Welcome, and thank you for your interest in the UrbanIT project. This work is being conducted at the City Futures Research Centre at the University of New South Wales. This project is funded by a Linkage Grant awarded by the Australian Research Council (ARC). Our industry partners are the NSW Department of Planning, City of Sydney Council and Landcom.

The central aim of this project is to demonstrate that a better information framework can be exploited to support better decision-making and successful management of metropolitan development in Australia. This can be developed through effective integration of diverse sources of geographic, demographic and planning information. This research has national relevance for all organisations and groups responsible for the management of Australia's urban fabric.

THE CHALLENGE OF PLANNING SYDNEY'S FUTURE

As Australian cities continue to grow in the context of complex social, environmental and economic forces, it is critical that metropolitan managers have the tools to ensure correct decision-making. Major urban renewal programs are being planned in many Australian metropolitan areas where established town centres are recast to accommodate higher density mixed use development in an effort to accommodate the proposed growth of the city. These plans involve intensive transformations of urban space, but there is not yet a robust way of accessing the multiplicity of data needed to assist planners and developers assess the likely outcomes of such redevelopments. In reality, the building blocks of such data sets are already in use: architects, developers and planners already use a variety of computer based spatial data formats to describe and assess new developments. These range from traditional 2D Geographic Information Systems (GIS) and cadastral databases to 3D models of individual buildings, and visualisations of town centres. However, while it is now possible to construct a digital model of a proposed building to visually present these together with associated databases on building performance and construction, it is not yet possible to integrate this information with the cadastral based datasets commonly used by planners. With better data harmonisation planners will be able to harness this rich source of information to effectively measure the outcomes of planning proposals.

BUILDING INFORMATION MODELLING

The UrbanIT project will focus on the emerging technology of Building Information Modelling (BIM) in order to apply the same principles to urban modelling. In BIM, the building is seen as a complex assembly of objects that represent both the physical fabric of the structure (walls, slabs, doors, fixtures, etc) and conceptual objects such as spaces, storeys, functional zones and sites. This permits the objects, and the relationships or dependencies that exist between them, to be explicitly represented within the model, allowing a wide range of systematic analyses to be undertaken to test and evaluate the design proposal. In the literature, this is referred to as semantic modelling (for example, Kalay 1998) because it allows us to capture the deeper meaning of the real-world entities that we are modelling.

To take advantage of BIM for design analysis at the scale of a single building, an effective way is required to share the rich model data between a range of analysis tools. The most promising current development to support that data sharing is the building model schema known as Industry Foundation Classes (IFC) developed by the International Alliance for Interoperability (IAI). This is an object database schema that provides an accurate representation of a building

project to support the design and management of that facility throughout its complete life cycle (IAI 2005). A notable application of this technology in the urban management domain is Singapore's CORENET e-PlanCheck system (Maïssa *et al*. 2002), which carries out automated building code compliance checking through a single portal integrating IFC-formatted building submissions for over 12 regulatory agencies.

This technology creates an opportunity for the development of a whole suite of new computer tools that can access BIM data and undertake multiple analyses. These can cover initial planning areas ranging from issues of urban ecology, urban sustainability, transport planning, demographic change and economic development. In addition, the technology provides a platform for the efficient management of traditional planning and development processes such as development and building approvals. Already, the Norwegian Directorate of Public Construction and Property (Statsbygg) are building a system (known as Byggsøk) that is based on the Singapore code-checker and extends the permit process to include Development Approval with a preliminary integration of GIS and planning data. Our proposed research will extend this Norwegian initiative into the domain of urban analysis and policy development by demonstrating how the data harvested through the development approval processes can be integrated into an on-going strategic planning assessment process. Statsbygg have indicated strong support for our project. More recently, the group behind the CityGML, SIG-3D in Germany have begun to look at using IFC to support rich urban data modelling, and they too will be collaborating with this research.

EFFECTIVE URBAN INFORMATION MODELLING

The key question is how to link GIS and 3D visualisation modelling together to create an effective planning tool. Members of our research team have completed some preliminary work in this area (see Barton, Plume & Parolin 2005), and this work highlighted the need for better integration of data. GIS are the traditional tools used in urban planning and management. Although this provides for sound systematic analysis, the data for an effective urban management GIS must be drawn from a range of government instrumentalities. These data are not always current or accurate, and may be held at an inappropriate level of detail. A recent trend to supplement GIS analysis is to develop 3D city models that collect cadastral, topographical and CAD data and combine these with aerial imagery to visualise urban landscapes. In 2000, the Centre for Advanced Spatial Analysis (CASA) conducted a comprehensive survey and reviewed over 60 such models (Batty *et al*. 2000). They found that there are a plurality of techniques and approaches to 3D city modelling in use today, but showed that while they begin to address the fundamental need for integrated information by permitting visualisation of that descriptive data, most failed to have an impact on urban management because the data was purely visual. The models provide little opportunity to carry out the essential

social, economic and environmental analysis needed to create sustainable cities. The capacity of these models to assist in complex decision-making is limited by their lack of ability to harness more meaningful information about the geographic areas they represent.

CREDENTIALS

Our research team has strong credentials to address these issues and the UrbanIT project builds on recent research in this area by members of the research team. For instance, work recently undertaken by the City Futures Research Centre for the City of Penrith Council (Randolph and Holloway, 2005) piloted a framework whereby redevelopment proposals can be assessed in terms of their likely social outcomes based on census profiling linked to cadastral based 3D visualisations of these proposals. Similarly, research for a recent ARC Linkage project undertaken by Randolph and colleagues (Randolph *et.al*, 2007) modelled the water and energy consumption of 12 housing estates in Sydney, providing a methodology for incorporating data on environmental impacts into the proposed 3D framework. These research initiatives highlight the potential benefit for planners if comparable spatial information could be integrated into a live 3D urban model that is kept up-to-date through a range of planning processes, providing an information-rich spatial model of the city.

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