration of BIM and urban models.

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1 INTRODUCTION

Before the emergence of GIS and its popularization in the later 1980s, the traditional representation of geographic data (information) was mostly static map products. Even a digital map displayed on a computer could do no more than zooming in and out and pan. The information on the map cannot be changed once it is created. GIS adds an attribute database to the geographic data, and therefore GIS greatly enables geographical analysis (Burrough 1998; Bolstad 2005). Spatial decision-making now relies on GIS systems. An estimated 80% of actions taken by municipal authorities are supported by geo-spatial information (Hnojil et al. 1998; Lemmens 2001). However, in some GIS applications, there is a request to know more detailed information about a particular interest area, for example, an estate agent might want to show particular building information to their clients in detail and meanwhile the client should be able to see the construction in a large scaled context. For public participation scenarios, it should also be very useful to show participants not only the urban area as a basic map, but also detailed information of particular buildings.

BIM as a recent emerging and developing concept has added more sophisticated data structures to 3D CAD models. Because of this, 3D building models becomes a feature-and-object based model from just a graphic representation. Each feature in the geographic representation represents a real world object such as a window or a door in the model and has its own property information. This is also true for the field of 3D city models in a large scale modelling approach for whole cities or boroughs. Instead of setting up a visual representation of the urban space by modelling the geometry and appearance of the objects, standards like CityGML also define additional properties and semantics for buildings and other elements of urban space (Gröger et al. 2008). However, BIM is still a building scaled concept. To fully consider and assess the building information, BIM should be combined with geospatial information, because buildings cannot be isolated from the affect of their surrounding neighbourhood and city environment. For example, the location of the building in terms of transport connections etc. has a big impact on the way the building can be used. From a sustainability perspective, to achieve sustainable planning it is necessary to gather city information together. This integrated information has to include both urban scaled spatial data as well as detailed information of particular buildings in the city. The integration of the BIM and GIS technologies offers a City-BIM approach which would make it easier for users to holistically consider the planning and regeneration issues.

This chapter reviews the VEPS project scenario using the Stuttgart city model that the authors have cooperated on. The review presents the aim of the project i.e., using 3D city models for the public participation process, and will also outline possible extensions beyond the public participation scenario integrating BIM data. Possible applications based on the technology developed in VEPS could support the information needs of stakeholders such as building contractors, estate agents, city management, and public sector etc. through the integration of BIM and 3D city models.

The integration of BIM and (3D-) GIS has already been investigated in terms of a technical integration of these two domains and the mapping of data models and semantics (Isikdag & Zlatanova 2008; Wang 2007; Song et. al. 2007). This work already shows examples of integrating the two worlds on a data level and in technological terms. This is also discussed in another chapter of this book on "BIM integration with geospatial information within the urban built environment"

This paper will however review the integration from an application perspective. It discusses the VEPS project the authors were involved in, and city scaled modelling. From the urban modelling perspective and lessons learned from the VEPS project, the authors will outline the need and usefulness of integrating BIM data into digital