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BIM Goes Residential (AEC Insight Column)

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Design and production software give homebuilders all the advantages of BIM.

For the past six years, building information modeling (BIM) has been hailed by designers and constructors of commercial and institutional buildings as a revolution in the construction business. Ironically, the world of stick-built, single-family detached dwellings on the U.S. market has long enjoyed many of the same benefits without all the hoopla. A large chunk of this market is served by local and regional homebuilders operating as integrated design-build organizations and turning out a few dozen homes or fewer per year.



Figure 1. Third-party providers, such as CG Visions, offer homebuilders comprehensive modeling and plan services based on sophisticated and integrated software technology that might otherwise be beyond the reach of a residential builder. (Image courtesy of CG Visions)

These builders require software that includes many of the capabilities demanded by architects for design and modeling, plus the ability to easily produce plan sets for filing with building officials and coordination with subcontractors (such as plumbers and electricians). They also require that their tools provide unique capabilities for generation of framing plans, bills of material (BOMs), cut lists for lumber yard orders, and so on. Furthermore, homebuilders increasingly rely on slick renderings and animations to help them sell their as-yet unbuilt designs to prospective homeowners. The latest BIM-like capabilities extend to pricing and ordering materials and components — such as windows, doors, plumbing fixtures, and the like — and closing the loop from the digital model back to the onsite work for greater accuracy of construction and assembly. In fact, there are so many builder-focused design and production tools on the market that it would be impossible to do justice to all of them in a single column. My apologies in advance if I've overlooked one of your favorites.

Sticks and Stones

BuildersCAD and the related Intelli-Framer product — sold by the same company as ARRIS, a pioneering general-purpose architectural design program — encompasses wood-framing and material-takeoff functionality not needed by architects who don't also build. This extends to ordering key homebuilding components, such as doors and windows. Sigma Design also markets its eZ series of viewing, mark-up, and online collaboration tools that can be especially valuable on smaller projects (such as residential construction) that may not justify the expense and system overhead of a full-blown project collaboration network (see "Share and Share Alike," *Cadalyst*, December 2007, www.cadalyst.com/1207AECInsight).

Considered by many to work similarly to ArchiCAD, a leading BIM model-authoring tool, SoftPlan ranks among the leaders in all aspects of product needs for homebuilders, from design to estimating, framing, permitting, and so on. SoftPlan includes visualization capabilities to help homebuilders sell their designs, and the company provides excellent support, training, and educational materials to make its products easy to use.

Envisioneer, from Cadsoft, is another highly capable, full-function software package for homebuilders that is offered at a competitive price point. As with many programs aimed at homebuilders, Envisioneer encompasses everything from interior design within the home to landscaping design that surrounds the home. With all of Envisioneer's functionality so tightly integrated, Cadsoft touts the speed and efficiency afforded by its approach.

Hail to the Chief

Rated by many observers as the benchmark product in this sector, Chief Architect (from the company of the same name) provides one of the most comprehensive and full-featured product offerings for homebuilders, remodelers, designers/architects, and drafters. As with most of the homebuilder software competition, Chief Architect generates framing plans, BOMs, and cut lists. Chief Architect's drafting tools are comprehensive enough to produce even the most exacting drawing sets for permitting and field use.

Chief Architect also offers home design software in conjunction with *Better Homes and Gardens* magazine, and this software is targeted at the home-enthusiast market — consumers contemplating their own dream home.

Taking Care of Business

Homebuilding is a business as well as a craft, so home-builders need business software tools for land inventory, customer management, scheduling, change orders, postconstruction warranty work, and so on. Many homebuilders make do with checklists and Excel spreadsheets to manage these tasks, but more integrated approaches are available from BuilderConnect Solutions, BuildTopia, and BuilderTREND. All exemplify the Web-based software-as-a-service (SaaS) model, in which the software user need not purchase, install, configure, or maintain any software applications on his or her own business premises. All the requisite functionality is accessible 24/7 wherever the builder has an Internet connection.

BuilderConnect emphasizes its comprehensive approach, and BuildTopia's key differentiating feature is BTAcounting, with specific interfaces to mainstream financial programs such as Microsoft Dynamics, QuickBooks Pro, and Timberline. BuilderTREND extends its Web-based communications loop to mobile and handheld devices, along with the capability to take, send, and view photographs, thereby streamlining one of typical builders' most time-consuming chores.

Closing the Loop

As noted above, homebuilder software includes many tools and functions that predate the current popularity of BIM for general construction. Some homebuilder business management tools take advantage of the latest, Web-based, SaaS delivery model. A few tools leverage some of the more advanced recent ideas regarding BIM, but they are scaled appropriately for the homebuilder market.

One company offering such solutions is CG Visions. As with many of the standalone home-design and homebuilder programs, CG Visions can provide plans (figure?1), models, estimates, framing plans, visualizations, marketing tools, and back-office integration. However, CG Visions provides these capabilities on a service basis, rather than selling software with which builders can do it all themselves. By relying on advanced BIM software and skilled in-house professionals, CG Visions can cater to any or all the information management and documentation needs of a typical homebuilder. Especially for builders who prefer the hands-on craft side of building (over the computer-based office work of the building business), CG Visions' approach can yield more professional-looking results with less in-house effort. In a time of rapidly evolving technology and standards, the CG Visions business model, like service bureaus of the past, helps insulate small business owners such as homebuilders from the risk of technological obsolescence in their software purchases.

Another important component of the building lifecycle subject to increasing automation through BIM tools is the pricing and procurement of building components. Many tools exist for architects and engineers to link their BIM models with specifications (see "Building with Words," *Cadalyst*, February 2008, www.cadalyst.com/0208AECInsight). However, the ability for any builder, especially a homebuilder, to easily obtain prices for individual components contained in a design is not yet widely available or implemented. This niche is served by 1ST Pricing, a patent-pending solution that links CAD/BIM models to actual prices of real components. Although 1ST Pricing intends to expand its offerings to cover all components for all classes of construction, its initial base is in the residential construction market, making the product ideally suited to the current needs of homebuilders.

An additional area in which BIM technology continues to evolve is the connection between virtual construction — digital models of buildings and their associated data — and the physical world. In BIM-oriented general construction, laser scanners acquire data about existing conditions and as-built conditions during and after construction. Total stations and similar computer and laser equipment enables model-driven projection of control points on and above the commercial jobsite. Although appealing, these tools are beyond the reach and exceed the needs of most residential projects. However, the AccuFrame System takes a unique approach to closing this virtual–physical loop for residential projects. AccuFrame works from models to generate framing templates that enable rough framers on jobsites to operate with significantly increased accuracy and significantly decreased waste. By confidently working error free, framers also can work faster. The result is a triple-threat improvement in cost, time, and quality.

Although operating at a smaller scale and directly applicable to the jobsite, AccuFrame works in the spirit of direct model-derived control over fabrication that is the hallmark of the most advanced BIM automation projects. One may not think of a mechanic assembling laser-guided titanium components of a Gehry- or Foster-designed cultural icon in the same sense as a residential framer cutting joists to precise length via an AccuFrame template, yet both represent a continuum of tools and methods that bridge from the grandest commercial and institutional BIM applications down to the design and production needs of even the humblest homebuilder.

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