

Transitioning to BIM

This paper profiles best practices for implementing building information modeling (BIM) solutions, exploring the key success factors for a successful BIM deployment, the process and staffing changes that can be expected, and the requisite training needs for BIM.

Key Success Factors

Let's begin by focusing on the key success factors for a successful BIM deployment and what firms can expect as they transition from 2D or object CAD systems (sometimes called single-building modelers or virtual building modelers) to a purpose-built BIM solution like Revit® Architecture software.

“A New Order of Things”

At the end of 2003, Autodesk commissioned an independent research study¹ that looked at the process changes, benefits, and challenges being experienced by firms implementing Revit Architecture. A key finding of the research is that practically all of the participants in the study were grappling with issues of change. To supplement the study, Autodesk conducted an online survey of their Revit Architecture customers, which included questions relating to change. In the survey, 82% of the respondents noted their design process was changing as a result of using Revit Architecture, and 80% reported that their deliverables were changing as well.

"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm (indifferent, uninterested) defenders in those who may do well under the new."

Niccolo Machiavelli, *The Prince*

Think back on the resistance there was to the first 2D CAD systems. Then came 3D modeling systems and even more grumbling. This same resistance to change holds true for BIM solutions.

A purpose-built BIM solution like Revit Architecture provides architects a distinct, intuitive, and powerful means for building design. Its parametric approach to modeling is

¹ *Implementation in Practice*, by Dr. Lachmi Khemlani (available at www.autodesk.com/revit)

the essence of true architectural design, but it also represents a groundbreaking new way of using a computer to design. Transitioning from CAD-based technology to object CAD technology is an incremental change. Moving to parametric building modeling is a bigger change, but one that's particularly attractive to firms that want to use technology as effectively as possible. Education and awareness about BIM - the dramatic benefits it can bring as well as the work flow changes it requires - are key weapons when tackling this natural resistance to change.

Implementation Strategy for BIM

A formal implementation strategy is an essential component of any successful BIM deployment and must go well beyond a simple training & rollout schedule. It should address head-on the workflow and organizational changes inherent to BIM.

The implementation strategy also needs to address how the new solution will initially co-exist with existing 2D drafting or 3D modeling applications. Wholesale abandonment of these legacy design applications is impractical and often ill advised, but as the implementation expands, the strategy may also include plans for the phased retirement of legacy systems if applicable.

Firms should look at how the building information model can be accessed by related applications such as energy analysis, cost estimating, and specifications. Specifically, look at the work you need to accomplish today, and match that to the tools you put in place today.

For firms that handle very large projects, your implementation strategy should include guidelines for creating and working with large models (additional hardware requirements, techniques for reducing model complexity, etc).

The Right Stuff

Because BIM represents a new approach to building design – not just the implementation of new supporting technology - firms should pay close attention to the makeup of the transition team. The team should be comprised of agile, progressive individuals who understand the big picture and will act as evangelists for BIM.

Your team needs to come from the entire organization - reflecting the underlying process changes that come with BIM. And your user community should extend beyond your core group of CAD operators. In fact, don't put your best CAD operators on a solution like Revit Architecture—put your best building designers and architects on it!

Bread & Butter Projects Starting Out

Select the right project to start with; something your firm already knows how to do, so there's only a single dimension of learning.

If possible, select a project type with known metrics, so you can accurately gauge the benefits of the new solution. Some of the most important benefits of BIM are difficult to quantify: more time for up-front design, clearer presentation of the design to the client, etc. But some benefits, such as increased documentation productivity, are more immediate and relatively easy to measure. Gathering these statistics can substantiate the promised ROI of the system and help garner support amongst the "show-me" members of the firm.

The Way Forward

RTKL Associates (www.rtkl.com) is one of the world's foremost architectural, engineering, and planning firms, with over 700 employees in 10 offices worldwide. The company's portfolio of large-scale projects include the U.S. Capitol Visitor Center in Washington D.C., the Chinese Museum of Film in Beijing, and the Maryland Museum of African-American History and Culture in Baltimore, Maryland.

RTKL is currently in the process of converting to Revit Architecture after experiencing the benefits of BIM on four major projects. "Our implementation of Revit reflects our belief that its database concept is the future of architectural design and document software," reports Douglas Palladino, AIA, a principal at RTKL's Washington DC office. "We know that the transition to Revit will change how we do business. We can't send everyone off to a class for a couple of days and just expect everything to fall into place. Revit is much more than a new design tool; it changes everything!"



Figure 1

RTKL Associates is converting its offices to Revit after experiencing the benefits of building information modeling on major projects such as this Washington DC Union Station Garage addition.

Checklist for Success

At the top of the checklist for a smooth deployment of a BIM solution are these critical success factors:

- Develop a sound, comprehensive implementation strategy,
- Assemble the right team, and
- Select a suitable starting project.

And be prepared for the inevitable resistance to change that a revolutionary approach like BIM will provoke. But after the tedious error-prone world of systems that the architectural profession has tolerated up until now, they'll soon realize that the parametric building modeling technology of Revit Architecture is like a dream come true. As stated in the conclusion of the third-party implementation study referenced above, "Those who have persevered in their learning and use of Revit have come to love the application and find it anathema to go back to traditional CAD. For them, the practice of architecture will never be the same again."

Getting Ready for BIM

BIM represents a novel approach to building design that will change the functional dynamics of a design firm. Therefore the transition to BIM requires a thorough examination of how best to organize an office around BIM – identifying potential process changes that BIM will bring about and how to apply the right mix of people and skills to those new processes.

A New Way of Working

In the Autodesk survey referenced earlier, 82% of the respondents noted that BIM was changing their design process - forcing them to re-evaluate their existing ways of working. As a result, Autodesk's consulting team often begins a BIM implementation with a process assessment. Over the past several years these assessments have produced some key learnings that can be leveraged by any firm adopting BIM. Here are the four most important ones:

- 1) **Re-balance team effort to design phases:** Perhaps the most significant change resulting from BIM is the luxury of being able to increase the amount of time spent in the design phase. Revit creates and coordinates drawings dynamically, directly in the building information model, so the documentation effort is dramatically reduced. Therefore, firms should plan on budgeting much less time (and staff) on documentation and coordination, and more time in early design - resulting in better decisions early on.
- 2) **Avoid over-documenting:** Revit produces drawings so easily it can lure a firm into "over-documenting". At the beginning of a project, it's a good idea to create a cartoon set of drawings (which is also part of the building information model) to serve as a guideline and scoping mechanism for documentation as the design progresses.
- 3) **Use more visualizations for client communication:** Revit produces high-quality renderings and walk-throughs on-demand, which facilitates communication with the client and enables a firm to be much more responsive in the design process – at little or no additional expense. As a result, firms may want to revisit their policies and procedures surrounding client deliverables and the provision of renderings.
- 4) **Consider some expanded services:** Finally, the Revit building information model can interface with and drive certain analyses and tasks such as daylighting, energy usage, quantity takeoffs, and specification coordination. By taking advantage of some of these capabilities of the building information model, firms can offer expanded services to their customers.

The BIM Team

These process changes also affect project staffing and the distribution of skill sets, which should be taken into account when establishing your BIM team.

The makeup of a traditional architectural project team is governed by the huge effort required to produce a construction document set, with roles corresponding to drawing types: plans, elevations, sections, details, etc. As described earlier, Revit Architecture significantly reduces the documentation effort - thus rendering this traditional project structure obsolete. Instead, a Revit Architecture BIM team should be organized around functions such as project management, content creation, building design, and documentation.

Firms will also find that they can budget for much smaller project teams as the overhead of documentation and traditional CAD tools is reduced. In some cases, as few as half as

many people are required to complete a BIM project compared to traditional ways of working. The smaller team (3 to 5 people is a typical size) encourages agility during the implementation period and sets the right expectations for the rest of the firm that BIM doesn't require resources beyond conventional methods to succeed. As the implementation expands, let the BIM team grow organically – adding new staff as needed.

Investing for Productivity

One firm that has experienced these transition learnings directly is URS. The URS Corporation (www.urscorp.com), a global architecture, planning, and engineering firm, provides consulting services in planning, design, and construction management for architectural and engineering projects as well as planning and environmental consulting services to both public and private sector clients. Ranked number one in Engineering News-Record's list of the top 500 design firms, the firm is one of the nation's largest professional service organizations whose total staff of more than 26,000 includes some of the most distinguished and experienced representatives of the architectural and engineering professions.

In the fall of 2003, URS was mid-design for a prominent corporate college conference and training center in northwestern Ohio when their client came to them with additional budget and a request to add features to the project. Using Revit Architecture, URS was able to swiftly redesign the building (in about 40% less time than would have been required if they had been using a traditional CAD program) and meet the project's first fast-track construction deadline. Following this success, URS decided to implement the software on two additional projects and continues to expand their use of Revit Architecture.



Figure 2

URS Corporation used Revit to design this 107,000 square foot, \$14 million dollar, middle school located in Ohio.

URS recognized at the outset that implementing Revit Architecture software would require a new way of working. To ensure that the staff of the Cleveland office, where the software was first being rolled out, would experience rapid success, the firm engaged our Autodesk Consulting team for a comprehensive training and implementation program. This program included an initial two-day process assessment, a week of product training, and subsequent, staged implementation and evaluation services.

“By investing in implementation services, we were able to quickly become productive in using the software,” said Laura Rees, director of architecture for URS Cleveland, a division of the URS Corporation. “We had no idea then how much time we would eventually save by making this crucial initial technology decision.”

Ready, Set, Go

BIM can radically transform the process of designing, constructing, and operating a building. But take a cue from the experiences of forward-looking firms like URS who have

experienced the transition – invest the time and energy up front to carefully plan for that transformation. Know what you're trying to do before you do it!

Training for BIM

System training tends to be a balancing act for most firms - teaching the right skills to the right set of people with minimal disruption. There's no magic formula or right answer for BIM training. Size of a firm, existing expertise, rollout strategy - all of these need to be factored into your BIM training plan. But here are three training takeaways to consider.

Training for Change

BIM means changes - changes in way of working, changes in staffing needs and project organization, and changes in how a firm uses of the information contained within the building model.

Because change is potentially disruptive to ongoing operations, it needs to be addressed head-on, prior to implementation. Education and awareness about BIM are key tools when tackling the natural resistance to change, particularly in large firms where organizational structure and disparate locations make communication more complicated. Large firms should preface their launch of BIM with a series of corporate presentations, (tailored for different levels of staff) explaining the reasons to consider transitioning to BIM, its potential benefits, and the changes that it may bring about.

Productivity Payback

When an application seems fairly easy to learn, like Revit Architecture, it may be tempting to just skip training altogether. Avoid that trap. BIM is very different from CAD and without some sort of training, users will try to force the BIM solution to work like their CAD system did - with poor results.

The loss of billable hours during training is always a concern. But keep in mind that short-term productivity paybacks will quickly offset that loss. A recent online survey of Revit customers reported that although there was an average productivity loss of 25–50% during the initial training period, it took most customers only 3–4 months to achieve the same level of productivity using Revit as with the previous design tool. Building on that statistic, the estimated increase in productivity (as a result of migrating to Revit) ranged from 10% to over 100%, with more than half the respondents experienced productivity gains of over 50% and close to 20% experienced productivity gains of over 100%.

Just-in-Time Training

When introducing software, time constraints often force firms and staff to keep moving ahead on productive project work while learning the new system. In these circumstances, on-the-job training (the ultimate just-in-time training!) is a good answer - and it also happens to be a very good learning environment.

For small firms, this may mean that your user(s) spend a day or so running through the "getting started" self-paced tutorials or web-based classes that software vendors usually provide with the software. Then, complete your training by working on an existing project. Think about starting with a project that your firm already knows how to do, so there's only a single dimension of learning.

Larger firms may want to combine the self-paced training with instructor-led training for some percentage of users, and then let them dig into a live project to complete their training. Another training option is role-based classes (where users receive training content that targets their specific project role). Most firms don't try to implement the entire

spectrum of software functionality - they role out functionality as needed. The same theory should be applied to training - not everyone needs to know everything. Focus your initial training efforts on must-have functionality, then handle the rest on an ad hoc basis.

It's also a good idea for larger firms to have dedicated solution experts providing over-the-shoulder product support and coaching during this period. These "super users" will need to be specially pre-trained for this mentoring role, usually by sending them to classes offered by your BIM software vendor or reseller. Although these experts will most likely be assigned to project work of their own, having ready access to this expertise can be essential during the ramp-up period, preventing the design team from getting stuck on some software feature during a critical phase of the training project.

TIP: Set aside time to produce project templates based on your office standards and have them available for your project training. This allows your users to learn the software in a familiar context.

Training Case Study

The Stubbins Associates (www.stubbins.us) is a 100-person design firm located in Cambridge, Massachusetts, and Las Vegas, Nevada. The firm's projects tend to be large and fast paced within six building market sectors; hospitality, healthcare, laboratory, corporate commercial, college & university, and government & institutional. As a rule, the firm utilizes advanced technology, including 3D modeling, on all projects. For several years, Stubbins has been investigating BIM solutions. In the spring of 2004 they rolled out Revit Architecture on 2 initial projects: a 200,000-square-foot tenant fit-out for a high-end advertising agency, and a 360,000-square-foot hotel.

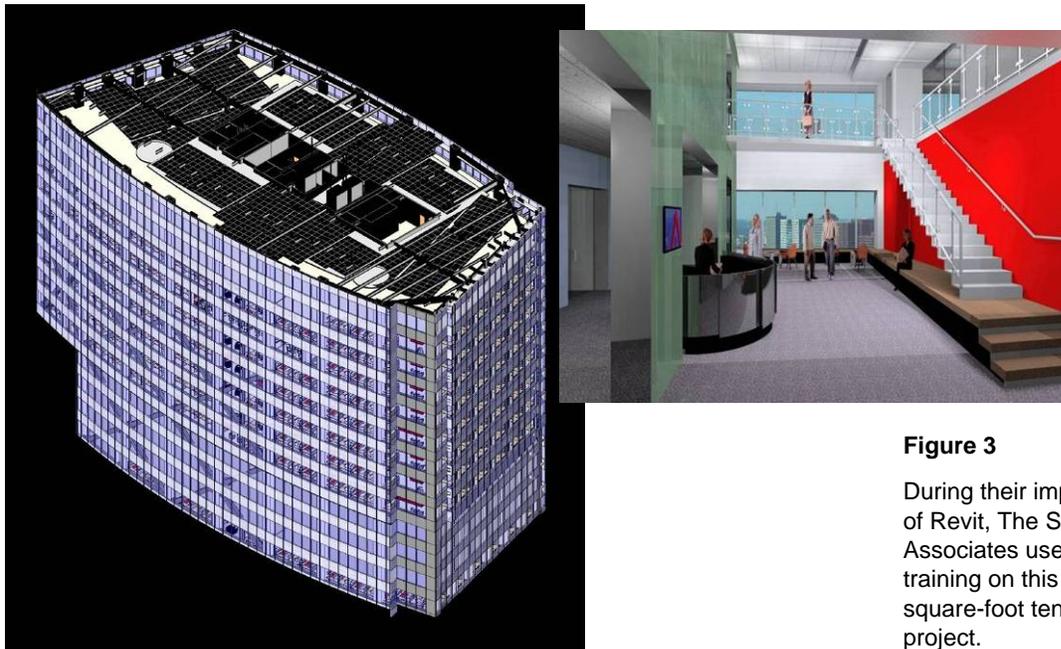


Figure 3

During their implementation of Revit, The Stubbins Associates used just-in-time training on this 200,000-square-foot tenant fit-out project.

Stubbins used a combination of classroom and on-the-job practice during their Revit Architecture implementation, immersing their new users in two weeks of training. Users received classroom training in the morning and then applied their training on project work during the afternoon. "Software training is a catch-22," reflects Jeff Millett, AIA, Director of Information and Communications Technologies for Stubbins. "You can't learn it without using it but you can't use it without learning it. We felt this half-day split of just-in-time training was a good balance for us. Although the hours weren't billable, we were able to

move the project forward and our staff could immediately apply the concepts they learned on a real project. The key is to get people using the software straight away."

What NOT To Do

Don't forgo BIM training. There are a variety of training options that can mitigate its cost. Your dip in productivity will be short-lived. On-the-job training will keep your firm productive while learning the new system. And there's light at the end of the tunnel. "Now that we've got a couple of projects under our belt, we plan on starting our new projects in Revit," reports Millett. "It's sad to see an architect drafting in CAD - such a waste of talent and energy. Revit is an exciting tool and we're looking forward to having our staff designing in a whole new dimension."

Summary

BIM can deliver tremendous business benefits, but doing so requires a departure from traditional ways of working. Moving from CAD-based technology to object-CAD technology can be an incremental or evolutionary change. Moving to building information modeling technology is a much larger change, and thus requires careful implementation planning, staffing- and training.

About Revit

The Revit platform is Autodesk's purpose-built solution for building information modeling. Applications such as Revit Architecture, Revit® Structure, and Revit® MEP built on the Revit platform are complete, discipline-specific building design and documentation systems supporting all phases of design and construction documentation. From conceptual studies through the most detailed construction drawings and schedules, applications built on Revit help provide immediate competitive advantage, better coordination and quality, and can contribute to higher profitability for architects and the rest of the building team.

At the heart of the Revit platform is the Revit parametric change engine, which automatically coordinates changes made anywhere — in model views or drawing sheets, schedules, sections, plans... you name it.

For more information about building information modeling please visit us at <http://www.autodesk.com/bim>. For more information about Revit and the discipline-specific applications built on Revit please visit us at <http://www.autodesk.com/revit>.



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