Revit - Automate to Conquer | Overcoming Architectural Project Challenges

Introduction

As an architectural company we are challenged daily to directly generate the necessary outputs using BIM software throughout all stages of a project.

Each office has its own needs and output specificities / specific outputs. Software should be able to meet our needs, but sometimes it's not. In that case, we need to figure out how to make it work.

Hands on BIM

We will always need to rely on specific software. It is not possible to talk about BIM without referring specific software and its pros and cons. Note that we are not talking about BIM theory, but instead the day-to-day BIM, focusing on the issues needed to be addressed in the daily routine of an architectural company.

At our office we use Revit, not only because it is the most used software, but also it allows better interoperability, giving us more efficiency, which is one of the main goals of our job. That is what we want to present in this article.

If an architectural company outsources BIM, it will not be "true" BIM neither efficient. BIM must be used from the beginning, allowing teams to take advantage of the models during project development. Paying to an external team to model in a BIM software at the final phase of a project cancels and corrupts the essence of BIM, as it delays the process, once the model can only be developed after project conclusion/closure. Thus, for an architectural company to be efficient it must have integrated BIM in their internal teams.

Conquer

Conquering BIM using a software like Revit, implies increased profitability and that is why it needs to be efficient. It's needed to prepare all the tools, to think in advance about what is needed in the end of the project and to figure it out from initial stages. This leads to a well-informed process.

We use the same model for every stage, by having our template prepared to receive increasingly more information, as needed in each stage. This is obviously more efficient than modelling the project from scratch in each phase. Of course, that in order to make it work, its necessary to prepare tools and teams before starting to do anything else.

Defining the LOIN (Level Of Information Needed) is more important than defining the LOD (Level Of Development), as it defines the output and data needed. LOD must be a consequence of LOIN. Then according to the defined LOD, methods and procedures must be established. Defining ways to model for different scenarios and always being prepared for the worst-case scenario is crucial.

Sometimes, software is not able to do what we need to reach project's requirements and countries' specific regulations. In this case automation might be needed, not only for organizing data and standardizing work, but also by programming and creating customized tools.

Creating automations will not only increase productivity but also prevent human error.
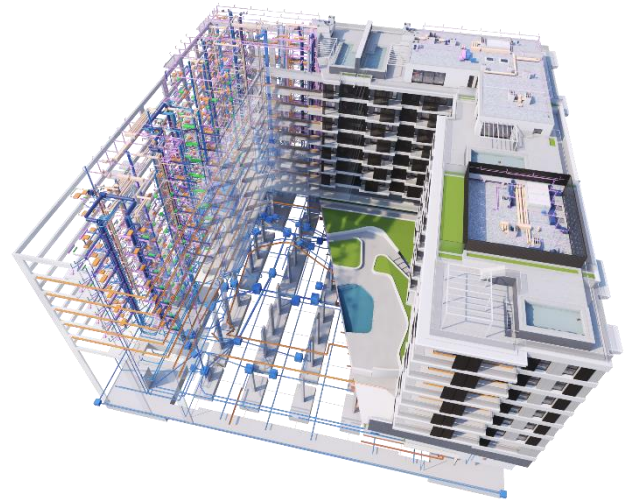
Efficiency

1. **Human Resources**

   Efficiency in BIM depends on having the right people with the proper mindset to help moving forward and get the job done, despite bearing limited tools. It is particularly important to adjust the size of the team to the scale of the project; it may seem obvious but sometimes leaderships forget it. It is essential to have a structured hierarchy regarding BIM, to make sure responsibilities are addressed. It is essential to train teams to correctly use software and to respect internal procedures. Individual productivity is not directly proportional to collective productivity; it is important for teams to understand this.

   BIM Hierarchy is essential to make sure work runs smoothly and companies must not be afraid to delegate and ask for responsibility.

2. **Hardware**

   Having inappropriate hardware although using the right software will not work properly and your teams will not be efficient, you will have to deal with delays and excuses. Good equipment is expensive, but time is more. The better the equipment the quicker teams will do their work.

3. **Software**

   The right software and a number of licences adjusted to teams is required. It should be kept in mind interoperability between members and teams is critical, but also remember that the more software used, the more data will be spread, lost and/or inconsistent. The less software, the best. This will guarantee a single source of truth and avoid wasting time in conversions.
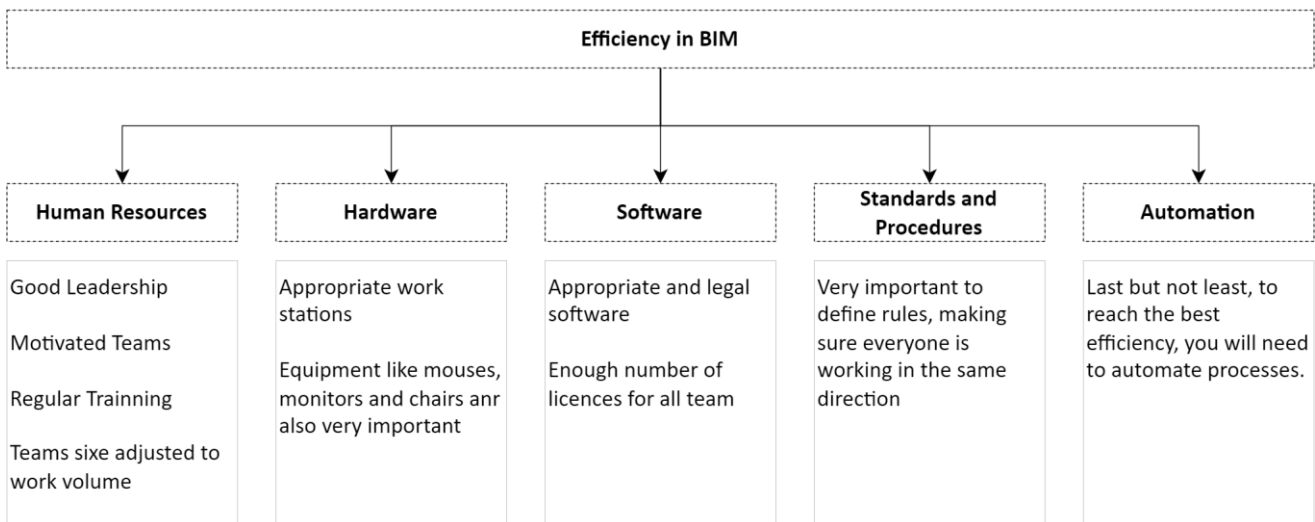
4. **Standards**

   For a team to be productive, it must know how to work, what to do and when. It is key that all the procedures are defined and structured according to the company standards has a guide map for every collaborator to make their part of a whole in a consistent manner.

5. **Automation**

   After assuring the above needs, it is possible to start thinking about automation.

   Automation can represent very different things inside a tool like revit. This topic will be approached ahead.

Efficiency in BIM				
Human Resources	**Hardware**	**Software**	**Standards and Procedures**	**Automation**
Good Leadership Motivated Teams Regular Trainning Teams sixe adjusted to work volume	Appropriate work stations Equipment like mouses, monitors and chairs anr also very important	Appropriate and legal software Enough number of licences for all team	Very important to define rules, making sure everyone is working in the same direction	Last but not least, to reach the best efficiency, you will need to automate processes.

Automation

There are several ways to automate, some simpler than others:

- Modelling with groups;
- Use global and shared parameters;
- Create your Revit template;
- Create your families with shared parameters related to schedules already prepared in your template;
- Create your own titleblock and included it in your Revit template;
- Prepare your shared parameters files to use in your template, families and all projects;
- Prepare libraries organized by topics with your families;
- Make a survey of architectural solutions that your company repeats in different projects and make families to import them easily to your new project, for example, bathrooms, kitchens, any modular system;
- Create your own tools for automation – to do this you will need programming.

Programming

Every company has the main goal of making money. And every employee must be aware and focused on that goal. For a company to be profitable it has to be efficient, and everyone should work for that purpose. Sometimes, however, having a strong team, good equipment, software and procedures, is not enough. When you want to go beyond and get the best of data, especially when specific output is required, you will need to create you own tools.

Before thinking about that, you must make sure your templates and libraries are developed as much as possible and cover all the "conventional" ways to solve a problem. Sometimes problems are easier to solve then we think. Do not start making a tool without making sure there is not a native way in Revit to do it. You can always search for an add-in in the Appstore. You should research and try to understand if that add-in will be continued for newer versions, otherwise you will make your procedures depend on a tool that might be discontinued. If there is no alternative, then you must think about developing your internal tools.

By this point you are entering the BIM development world. Maybe you are an architect with particular interest in this area and you want to explore and do it by yourself, or you might need a BIM developer or a trained programmer to assist you.

Tools

1. **Dynamo**
   Dynamo is the first step to become a programmer. Still do not be naive, it's visual programming, but it's not that easy. Dynamo can be used for two tasks, complex modelling or handling the database. The latter is more interesting for us because of the kind of work we do.

2. **Python + PyRevit**
   With this strategy you will need to install pyRevit to have your own tools integrated in Revit interface and you will develop your code in python.

3. **C#**
   Will enable you to have your tools without depending on any other add-in like pyRevit.

Notes:

- Any of the previous options are only possible in Revit Full. Revit LT does not support add-ins.
- When programming you will need to be familiar with Revit API (Application Programming Interface).

Overcome the challenges

The following limitations were solved using python. We reached a point where Dynamo was not stable and flexible enough for what we needed to do and to respond to both size and complexity of our files. Our next step will be to convert the scripts to C# and to share it with the community.
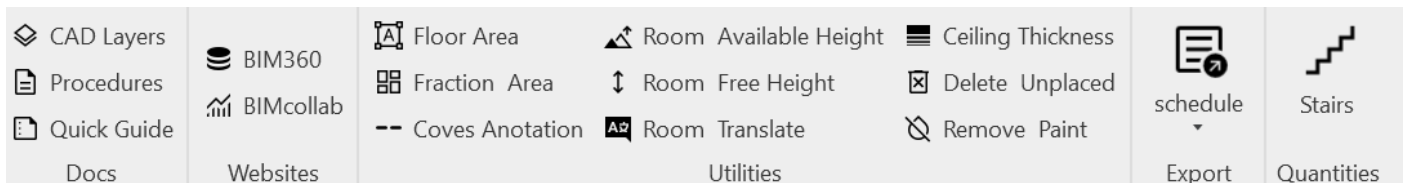
Finishes schedule –The fields of the room's schedules needed to be filled manually, which took time and gave space for human errors, most of the times what was filled in the rooms' parameters did not match what was modelled. To solve this challenge, we have created a script that detects all finishes used in each room and reports it back to room's parameters, making it possible to have one schedule summarizing the finishes in all rooms in a single document.

Stairs Quantification – Revit by default does not calculate quantities of stairs, which is why we have created an add-in that calculates all finishes' quantities separately: runs, treads, risers and landings.

Bill Of Quantities – Revit users know that is impossible to make a single schedule with all the data needed and formatted as the final document of BOQ to deliver. The data would always have to be exported and managed in another software, wasting time and generating problems. Every time there was an update the process had to be repeated. To solve that we created a add-in in python that takes all the data you need to create the BOQ directly from Revit and organizes all the information in one final document in excel, already formatted. Every time there is an update you just need to click the add-in button. This saves us weeks of work and errors.

Room Translate – Sometimes we have projects that need to be presented in Portuguese and English at the same time. In a big project it takes some time to translate all rooms. We created an add-in that translates rooms names into different languages automatically.

Many other tools for simpler tasks but yet very time-consuming, were also developed and more are in progress. In the image bellow you can check our proprietary tools' tab with some of the tools.

CAD Layers	BIM360	Floor Area	Room Available Height	Ceiling Thickness	schedule	Stairs
Procedures	BIMcollab	Fraction Area	Room Free Height	Delete Unplaced		
Quick Guide		Coves Anotation	Room Translate	Remove Paint		
Docs	Websites		Utilities		Export	Quantities

Conclusion

With our strategies and automations, we can produce every document needed for a delivery of any project stage directly from Revit: general drawings, detailing, Specs and BOQ. This allows teams to spend more time thinking about architecture and project instead of repeating time-consuming tasks that can be done by a machine. If a team is doing a BIM project for the first time, without any work base it will take twice as much time. Yet, in our experience, with a well calibrated team and methods, BIM projects can be up to 3 times quicker than CAD traditional projects. We were able to arrive at the conclusion, by comparing projects time and cost, that the BIM process is much more efficient when compared to the traditional methods, and we know that, if structured and automated, BIM can be quicker, better, and more profitable.