A Landscape Architect's Review of Building Information Modeling Technology

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Technology

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Integrated Project Delivery (IPD) integrates people, systems, business structures, and practices into a process that harnesses the collaboration, talents, insights, and information of all participants to reduce waste and optimize efficiency through all phases of the design, construction, and life-cycle maintenance of projects (IPD Definition Task Group 2007). IPD is promoted by many trades and disciplines within the building industry, but is not promoted by landscape architecture profession (IPD Definition Task Group 2007; Eastman 2008; C. C. Sullivan 2009).

A key component of IPD is the early formation of the design and construction team, and the collaboration and contribution of knowledge and experience from all members of the project team. Building information modeling (BIM) software has been critical to the success of IPD and includes the following software: Autodesk Revit, Graphisoft ArchiCAD, and Nemetschek Vectorworks. This article will review Autodesk Revit Architecture 2009.

BIM is used for designing, creating, and managing building data during the life-cycle of a building. The result is a computer model that includes the building geometry, spatial relationships, geographic information, material properties, and quantities of all building components. These topics may sound familiar to landscape architects as Geographic Information Systems (GIS) provides similar types of functions. The difference between BIM and GIS is scale. BIM simply brings GIS functionality to the scale of the building and its many components by providing highly accurate information in a computer aided drafting environment.

A key component of BIM technology is the 3D parametric object. Parametric objects have parameters and rules that determine the object's geometry, features, and properties. These parameters and rules allow the objects to automatically update based upon user control or changing events (Eastman 2008). Parametric objects are also linked, and when an object is changed in plan view, sections, details, and 3D views are automatically updated. As a result, reports (for example, bill of materials, schedules) and specifications can be automated within the model. Since BIM models are constructed of quantifiable and measurable components, it is easy to generate LEED compatibility and energy analysis reports, and construction documents.

BIM has the potential to revolutionize the accountability of designs. As owners, clients, and decision makers require the quantification of design choices, BIM can help stakeholders make informed decisions between two equally desirable designs.

BIM can also eliminate inefficiencies in the design and construction process. Working with a central file allows for real-time updates of information so every consultant is working with current information. Automated construction documentation and centralized file repositories have saved time and money by reducing change orders (Eastman 2008).

Autodesk has established itself as a leader in the CAD and BIM industry within the United States. Autodesk's Revit software has been tailored to the needs of the disciplines of Architecture, Structure, and Mechanical, Electrical, and Plumbing. To increase functionality, Revit easily imports many CAD file formats into a Revit building model.

Within the first few minutes of using Revit it is apparent that the software is incompatible with the workflow of landscape architects. Most noticeable is the lack of an efficient means to grade a site. To grade a site it is necessary to use Autodesk Civil 3D and Revit Architecture; the grading must be completed in Autodesk Civil 3D, then imported as a 3D CAD file into Revit Architecture to create a surface. It is then necessary to subdivide different surface materials into distinct sub-regions to create a site model that is defined by individual parametric objects (for example, road, sidewalk, turf, etc). This process is very time consuming and pushes a Windows x64 system to the limit of its processing power.

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Two additional drawbacks to Revit are interoperability between programs and lack of predefined site parametric objects. IPD requires collaboration and the exchange of information between team members; however, many non-Autodesk generated file formats are impossible to import into or export from Revit. This is a major limitation because to truly collaborate one must often use several software packages. Furthermore, while Autodesk provides almost a limitless library of building, structural, and mechanical components, it landscape components are limited.

Despite these limitations, Revit is becoming the software of choice for BIM in many firms that currently use Autodesk products. To best facilitate a landscape architectural workflow, it is necessary to supplement the workflow with: AutoCAD Civil 3D (with a plugin such as Land F/X plus irrigation), Revit Architecture, and ESRI ArcMAP. The combined cost of these products for the average user is $18,480.00.

With current economic pressures, and clients demanding faster project delivery with a higher degree of accountability, BIM can provide an advanced software solution. However, Autodesk Revit is currently not a practical tool for landscape architects. These issues are not limited to Autodesk Revit. Graphisoft's Archicad has similar issues with software interoperablility, a lack of predefined site parametric objects, and non-traditional landscape architecture workflows. And, despite Nemetschek's Vectorworks providing a sensible landscape architectural solution for BIM, it does not integrate well with Revit or ArchiCAD. The lack of landscape architectural integration across software points to a larger issue.

Currently IPD and BIM software are being developed by the software and construction industry with American Institute of Architects at the helm, and landscape architects have little to no voice in this process. To move towards integrated, sustainable construction projects, faster project deliveries, and greater design accountability, site and building development must be incorporated. Clients realize the benefits of IPD and are demanding BIM. Landscape architects cannot afford to be left out of the process.

A concerted effort by the profession needs to be organized—one voice alone will not gain the attention of an entire industry. The American Society of Landscape Architects (ASLA) needs to lobby to be included in these discussions. In particular, the ASLA Computing Professional Practice Network should be actively engaged in addressing the concerns of its members to software manufacturers.

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