Successful Autodesk® Revit® Building Implementation

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BD11-2 It is no mystery that Revit is a great software tool. What people want to know is how to take advantage of its power. Because no two firms are the same, we will cover the 7 factors of planning Revit implementation along with the 4 key factors of success. We will also have guest speakers share real-world examples within their practices. After this class you will know what to do and what you need to avoid if you want to get started on the right foot.

About the Speakers:

James J. Balding, AIA is a licensed architect with over 19 year's experience and is currently employed with Wimberly, Allison, Tong & Goo (WATG) in their Irvine, CA office. Jim has over 18 years experience integrating technology into the architectural field. He has been a member of the Revit Client Advisory board since its inaugural meeting and is currently serving as the Revit Product Chair for AUGI. Jim is the co-author of the Autodesk Press book, *Introducing and Implementing Autodesk Revit Building*. He has developed a successful Revit implementation strategy and has spent this past 3 years bringing the 5 worldwide offices of WATG up to speed in its use.

Mario Guttman, AIA is a vice-president and the Firmwide CAD Director for HOK, a multi-disciplinary, international design firm with 22 offices in six countries. In this role he coordinates the CAD Management activities of the offices and focus groups, as well as setting the strategic direction for CAD within the firm. Mario holds degrees in mathematics and architecture and is a licensed architect. In addition to practicing architecture for 20 years, he has worked in software development, computer-aided facility management and construction. HOK is a leader in the advanced use of information technology in the AECO industry and supports industry-wide interoperability standards. During the past two years the firm has begun a transition to Revit for its primary CAD platform and currently has over seventy pilot projects underway.

Rolly Stevens is an Associate at ESG Architects in Minneapolis, a national firm of 80 that specializes in multi-family housing, hospitality, and mixed-use development. Rolly is tasked with many roles within the firm, including Revit Manager, Assistant IT Manager, and Project Captain. He has over 15 years experience in architecture and over 10 years experience in CAD management. A Revit user for over 4 years, Rolly has developed a 5 year implementation plan for ESG, which is entering its third year. Rolly also heads the Minnesota Revit User Group (MNRUG), and is playing an active role in promoting Revit use throughout Minnesota.

Introduction

The following text is an outline of several firms' thoughts on the implementation of technology, BIM and Revit in particular. We have organized this handout to follow our presentation. We will discuss some general background information and follow up with real world findings and examples from each of three firms. We have representation from a small (ESG), medium (WATG) and large (SOM) firms to cover the whole spectrum.

Overview

Revit implementation background

- Why change
- The steps toward change
- 7 factors of implementation
- 6 phase of a Revit user
- 5 emergent categories of BIM evolution
- 4 keys to success

Real World Use at ESG

- Decision Making
- Challenges and Solutions
- Implementation Successes

Real World Use at HOK

- The Decision to Use Revit
- Work Process
- Multiple Models and Worksets

Real World Use at WATG

- Decision Making
- Challenges and Solutions
- Implementation Successes
- The Horizontal Approach and The Place Holder Approach (HA-PHA)

Additional Information

- Books
- Magazines
- Blogs
- Forums
- Content

Why Change

There are many reasons to change to the Building Information Model (BIM). In the beginning the most compelling is the three dimensional aspect of designing and documenting a project. In addition to that, many find the coordination of the single model to be a compelling reason. If that doesn't convince you, the fact that firms are consistently providing better service and deliverables in less time or with less staff and occasionally both, may sway you. The bottom line is that it has always been the "Holy Grail" of design and documentation and only recently have the hardware and software been able to deliver on "the promise".

The Steps Toward Change

There are as many processes or steps to go through as there are people going through them. The reason for outlining one such linear path is not to outline the process but to establish the position with in the process an individual or firm might be in for the purpose of this class. These linear steps might be; (1) hear about the change, (2) evaluate change, (3) decide to change, (4) plan the change, (5) implement the change, (6) Re-plan the change (7) implement new plan, (8) Reap the rewards of the change. For the purposes of this class it is assumed that the students are somewhere between steps 2 and 7.

The Seven Factors of Implmentation

While there are many different factors of implmentation most can be grouped into one of seven categories. The following list is in order of importance, GENERALLY speaking. The purpose of listing them is to give an outline of topics that should be considered and understood when planning the implementation of a BIM tool such as Revit.

Firm size
Project sizes
Architectural style
Project types
Scope of services
Firm locations
Firm culture and age

Firm Size

The size of the firm is the number one issue when it comes to implementing the Building Information Model. While there are many key factors that firm size will affect implementation the key factors are project size, technology, training/support/R&D, personnel, decision making, and standardization. Below are **"GENERAL"** observations regarding firm size and the key firm size factors listed above. Each category has been labeled with advantage towards the larger or the smaller firms. This is by no means an absolute and the advantage could be great or a slight, use your own experience when considering these issues.

Project Size – Advantage Smaller Firms

Large firms generally have larger projects and when it comes to BIM that can be viewed as an obstacle with regards to implementation. If you consider that you are adding all of the building data to one file, that file can certainly grow and becomes exponentially larger than the single referenced files you may be presently using. BIM products have strategies to alleviate the issue of large projects; however, many firms feel that they need more time to get to a comfort level using full BIM implementation on such projects. It is important to note that this does not count out larger projects, they will simply require a little more planning and more experienced BIM users.

This is where the smaller firms tend to shine. They typically have smaller projects that are ideal for BIM implementation. There is not as much information to be communicated in a smaller project which translates to smaller files and project teams.

One thing to keep in mind when selecting projects based on project size, It is advisable not to base the decision entirely on the floor plan area but the "spatial size", the amount of mass and detail to be built. For example, designing and documenting a 750,000 s.f. warehouse using BIM can be far easier than a 20,000 s.f. gothic cathedral.

Technology – Advantage Larger Firms

Due to the fact that BIM models are larger and more complex than ordinary 2D drafting files, BIM software and models require fast machines with plenty of RAM and good video cards. When it comes to technology, the larger firms usually have the upper hand. They typically have the latest hardware, fast LAN's and WAN's, and perhaps a dedicated IS team to support the systems.

The small firm generally finds themselves behind the eight ball in this arena. They may have made a recent, significant investment in connectivity, hardware or software lately and can't afford to budget large ticket items such as these every year. A small firm with an investment in technology could find themselves in a very advantageous position when implementing BIM.

Firms of any size should pay close attention to the hardware requirements of BIM software as well as performance on typical firm project types. Maintaining up to date hardware and software often pays dividends not only speed of deliverables but pride of ownership, incentives to learn and maintain knowledge not to mention reinforcing a companies' commitment to technology.

Training/Support/R & D – Advantage Larger Firms

The larger the firm the larger the operating expenses. With this in mind the ability to create and maintain in-house expertise to provide training and support as well as perform research and development roles for firm specific tasks. This phenomenon often runs parallel with a firms CAD manager role, if the firm has a full time CAD manager, typically they will have a full time BIM manager; occasionally they are one in the same.

The smaller firm will tend to have a part time CAD manager, often an architect that knows the ins and outs of computers better than the rest of the firm. Firms can expect additional overhead responsibilities when it comes to BIM; however the return on investment is proving to be much larger proportionately to two dimensional CAD.

Training and support are two of the keys to success, discussed later, and should be given serious thought when implementing BIM.

Personnel – Advantage Larger Firms

When planning the implementation of BIM one of the first things you need is a "champion", the person responsible for heading up the change. However, one person can not do everything required to make the move to BIM, you will need talented people to carry out the plan and use the software to deliver on the promise.

Because the larger firms subsequently have larger talent pools to select from they generally have the luxury of hand selecting the users that best suit the chosen tool. One thing to note, however, the proportion of talent and roles between the larger and smaller firms will tend to be about the same.

Decision Making – Advantage Smaller Firms

When it comes to making the decision to change it seems to be better to have a single entity make that decision rather than by committee. No where does the saying, "too many chefs spoil the broth" apply more than the issue in implementing change. Larger firms with multiple locations will have more challenges in the way of purchasing, planning and organizing an implementation plan.

Smaller firms, generally one location, have but one "chef" who makes the decision to implement and it is time to move on. When changes in the plan occur there is not another round of negotiations, planning etc.

Standardization – Advantage Smaller Firms

Here again, the larger firm will tend to have many "chefs", from the top to the bottom. Somewhere in between might a local CAD manager with localized CAD standards and techniques. Throw in an occasional international firm and you have, potentially, different languages, building techniques, documentation techniques, cultures and infinitely more issues.

Once again the smaller firm will get the nod in this arena. With one location the standards can be established even voted on in one location perhaps at one time. When changes to the standard occur, communicating that change is simple and most will understand the reasoning as it undoubtedly has arisen from issues within the local firm.

Firm size - Conclusion

While there are many factors listed here there are many more that will be firm specific. As stated above, firm size is the number one consideration when deciding how to implement BIM at a firm. And while each subject has been titled with an advantage score the intention of this section is to make firms aware of the issues regarding firm size and to assist firms in their implementation process.

Firm Size Final Score: Larger firms – 3
Smaller firms – 3

Project Size

While project size is major factor in BIM implantation, it also is generally influenced by firm size, refer to "project size" under firm size above.

Architectural Style

When referring to architectural style and the implementation of BIM, the foundation of the distinction is the size, shape and the amount of the detail involved. BIM does not recognize the literal difference, for instance, between Romanesque, Renaissance and Post-Modern architecture.

Common sense, while not always common, does, in fact, make sense here. When it comes to modeling a building, straight, square forms are easier to model/build than the organic styles of Mr. Gehry. This is not to say that it is impossible to build, just more time and technique are required. If you can imagine the effort required to physically build the building, there is not a great difference to building it virtually using BIM. Simply put, more detail, shapes and mass equals more time to develop and build.

While modeling all of the components in a project has desirable effects, one thing to keep in mind, it is not always necessary. During the planning stages of a project it should be determined what will be modeled and what can be "represented" with CAD lines, arcs and circles or even hand drawings or sketches. A simple example, if you have raised wood paneling on a door, there is no harm in drawing lines on the surface of the door to represent the paneling and moving on with the project. Some might argue that it would not render properly or that there is a different material in the panel. The point is that there needs to be an understanding, on a per project basis, what is important enough to model and what isn't. Modeling in BIM is not an all or nothing proposition.

Project Types

Project types often affect different firms in different ways. Generally speaking, however, some project types are better suited for BIM while others are not. Again, this is not to say that it can not be done. Some of the aspects of project types that dictate the ease of implementation are repetitive elements, component driven, area driven, or those that make use of, and find great value in, the different visualization and/or scheduling advantages of BIM.

Below is a **"GENERAL"** outline of the advantages and or challenges typically presented by project type.

Entertainment/Retail

Some of the advantages of BIM in entertainment and retail might be the presentation value gained in color fills for area or room types or the coordination area calculations. Perhaps there is a need to schedule and color the tenant spaces by lease expiration, retail type or rent per foot. Bi-directional, live scheduling may also have advantages whether it is display racks, flooring or parking stalls.

Some of the challenges facing the entertainment/retail architect might be custom furniture and fixtures, project size and scale. It has also been noted that due to the nature of a retail mall, retailers often have architects of their own there are many different designs and ideas flying about at any given time.

Healthcare/Hospitality

Healthcare and hospitality designs, of course, are going to have significant gains using the repetitive, modular or component driven aspects of BIM. It could be argued that this is also the case with CAD drawings, where xrefs, blocks or cells are used, but BIM goes beyond that. When duplicating the data along with graphic representation of that data you have the benefit of scheduling, coordination and visualization. When a single change to one guest room sink and vanity can affect, the plans, interior elevations, sections, scheduling and specification information for 500 rooms there is great efficiency in place.

The healthcare and hospitality architects are faced with similar challenges. Generally their projects are large very complex designs with large project teams. Incorporating and coordinating that data set can become a significant burden. Planning a project of this nature is possible, but requires advanced planning and experienced BIM capable staff.

Residential

Residential gains major steps in the fact that it is generally smaller in size as discussed above. Beyond that there is the fact that residential clientele may not read or understand floor plans, sections and elevations, but certainly can understand a perspective or a rendering.

Challenges facing a residential architect might be the scale of the project as well. There is a tendency in residential work to be shown at a larger scale and therefore include more detailing in each drawing. This tendency can translate to the notion that all of the information must therefore be modeled. The residential architect would be wise to evaluate and plan the model.

Public/Religious

This is a very broad spectrum, projects large and small, simple and complex. What they have in common is that at that there is a large body of "critics" to please. Whether it is the congregation of a church or the citizens of a city, communication is the key ingredient. This brings the visualization aspect of BIM to the forefront. City councils can see the building within the proposed setting. The public understands the aesthetics and the color fill diagrams showing the location of the services to be provided.

Challenges that might face an architect specializing in these areas might include the fact that many of these building types might be rather large and ornate in nature, requiring additional time spent modeling. The need to provide many different presentation level images requires additional time is spent working out materials and computer rendering time.

Scope of Services

Due to the nature of BIM, building a virtual model of the project rather than representing one with lines, it has been noted that more of the effort is front loaded in the schematic design and design development phases. In other words, you are working out constructability issues earlier in the design process. This generally provides great gains in efficiency in the construction documentation phase. Architects need to be cognoscente of this issue and perhaps make adjustments in the area. When the scope of services ends at what could be described as the traditional design development phase there is a greater level of information within the model. Architects are beginning to understand this and responding in many ways such as marketing additional services, adjusting fees (front loading) to maintain projects through their entirety and/or using it as a sales tool for current and future work.

Firm Locations

It may go with out saying, but the more office locations there are the more complex the implementation process gets. There are many things to consider as noted above training, support and standardization also become more important and slightly more difficult when there are multiple office locations. It is not impossible to do, it will, however, require a little more planning. The planning will need to take into account the different office cultures, personnel etc.

Firm Culture and Age

Firm culture and age may not seem important in the planning stages of implementation; however, it will become readily apparent during the implementation itself. Areas to consider are, how well does the firm(s) accept and anticipate change. Is it a corporate culture? How do the lines of communication operate and what is the management organization. Who will need to back and support the initiative?

When age is considered, generally speaking, younger firms are more open to change while the older firms might be more set in their ways and resist a change of this nature.

7 Factors of Implementation – Wrap Up

This brief is, just that, a brief. There any number of combinations and additional factors that could, and very well will, affect the implementation of BIM at any given firm. The intent of this brief and class is to give **GENERAL** guidance to those on the implementation path.

6 Phases of Revit (reprinted by permission – Christopher Zoog)

Although the following is a light hearted look at the phases a user might go through as they traverse the Revit learning curve, it holds very true. The phases are real and the team/firm should understand that it is quite normal and be prepared to understand and allow for it. The most frequently asked question is, “How long does it take to get up to speed in Revit?” or, “How long does it take to get to phase 5?” The simple answer is, it is not based on a time line but repetition, so people that have gone through 2-3 typical firm projects find themselves “Enlightened”.

Phase One - Initial Excitement!!!

"Holy ****! Look what I can do with this thing!"

Phase Two - First bump

"Hmmmm...? Why won't it do what I want? That's not how I do it in (insert other cad software here)!"

Phase Three - Creamy Middle

mmm... things are going more smoothly, now.....mmmmm"

Phase Four - WTH stage

The family editor "eats you up and spits you out"!

Phase Five - The Enlightenment

Things really begin to click! You understand why things are happening in your model, and better yet how to control them and avoid problems. You have conquered the family editor.

Phase Six - Zen of Revit

You have mastered nearly all things Revit. You "know" what Revit "likes", and what it "dislikes" during model construction, a sixth sense, really. You spend your time exploring and tweaking advanced scheduling, OBDC, external parameters, AR3. You have a template to beat all templates, families for every situation.

5 Emergent Categories of BIM Evolution (reprinted by permission – John E. Taylor, Stanford University)

The following categories were derived in a study sponsored/coordinated by Autodesk and completed by John E. Taylor while at Stanford University. The underlying conclusion is that the further you delve into BIM implementation the further you get down the evolution ladder. It has also been declared that the further down the ladder you go the more data required in the model, not to mention the importance of accuracy.

Visualization
Sectional Perspectives, Renderings

Production
Floor Plans, Sections, Elevations, Schedules, Area Calculations, Annotation Coordination, etc.

Coordination
Inter-Consultant Data Sharing, Interference Detection, 3D Objects and Data from Consultants

Analysis
Structural, Thermal, Egress, Simulation(s)

Supply Chain Integration
4D Simulations, CNC Fabrication, FM, 'Intelligent' Job Site

4 Keys to Success

Listed below are the four keys to success. It has been found that when focusing on these steps the potential for success increases greatly.

Plan
The first stage of implementation is planning. Of course, each firm is as individual as the employees within the firm. Careful planning is the foundation to a successful implementation. Using the seven factors of implementation can supply a firm with guidelines but each firm should consider it's individuality in each instance. Planning the implementation of any strategy or technology should take into account all of the individuals and groups that the change will affect. It is advisable to discuss these issues with key individuals in these groups.

Communicate
Once the plan is in place it will become imperative that everyone knows what it is. It is very important to share the plan with the entire office. This does not mean inviting the office as a whole to a meeting to show them the latest tool. Given consideration that there are many different roles with in the firm and that means that this new tool will affect them in different ways and therefore they will be interested in different aspects of the tool.

The principals or senior leadership will be interested in how it affects the bottom line, what is to be gained. They will also be interested in what kind of investment, capital and staff, it will require. This group will also be interested in why we would make the change from the process currently in place. Generally speaking what does this mean to the business of architecture?

The project managers will want to know how it affects them. Will it really allow them to get work out sooner or with less staff? The coordination of drawings, detail and grid bubbles is greatly appreciated. They are also interested in coordination between consultants and how a team might share the data. What does this mean to the process of architecture?

The architects and designers that will be using the tool are generally concerned with the user interface, tools sets and how long it will take to learn. They also will be asking questions about how to create specific detailed models. What does this mean to the design and documentation of architecture?

Train
When implementing a technology like BIM it is advisable to have dedicated training. While on the job training proves to be a great learning experience, it can also be detrimental. When there are deadlines and revisions flying about, trainees tend to want to jump back to their comfort zone, 2D CAD.

The training should be organized and tailored to cover firm's specific topics and issues. Having general training to cover the basics of the tool can be helpful initially, however, having an expert in the firm covering firm specific issues will pay dividends later.

All that being said, for those of you that wish to dive right in; one "on the job training approach" is the "Just-in-Time" training. Just-in-time training is a term that describes an on-going training process that lasts much of the length of the project. Typically there is a BIM expert that will give the required training just before the toolset is required. A simple example is at the beginning of a project, the first thing you will need to use is the wall tool. The trainer demonstrates all of the uses, tips and techniques required to use the wall tool. You would then go and layout your building, walls only of course. Once the walls are in place it would be time to learn about doors and windows. This process continues for several weeks until you have what you need to complete the current phase. It might go with out mention, but this technique requires an "on-call" trainer that also serves to answer questions and support the users. This technique has proven successful on several occasions.

As pilot projects progress, evaluation data should be recorded, monitored and analyzed for post-mortem study. It often helps to have an outline of your firm's current processes to compare to the new BIM processes. It's easy to forget how you did something in the past when you are deeply involved in new tools.

Support

Once the plan is complete and communicated and when training is finished the implementation is not complete. Firms should plan on maintaining and updating information through ongoing support. It is advisable to have regular meetings to discuss issues anywhere from new techniques to changes in structure and beyond. Additionally, you will want to set up support network and protocol. Users will need to know where they can turn to get questions answered as they arise. Sources can be email distribution list, resellers, Autodesk subscription support, books, manuals and forums.

HOK

The Decision to Use Revit

Using Revit has many potential advantages; however, it requires changes in the work process and exposes a project to some risk. This section will help offices and project teams to make the decision of whether or not to use Revit, and help them to be successful if they do.

Office CAD Management

Goals and Risks: The office and team management should meet and review the goals and risks of using Revit before the start of the project. It is especially important that key members of the project management team understand the impacts and endorse the decision.

Project Budget: The possible effect on the project budget must be considered. Ideally, near-term delays due to Revit will be offset by later advantages and will not result in a long-term net loss. Some team members have claimed overall slowdowns of as much as 15% of the CAD work, while others have shown significant overall gains, primarily through reductions in the team size from, for example, 5 to 3 people.

Data Leader: An individual should be identified to be responsible for managing all of the technical aspects of using Revit. This is in addition to the involvement of the office CAD Manager.

Support for the Team

Training: The office needs to provide a high level of training to all Revit users. Typically this is a five-day, classroom type, series that includes production of billable work in conjunction with the training.

Expert Help: A person that can address the most difficult questions, needs to be available as issues arise, after the initial training period. This may be performed by the office CAD Manager or other office CAD leader, or by an outside consultant.

Unqualified Staff: People who are not prepared should not be allowed to corrupt the model from ignorance.

Team Size: The performance of the model is sensitive to the number of people accessing it at one time. This becomes problematic when the simultaneous users exceed about six or eight.

Team Location: The entire Revit team should be located in adjacent workstations.

Technical Issues

Approval: The local office IT and CAD leaders must agree that the software and hardware will function properly for the scale of project anticipated.

Support: Technical problems will arise, but the CAD and IT support system must commit to responding quickly and sufficiently. Problems should be identified clearly, resolved in a timely way, and not allowed to fester or become the source of unhappiness amongst the team.

Off-line Problem solving: Normally, the problems are reported in a predefined sequence. If this is not possible, the procedure used must not disrupt the support operation or fail to keep people informed. Support staff should isolate the problem from the project team and solve it separately so that work can proceed while a solution is being developed.

Project Management

The Project Manager, Project Designer, and Project Architect must be aware that the nature and sequence of tasks will be different.

Schedule of Changes and Deadlines: Revit does not support making last minute changes on individual drawings. Changes in the model tend to have broader consequences and can be problematic if made too quickly. The project schedule should include a freeze on changes to the model one or two days prior to a deadline to allow cleanup and view-specific graphic edits to be made without changes in the view backgrounds.

Time Requirements: The work plan for the team and individual work patterns must consider the time requirements of Revit: It takes longer to make changes in the model than to change 2D drafted graphics; there is also a need to "Save to Central" and other Revit-specific tasks that take time.

Filtering Changes: Changes in the model tend to have far reaching effects and may adversely affect another team member. To prevent this, design changes and other modifications should be filtered through a single team member.

Work Sequence: Work will be focused on creating model elements initially, without producing the typical 2D drawings initially. This can be disconcerting to the project management until they are convinced that the views can be created quickly later. There is a tendency to document more of the building initially than would normally be done with 2D documents. This can lead to confusion because some of the documentation is based on "place holder" rather than well thought out decisions. The initially modeling work will go more quickly than anticipated; later stages of documentation will take longer than the corresponding drafting tasks.

Proper Model Construction: There are good and bad ways to construct a model, and the difference will not necessarily be apparent to the casual observer.

Design Exploration: Designers will be able to easily study 3D issues. This can be advantageous in terms of resolving issues that would otherwise be hidden, but may add time to the design and design development process. There is also a temptation to continue designing beyond a prudent cut-off point.

Alternative Documentation Strategies: The 3D model can be viewed in innovative ways, such as axonometric views and cut-away section views, that will greatly improve the utility of the document set; however, the legal meaning of these views as contract documents needs to be planned carefully.

Revit Usage Guidelines

Revit is new, and our knowledge of how to use it properly is evolving. Each specific project will also have unique requirements.

Use of Other Design Tools: In the very early stages of schematic design, other CAD software, including AutoCAD (without the Architectural Desktop features), 3D Studio, SketchUp, Photoshop, and others may be used to define forms and concepts. The project should move to Revit as soon as specific building elements and spaces are identified, and additional refinement of the design should continue only in Revit.

Efficient Use of Drafting, Modeling, and Scheduling: Elements should be included as 3D objects in the Revit model when they the will appear in drawings at about 1/8" = 1'-0" (1:100) or less detailed. Some users feel that 1/4" = 1"-0" (1:50) should also be modeled; the exact cutoff needs to be planned for the project. Elements that will only appear in enlarged sections and details should be drafted as 2D linework. Very fine detail that occurs in many locations, such as reveals in a wall system, should be represented with model lines rather than 3D geometry in the model, and expanded with drafting lines

in details. Elements to be scheduled, including areas, equipment, etc., should be placed as Revit family objects but have only a 2D representation and should not be imbedded in the surrounding model objects.

Use of AutoCAD in Design Development and Production: It will be necessary to create AutoCAD drawings as output from the model, as well as incorporate drawings in the model, in order to communicate with the owner, consultants, and other members of the team. Generally these will be 2D drawings but may include 3D views. The team must be able to create and refresh these quickly and easily. It may also be appropriate to designate portions of the work to be done in AutoCAD. Most likely this will occur with details where it is desired to use existing AutoCAD material and to be able to add staff at the later stages of a production phase. AutoCAD work that is combined with Revit should not include Architectural Desktop objects although the Project Navigator and other work flow features of Architectural Desktop may be used.

Breakdown of the Model with Linked Models and Worksets: Models, especially with larger projects, should be dived into linked sub-models, and each of these should typically include worksets. These divisions should reflect the major building systems and the division of work within the project team. There is no simple formula for how to do this but it is very important that it be done carefully at the outset and maintained throughout the project.

General Conventions

Server Project Folders

🗀 **<office CAD root>**	*(Your office standard)*
🗀 **Revit**	*(In case other CAD systems are in use)*
🗀 **Model**	*(Revit project file(s))*
🗀 **Archive**	*(Interim copies and backups)*
🗀 **<YYMMDD-Desc>**	*(Varies – rename for each archive)*
🗀 **Attach**	*(Attached dwg or dgn files)*
🗀 **<consultant>**	*(Disciplines as appropriate)*
🗀 **Details-Exterior**	*(ACAD details, if used)*
🗀 **Details-Interior**	*(ACAD details, if used)*
🗀 **Library**	*(Family library)*
🗀 **(Subfolders)**	*(Match Revit Shipping version)*
🗀 **Publish**	*(Published dwg or dgn files)*
🗀 **Background**	*(Current version of selected views)*
🗀 **Review**	*(Complete set in DWF format)*
🗀 **Rendering**	*(Backup copy of materials)*
🗀 **Support**	*(Translation and other support)*

Model: The Revit project file(s) are located here and edited from this location until project sharing is enabled. At that time, only the central copy remains here; the local copies are saved to a local workstation (see following.)

Archive: Periodically, it is prudent to make a copy of the model, as a record of the state at that time, or as a way to recover from subsequent corruption of the model. Sub-folders, named in the form "YYMMDD-Description", are used to separate the copies so that the model(s), and any associated linked files, can retain their original name. The archived projects are saved to this folder and made into a new Revit central file. Linked files use a relative path so that they point to copies in the same subfolder structure.

Attach: Non-Revit drawings which are referenced into the Revit model (typically AutoCAD .dwg files but possibly Microstation .dgn files) are kept with the model even if this is a duplication of files at another location on the server. They are subdivided into <discipline> folders for each consultant discipline (Structural, Mechanical, etc.), and, if details are done in AutoCAD Detail-Exterior and Detail-Interior.

Library: Family definition files specific to the project are placed here. (Additional folders created should mimic the default Revit library where appropriate.)

Publish: The most current version of non-Revit files that are published from the Revit model are maintained here. (Historical versions may be maintained in the Archive and Transfer folders.) Separate sub-folders are used for Background

files (typically .dwg files of selected views that are copied to consultants) and Review files (typically a multi-sheet .dwf or .pdf set of all the sheet files.)

Rendering: If project-specific materials are used, Revit Rendering Material Library (*.mlib files) are stored here along with the associated bitmaps. The purpose of these file is to capture these custom materials in case the project is ever restored from an archive. However, these materials should not be used directly in the project; they should be added to the office master so that they will be available in the event that the project content is used in another project.

Support: Various configuration files, for AutoCAD import and export settings, and other uses, are stored here.

Subfolders of these are permitted but should be avoided where possible if they will result in unwieldy paths as they are referenced in the Revit model.

Local Project Folders

After worksets are enabled, a local copy of the model is checked out (copied) to the local workstation during use.

- **C:** (*Or other partition*)
  - **Revit Projects** *(Required standard name)*
    - **<Project Name>** *(Multiple projects are allowed)*
      - **Model** *(Revit project file)*
      - **Publish** *(Local copy of server version)*
      - **Rendering** *(Local copy of server version)*
      - **Support** *(Local copy of server version)*

Revit Projects: This folder shall be at the root of the local computer drive.

Project Name: The project name is similar to that used on the project server but may be a shorter version to avoid long paths. This value is standardized across all users.

Model: Local Revit project file. The filename is based on the project name, with a suffix that uniquely identifies it with the local user, such as their initials.

Publish, Rendering, & Support: These local folders are used to improve performance but the contents should be exact copies of material on the server. If new material is being created it must be copied to the server as soon as it is complete since the local drive is not backed-up and users must assume that it can be lost at any time.

View Naming Conventions:

Renamed Views are Prohibited: The view names that appear in the Project Browser are the same as other occurrences of the same data, i.e. level labels in sections and elevations, and view names that appear in the title bar when the view is placed on a sheet. (Revit includes commands that make it possible for these names to be different but that functionality is not allowed.)

View Names in the Documents: View names that also occur in the document set as level labels or plan titles are named in accordance with the office standards and other project concerns regarding the usability of the paper document set. Level names are spelled out as they need to appear in a room schedule (as well as how they will appear in sections and elevations.) Do not pad the level number with leading zeros.

LEVEL 1

Views that appear in the documents are named by identifying their subject first, and then modified by their level when appropriate:

FLOOR PLAN – LEVEL 1
CEILING PLAN – LEVEL 1
DETAIL PLAN AT ELEVATOR 1 – LEVEL 3
NORTH – SOUTH BULDING SECTION
WALL SECTION 1
SOUTH ELEVATION

Views are not renamed in order to make them sort or group more logically in the Project Browser. (This prohibition is problematic in terms of the way the views sort but it must be accepted as a limitation of the software.)

View Name Case: View names that appear in the documentation (level labels or plan titles) are all capitals. All other view names are mixed case. Users should not rename views that are all capitals unless they intend to make the corresponding change in the documents, and are authorized to do so.

View List Schedule: Larger projects with many views should utilize a special schedule, the View List, to manage the views. This typically involves adding one or more project parameters that can be used for sorting and grouping in the schedule. (These can also be used to modify the Project Browser organization however this has other effects and is not necessarily recommended.)

Special Plan Views: Plan views differ in Revit from other views because they can be duplicated (without reproducing their reference mark as is necessary with elevations and sections.) This results in many special-purpose plans that are not placed on sheets. These views do not typically contain any notation. There are exceptions to this, such as room tags on color fills and export documents, for example.

Color Plans: Color filled plans that will be places on a sheet will typically have a more descriptive title such as "DEPARTMENTS – FLOOR 1" and are not the subject of this section. Color plan are named with the form:

Color - <modifier>

For example:

Color - L1
Color - Level 1 Departments

Export Views: Special configurations should be created specifically for making consultant backgrounds and other, similar, tasks. (This requirement is necessary because there is always something that needs to be different for each such use.) These views are named with the form:

Export - <modifier>

For example:

Export - L1
Export - Level 1 Electrical Background

Import Views: A dedicated view should be used for attaching linked and imported material that needs to be segregated from other views. (This requirement helps to avoid technical problems and make it easier to control visibility.) These views are named with the form:

Import - <modifier>

For example:

Import - L1
Import - Level 1 Electrical

Work View Names: The use of temporary work views is encouraged however they should be should be named in a way that makes it easier to manage them, and they should be cleaned up regularly. Work views are named with the form:

Work - <user><description>

The <user> modifier is the user's initials. For example:

Work - MG
Work - MG Corner Study

Work Process

The process of using Revit is standardized where it is convenient or important to managing the team, to reusing work in other projects, and to restarting the work at a later date, even if there are other work processes that would yield the same result.

Project Startup

All Revit projects are started according to these conventions, even if the project is envisioned as only a temporary study.

Planning: The Project Manager and/or Project Architect provides a "Project Narrative" that includes details about the physical characteristics of the project (size, location, etc.), special project needs, the scope of the work, the team makeup, and the phase of the design process. The Data Leader prepares the project "startup" file(s) which may include special families, color palettes, the browser organization setup, and other elements.

Startup Files: Projects are started form one of the standard templates. The startup file is augmented with material from the standard "container files" that contain additional template material.

Ongoing Process

Following the initial setup, these processes are followed by the entire team under the management of the Data Leader.

Single-user File(s): A project of very limited scope, such as a design study, that is only to be used by one person at a time, may be maintained as one or more single-user file(s). Such file(s) must otherwise follow the standards (excluding the workset requirements.) In particular, such files are named according to the standard conventions and located at the standard location.

Single-user Local Copies: The single user files are copied to the local computer, at the standard location, and with the standard naming convention. There is no "save to central" process associate with this; the server version of the file is manually overwritten after the local copy is saved. Note that this process does not prevent multiple users accidentally editing separate versions of the file simultaneously. Care must be taken to prevent this and a multi-user file created if there is even a remote possibility of this occurring.

Multiple-user File(s): As soon as multiple users begin using the files, they are converted to multi-user files. This is done on the server while the no one else is using any copies of the files. The Data Leader oversees the conversion process and insures that the single-user version is no longer in use. Worksets are setup at this time according to the standard, which follows.

Local Copies: The central file on the server is never opened by general users and only by the Data Leader under exceptional circumstances. All work is done on a local copy that is based on the central copy but copied to the local hard drive and renamed according to the standards. The local copy is created with a file copy, not by opening the central file and saving as a local copy. The procedures for this are defined by the local office and the project Data Leader. A scripted solution is often used. There are some unanswered questions about potential data integrity problems with this process (that result in the local copy not being openable.)

Save to Central: User are expected to save the local file to the central file using the Revit "Save to Central" command, not a file copy. The save to central should occur frequently, such as every one-half hour. (This insures that the work is saved, insures that others have the latest version, and reduces the time of the save.) The team should coordinate their activities so that not more than one user is performing a save to central at the same time. (This is to prevent performance and integrity issues that are not currently handled properly by the software.) Users must not leave their computer during the save to central; they must resolve any issue with the save at that time. (This is to prevent leaving the project, and other users, in an unworkable state.)

Local Folders: The folders (Publish, Rendering and Support) that duplicate the server material are used with reference material, or as a local site for the creation of new material. Such local folders are used only to improve performance and must not be used to maintain content that is different from the server version. The local content must be maintained as an exact copy of the server material. Updates must be performed immediately after changes occur in either location.

Worksets: When the local files is opened, selective worksets should be used, and as few worksets as possible included. (This improves performance and increases the options of other users.) No worksets are made editable on opening unless there is a specific need (which is unusual.) Instead, elements are borrowed as needed. Users must save to central frequently and relinquish the borrowed elements each time. (This is to make these elements available to other users.) The Data Leader or a designated user may open certain worksets deliberately to prevent others from borrowing them. (This is a technique that can be used to prevent accidents with fixed elements, such as grids or structure.)

Archive Copies: Local archive copies are allowed at the users discretion. (This strategy may be appropriate when attempting risky actions or where there is a possibility that the user would like to return to a previous state.) Local archive copies are not backed up so anything with potential lasting value should be copied to the server.

Multiple Models and Worksets

Multiple, linked Revit models are used to differentiate and organize the major components of large, interdisciplinary projects, and to improve performance. Each such model is further subdivided into worksets in order to control the visibility and editability of categories of components. This organization is very important to the team process and future usability of the work. It is standardized where possible, and careful management is required where project-specific configuration is required.

Multiple Models

In developing the Revit Work Plan the Data Leader must consider the specifics of the project and determine how many models are needed.

Linking Models: In each case where separate modes are defined in the following, it is assumed that the models are linked. In some cases it may be useful to use a container project whose only function is to link the various sub-models.

Models by Design Phase: It is common to use a simpler model structure during schematic design that in design development. This is appropriate and the work of dividing the model at the appropriate time should be included in the planning. Well structured worksets can make it easier to divide a model into separate, sub-models.

Disciplines: Each design discipline (architecture, structural engineering, etc.) uses a separate model, even if the models reside on the same server. In some cases, the architectural team will develop a preliminary model for an engineering discipline (typically structural.) Although this may be done within the architectural model during schematic design, it should be moved to a separate model by the start of design development, even if the model continues to be edited by the architecture team. Ultimately this model can be passed to the engineers, who then assume ownership of it.

Distinct Buildings: If more than one separate building is included in a project, each building is in a separate model or models. (This helps to control the size of the model and makes it easier to have different levels, etc.) This distinction can also be interpreted to apply to major building elements, such as the wings of a large complex. The need for a division, and the location of the match lines, is very specific to a project. Some considerations are:

- Document packages and phasing of the work: If portions will be delivered at different times.
- Organization of the document set: Where the match lines will occur in the sheets.
- Different Levels: It may be easier to define levels within different models if they do not align horizontally.
- Major Geometry: If the model can be broken down into distinct geometric types.

Site: On all but the smallest projects, if site work is included, it should be a separate model.

Additional Model Divisions: Very large buildings may be subdivided as a convenience for working. A typical division is into:

- Core and Shell.
- Interiors.

Project Sharing and Worksets

Project Sharing is typically enabled as early as convenient on a project in order to accommodate multiple users and establish the workset definitions. Worksets are used as a means of categorizing subassemblies of the model, as well as controlling user access. It is often not necessary to use very many worksets, and this standard should not be interpreted as requiring them where the team does not feel they need them.

Phasing: Ideally, a standard system, with sufficient granularity to support all projected team usage, is established at the outset of the project so that elements do not need to be re-categorized later, but typically, this is too cumbersome for the design team. A simpler set of worksets may be established at the outset of design, and additional ones added as needed. Even in this case, however, the initial worksets should be defined in terms of a standard set that will be appropriate to the more developed project.

User Names Used with Worksets: Each member of the project team will use their own name for general use. In addition, the tam may use two generic names:

- Project: This special user is managed by the Data Leader for tasks that are project related.
- Locked: This special value is used to lock elements (such as the grid) to prevent their being changed inadvertently. The workset is deliberately left checked out.

Default Workset and Assigning Worksets: At the time Revit Project Sharing is enabled, elements that are not part of a standard Revit workset are assigned to a default **Workset1**. After the project workset naming is defined, the default set is renamed as the shell workset and all of the others added. Finally, elements are moved from the shell workset to their appropriate location.

Workset Names: Where used, worksets are named in one of the forms: (This may evolve from the smaller form to the larger as the project progresses.)

<Scope>-<System>	*(smaller projects)*
<Scope>-<Zone>-<System>	*(larger projects)*

- Scope: Elements that are drawn by floor level are always separate into corresponding worksets. Elements which span multiple levels (such as curtain wall) use the level that they are associated with.

Site	*(site elements that are not in a separate site model)*
LevelXX	*(levels corresponding to view naming)*

- Zone: Larger projects, that are divided into horizontal zones, can break the worksets into meaningful names such as:

North	*(or East, South, West)*
Phase1	*(as appropriate for building zoning)*

- System: The System modifier is optional in some case. For example, Site may stand by itself, and in small projects, the level may be sufficient. When used, the system should typically be one of the following:

Ceilings	*(Ceilings and attached components)*
Cores	*(Architectural components of core)*
Furniture	*(Furniture and equipment)*
Interiors	*(Interior walls and doors)*
Shell	*(Exterior walls and openings)*
Slabs	*(Horizontal elements including roofs)*
Stairs	*(Stairs, ramps and landings)*
Structure	*(Structural slabs and columns)*

Examples:

Site	*(all projects)*
Level01	*(small project with no further breakdown)*
Level01-Partitions	*(medium to large project divided by level)*
Level01-East-Partitions	*(very large project with horizontal zones)*
Cores	*(small project; cores span levels)*
Cores-East	*(large project; cores span levels)*

As these are created the Enabled in All Views option should be checked in every case except Furniture. (This is a convenience but important because it cannot be changed after the fact.)

Workset Not Defined: Some elements do not require explicit workset definitions due to the standard behavior of Revit. (These are not really a standard since no action is required, but are included to show the relationship to other CAD products.)

Grids:	These are included in the Shared Levels and Grids.
Areas:	View specific and don't require a workset.
Annotation:	View specific and don't require a workset.
Rooms:	View specific and don't require a workset.

ESG Architects

Real World Decision Making at ESG

We at ESG have longed for better CAD software. We made the switch from Autocad to ADT four years ago. While ADT was an improvement, it left us yearning for more. Our local Autodesk reseller contacted us and was very excited to demo a new program called Revit.

Testing - Before we could consider using Revit, we had to answer some very important questions:

- Can Revit produce CD's comparable to those we've been producing using ADT?
- Can Revit export and import files so we can still work with our consultants?

The first step for us was to parallel a project that was being done in ADT. As a small office, we couldn't afford a lot of unbillable work hours. So, this was done on my own time.

The Plan – While Revit looked very promising, we knew that it would be a slow transition. Even in our early tests, we could see that Revit had the potential to change our process. Such changes would have to be dealt with over time, so we formulated a 5 year plan to switch to Revit, with a goal of 50% in 3 years.

"Infrastructure" - Before we could move on to a pilot project, we needed some "Revit infrastructure". A project template needed to be created. Plotting procedures needed to be set. Revit settings needed to be customized to follow ESG graphic standards.

The Pilot Project - The first project needed to be carefully selected. It needed to be a type of building that ESG specializes in: multifamily housing. We knew that if Revit couldn't handle this building type, it would be useless to us. We next needed the right team. We wanted to stack the deck with our best and most promising users. Once these users completed the pilot project, they could split up and move on to other projects, leading teams of new users. We also wanted to control the scope of the pilot project. We concentrated on CD's, because that was most critical if we wanted to replace ADT with Revit.

Buy-In - Before we could start any work, we needed buy-in. Management was informed of our test and that while the payoff could be huge, we couldn't guarantee that we would make any profit on the project. Most importantly, we needed the full, unwavering support of the project manager. It's the project manager's responsibility to see to it that the project gets done on time and on budget. If the PM wasn't behind the decision to try Revit, then Revit would be nothing more than a scapegoat for anything that went wrong in the project.

Training - Once we had our pilot project selected, it was time for training with our local reseller. It was very helpful to have a project in mind when we went to training so the trainers knew what we needed to learn most. We sent the entire project team as a group to training so that we all had the same learning foundation to start from.

Real World Challenges and Solutions

Just in time training – While we sent our pilot project team to training. We decided to do in-house training for the rest of our staff to save money. As a small firm, we couldn't really afford to send our project teams to training, both financially and in time lost to the project. Using just in time training, we could tackle problems as they arose on real projects. So, our staff could learn while working on billable projects. It turned out to be great for management, as billable time was maintained while we learned. As for the user, it was a much more nerve-racking as they often felt like they were constantly in a sink-or-swim scenario.

Standards – It took us over a year to formulate a standards manual. This was in largely due to the fact that it's more of a user's guide than a standards manual. We needed to outline standard procedures for using Revit. Often, these "preferred" procedures were constantly changing as we learned more and more about the software and as new releases with new commands came out.

Under the Microscope - I often find myself scrambling to solve problems quickly before public opinion can change. If a user tries to batch plot a set of drawings and their computer crashes, causing a delay, word gets around fast. A project

manager asks the user why the plots aren't done, the user says that it's because Revit crashed their computer. The problem escalates up the ladder as an owner/principal asks the PM how the project is going and the PM informs the principal that there are delays because of Revit. Pretty soon, the entire board of directors hears that projects are taking longer to do with Revit.

Team Structure - We quickly found that 2 people using Revit can do the work of 5 people using ADT. While this is wonderful news for project managers and firm owners who see dollar signs behind improved efficiencies, it can really throw a wrench into your workload. Also, project managers need to learn to split up project tasks based on areas of the building instead of drawings.

Underestimating CD's – Some of our staff developed the misconception that Revit "automatically" created wall sections and details. While Revit will create a wall section, it's far too diagrammatic for CD's. Users were surprised by how it seemed to take much longer to produce 2D sections and details in Revit. In fact, it just seemed to take longer compared to how quickly they were able to produce a DD set.

Revit Implementation Successes

Measured Steps - Our first projects were started in DD. Plans and elevations had already been done in ADT before we did anything in Revit. It proved to be an excellent way to go. Instead of learning new software and designing a building, our teams already knew what the building looked like; they just had to replicate what they had done in ADT. Just now in our second year of implementation have we started projects in Revit using massing studies.

Clients more in touch with the design – We no longer pin up floor plans and elevations for client review meetings. We now set up a computer and a projector and we show the client their actual Revit model. We can spin around and look at any part of the building they want. We can even show them different design options from whatever vantage point they want.

Designers more in touch with the design – Our designers can now instantly see the results of their design changes. We are able to make more design decisions earlier in the design process, when they're most effective and least costly.

Additional Services – Now that we have our buildings fully modeled in Revit, we are now doing more and more marketing renderings and animations. This work wouldn't have been feasible before because we had to build a model specifically for this work. Now, it's just part of the process.

Converting legacy information – One of the leading complaints from project managers was that they wanted to use details used either on another project or from the detail library. While these Autocad drawings can be imported into Revit, the results are hardly useful. We've been able to teach our interns how to draw details in Revit in about a half hour. They can then link the DWG into their own Revit project and trace the detail. When they're done, they can remove the link with no residual information left behind. We then import their drafting views into the actual project model, so there's no risk of a novice Revit user messing up the project model.

WATG

Real World Decision Making at WATG

WATG is in the process of implementing Revit as a BIM tool. Plans are for a 5 year transformation. During this (r)evolutionary period we have been forced to reexamine many of the existing processes. WATG has committed to solve these new issues and problems with an open mind or clean sheet thinking and seeking new tools to solve them efficiently and productively. While technologies are not the solutions they are often tools that aide in the solution. WATG has begun to review new tools such as SketchUp, Piranesi, Adobe Suite, Rapid Prototyping, and integrated practice models to move into the future.

See the big picture - It is important to remember that this is more than a lateral move and is a change in process. There will be issues that pop up on a daily basis. You and your teams need to look at the end of the process and see any challenges as a temporary situation.

Evaluate – WATG looked at several software solutions prior to deciding on Revit as the BIM software that best fits our culture and process. Base your decision on what is going to work best for your firm and the teams you work with on a regular basis. Begin to think about an integrated practice where you very well be working closer with your extended design team, owners and contractors.
Get everyone involved – The decision to change your process is a change for the entire firm. A firm is a team of people that provide specific skills and talents to each project. This change in process will affect them, get their input on these changes and be ready to make adjustments in your implementation plans to accommodate these skillets.
Pilot Projects – Identify and quantify specific goals for each pilot project. Don't implement all facets of BIM on each of your first projects.
Communicate – Meet and discuss implementation issues often. Don't be shy, talk about the difficult issues and solve them before they become real problems. Keep the management and executive levels of the firm abreast of broad brush issues and progress.
See Success and Recognize it – It is easy to point to stumbles and hiccups in any project, no matter the technique or technology used, focus on the positive from each project and move forward.

Real World Challenges and Solutions

Design Firm Atmosphere – WATG was born out of design and has its roots in design to this day. In many instances our designs are in far away and are communicated in 2D and handed off to a local architect for final CD's. As dwg is the preferred format we are forced to export information rich data down to simple lines arcs and circles.
Communication – As noted above, users need to know, not only how the tools work, but the concepts of BIM and why the firm is going in this direction. Understanding what BIM is, how it is to be used and why can be just as important as how to use it. Lack of communication can be fatal.
On-the-job training without full support – If it is impossible to get formalized, non-project related training; it will become essential that the new user have a support mechanism available as close to full time as possible. When it comes down to crunch time with new functionality and no one there to assist can be a breaking point in implementation. This could be an in house expert or a reseller/training center.
Attempting to hit a "Home Run" – Some BIM software can be easier to learn than 2D CAD, it is, however, incredibly comprehensive. Take baby steps into the software. After all, most people did not learn CAD on the first project. Generally speaking, users become very comfortable and highly productive on the 2nd or 3rd project.
Isolating users – This goes back to training and support, a user that is set free on a project without consistent support will tend to loose interest and get increasingly frustrated attempting to figure everything out themselves.
The over sell – It is advisable to avoid selling all of the benefits of BIM prior to having a few projects under your belt. Be certain that the firm can deliver on the promise. Avoid repeating vendor marketing promises without in-house verification. Set up short-term, medium-term and long-term goals.

Revit Implementation Successes

Planning – There is no substitute for good planning. Take the time to consider the issues within your firm and plan on addressing each and every one. Also, it is a good idea to plan on re-planning as firm specific issues will arise and need to be addressed.
Formal training – While on the job training can be the best quality training for the real world, real deadlines, revisions, and owners can often frustrate a users and prompt them to want to give up and go back to good ol' CAD.
On the job training – Occasionally, with the right personnel, project, schedule, team and support a user can get up to speed while working on an active project. Great care needs to be taken if this is the path you choose to take. *See Just-in-Time training above*
Baby steps – It is advisable to take a few of the overall benefits of BIM and focus on those issues on a particular project and master those and take on a few more on the next project. Some firms use pilot projects to take these steps.
Partial projects – "The Horizontal Approach" use BIM to design and document the plan view and scheduling while using CAD to document the vertical drawings like the sections and elevations and perhaps the details. This approach can work very well in the early stages of the project as the design is in constant flux. For instance, some firms will use the horizontal approach for schematic design phase and jump to full BIM modeling during the design development phase. See HA-PHA below.

Small projects with experienced users – It may seem obvious, but overloading the first few small projects with experienced users works well and serves purpose down the road. The theory here is that these users will gain real world experience and confidence. These users can then go on to work with others and spread the knowledge.
Management Buy In – It will be important for the entire company to have the management and upper management understand the issues and lend support to the projects and users. Failure shouldn't be an option.
Rewards and recognition – The early adopters of these technologies often have to endure the nay-sayers, critics and the frustration of learning a new software and design process. With rewards and recognition they will, at the very least, feel that it is worth the effort. Some firms reward the users by upgrading their computers first, preferred seating and recognition in newsletters and meetings.
On-going training – Many firms, recognizing the value and the fact that trainees can not learn this overnight, organize and support weekly mini-training sessions. These sessions generally last one hour and will cover a single topic.
Exit Strategy – On the occasion that the BIM is not working out on a particular project it may be necessary to exit to AutoCAD. It will be helpful if that exit is prepared ahead of time.
HA-PHA – Using the Horizontal Approach and the Place Holder approach

The Horizontal Approach

The Horizontal Approach (HA) is a technique that dictates that all views that are oriented to plan are produced using Revit while the vertical views (elevations and sections) are produce using the firms' traditional methods – CAD, hand, etc. Revit's interoperability with CAD formats and raster images allows for the coordination of drawing sets within Revit. This technique has been adopted firm-wide **DURING THE CONCEPTUAL DESIGN AND SCEMATIC DESIGN PHASES** on all Revit projects. The benefits include:

- **Lessens the learning curve** – Due to the fact that you are not publishing the vertical views there is no need to master all aspects of Revit from day one. Getting the basics should be adequate to do most plans – walls, doors, windows, rooms, color fills, sheet layout. There is no reason (outside of annotations) to get too deep into the family editor. The use of generic out of the box content should suffice.
- **Lessens the modeling time** – Due to the fact that you do not necessarily need to model elevational information equates to time savings. It is important to remember that you will be "going vertical" later in the project and your generic content should have some height parameters that will at least resemble the design.
- **Lessens the desire to "model it all"** – Due to the fact that you are not going to model ANY elevational information, the temptation to get in and figure it all out early in the design stage is mitigated. This becomes readily apparent when you model every last detail and the design changes and you just throw away 3 days worth of modeling. It is important to realize that the design changes rapidly in the concept and the schematic phases and it would be next to impossible to keep up with the changes if you model too much.
- **Takes advantage of Revit's power early** – Because this technique is geared for use in the early stages of design, it is designed to take advantage of Revit's power. It is easy to layout buildings, add simple doors and windows. Once rooms are established you have the basis for color fills, adjacency studies, basic floor plans and area calculations which are a major emphasis in early documentation.

The Place Holder Approach (HA-PHA)

Follow up the Horizontal Approach with the Place Holder Approach (PHA) that says the model develops as a whole rather than the individual pieces. The individual components are allowed to develop in stages as the design is refined. Some of the benefits include:

- **Lessens Expectations** – This process needs to be communicated to the entire design team, including the clients. If every one understands that the traditional, 2D, process develops one or two elevations at a time and may or may not be accurate or even work. Allowing the model to develop as a whole insures that the design is coordinated. The equivalent is the design process itself – start large and work your way to detail.
- **Allows the Design to Mature** – The use of this method allows for, even encourages, checks and balances. Designers see the implications of their designs at a massing or simple structure stage allowing for adjustments when they are easy to make and do not have implications further into the details.
- **Reduces the Throw-Away** – If a design, a window for example, has been fully developed with painted wood mullions, custom trim, sliders, and tinted glass has been modeled in 2 hours and then subsequently removed from

the design – there is a waste of 2 hours. On the other hand if a rectangular generic window is placed in the model and is subsequently removed, there is very little waste. The hypothetical evolution of the window might go something like:

- Day 1 – Generic fixed rectangle – size and proportion established.
- Day 3 – Exchanged for generic rectangular slider – major "break" or type established
- Day 10 – Generic slider opened, saveas, project specific window | 2D mullions drawn on the face of the glass – establishes proposed breakup of the window without fully modeling
- Day 11 – Project specific window opened and generic trim added – establishes size and proportion of trim
- Day 15 – Project specific window opened and real mullion break up built along with trim profile.
- Day 20 – Project specific opened and product specific data is added to identify the window as a manufactured product.
- This process continues until the window contains the all the geometry and information required to build the physical building.

While it may seem like an involved process it is a very simple Revit work flow, thanks to the "Edit Family" and "Load into Project" buttons. This process can be applied to many elements and encourages even development of the model.

For more information on the Horizontal Approach and the Place Holder Approach please reference AUGIWorld articles published online.

http://www.augi.com/publications/default.asp?page=63 click on the March/April 2006 for Part 1 (HA) and May/June 2006 for Part 2 (PHA). These articles also reference sample Revit models that can be downloaded and examined.

Additional Information

Below are just a few additional resources listed here for your reference. Refer to the electronic version of this document at AU Online (www.autodesk.com/auonline) for even more information (deadline is looming)

Books

Introducing and Implementing Autodesk Revit Building – Autodesk Press – Lay Christopher Fox and James J. Balding AIA

Mastering Autodesk Revit Building – Autodesk Press – Paul F. Aubin

Residential Design Using Autodesk Revit Building 9 – Schroff Development – Dan Stein

Introduction to Commercial Design Using Autodesk Revit Building 9 – Schroff Development – Dan Stein

Autodesk Revit Building 9 for Designers & Architects – Sham Tickoo

Magazines

AUGIWorld (free when you sign up for AUGI at www.augi.com, AUGI membership is also free)

Blogs

Blogs (short for weblog) are generally a single author publishing their views on a particular topic or event in journal or newsletter type format.

www.revitoped.com – Steve Stafford

http://reviteer.blogspot.com/ - Mike Hardy-Brown

http://dorevit.blogspot.com/ - Robert Manna

http://allthingsbim.blogspot.com// - James Vandezande

This is but a very small sampling of Revit blogs, many, if not all, of them list other Revit/BIM blogs within their navigation frame. You could read for days on all types of tips and tricks, thought and just plain great info – enjoy.

Forums

Forums are an excellent place to get technical information on your implementation issues, share images or just shoot the breeze.

http://www.augi.com/revit/default.asp?page=376 – AUGI is commonly thought of as the best place to go for technical assistance. This link will take you to the front page of the forums, from there you can navigate into the forums themselves.

http://discussion.autodesk.com/index.jspa - there are 3 links for the Autodesk Revit discussion sites, one for each of the products. Click the links for each midway down the page.

Content

Content is the the key to modeling a Revit model quickly. There are a few locations on the web that you can download some sites are free and some charge a small fee.

http://revit.autodesk.com/library/html/index.html - Official Autodesk Revit content library

www.revitcity.com – RevitCity viewed by many as the best place to find Revit content.

www.bimworld.com – A new and up and coming BIM content site. You will find content for Revit, SketchUp, Bentley, ArchiCAD and even ADT. BIMWorld focuses on manufacturers content.

www.formfonts.com – Another location to find BIM content for multiple platforms – Revit, SketchUp and AutoCAD to name a few.