AUTODESK UNIVERSITY

BES501756

How Revit Automation Saved Tens of Thousands of Working Hours at MRV&CO

André Fonseca Pinheiro
MRV&CO

Learning Objectives

- Learn about how we use Revit API to automate modeling and code checking processes at scale.
- Learn about collecting logs of plugin usage to improve performance, fix bugs, orientate new developments and so on.
- Learn about model and code checking automations.
- Learn about the importance of standardizing processes to leverage the use of automation at scale.

Description

Using building information modeling (BIM) in 100% of the designs at MRV&CO-the largest construction company of residential towers in Latin America-we designed 200,000 housing units in five years in an ecosystem of 400+ internal designers and external consultants. We trained ourselves to develop BIM automations through the Revit API in order to maintain the quality of information and process optimization, and from a data-oriented management perspective, we define the processes with the greatest potential for ROI, linking to team goals. Using agile frameworks with an interdisciplinary team and assertive data collection to target high-impact points, improvements, and corrections, we automate more than 50 activities related to the modeling process, and 130 to the model and code-checking process in various project disciplines, scaling up BIM methodology amid MRV&CO's digital transformation.

Speaker(s)

I am the leader BIM Manager for the BIM Implementation at MRV, largest construction company in Latin America, with 14 years of experience working always for the real state sector. Graduated as a Civil Engineer with emphasis in production, with sandwich graduation and research experience at University of Toronto, Canada. Consider myself passionate about technology, especially BIM.

https://www.linkedin.com/in/andrefonsecapinheiro/

BIM for construction of popular houses

MRV it is a company that was born to fulfil a **high demand of housing crises** in the Brazilian market, especially **for the workforce population**. Since 1979, the year of foundation of the company, the focus was built houses to this range of population, and it became the **core business of the company**. Today, popular construction represents 90% of what MRV builds in a year.

Over the last 15 years, the company has grown exponentially, and one of the factors that contribute to it was a **government program** created to help the construction industry and low-income families. It was created back in 2009, and this federal program helps construction companies & developers with construction fees and financing, and with a subsidy for low-income population to purchase the property.

According to information released by the Ministry of Development, the **housing deficit across Brazil** was 5.8 million homes, of which 79% were concentrated in low-income families. It means that we have a lot of demand to fulfill in the market focusing on this income bracket.

As it is a product that serves a low-income population, to make the product viable in the market we consequently have a low profit margin, meanwhile, we have a capillarity of operations in Brazil that gives us a significant volume of this product, it means that we have a small or tight margin in this product, however we have **enough scale** to justify a large representation of this product in our portfolio.

With a tight margin in the product, but with a sufficient scale, through the standardization of the company we were able to obtain and justify good gains with the use of BIM for this type of product. Nothing better than a standardizing product for a BIM implementation. With a well-structured process, state-of-the-art technology implemented and engaged & trained people, we were able to bring good results for the company using BIM, specially through the automations we have developed so far.

Swiss Park MRV's Residential Structural Project

Influence of product standardization in the BIM implementation at scale

MRV is a company that has a good identity on its products / buildings. Everywhere you go around Brazil, you can recognize easily which one is a MRV construction. Our products are very similar between them, and it shows that we have a very standard construction.

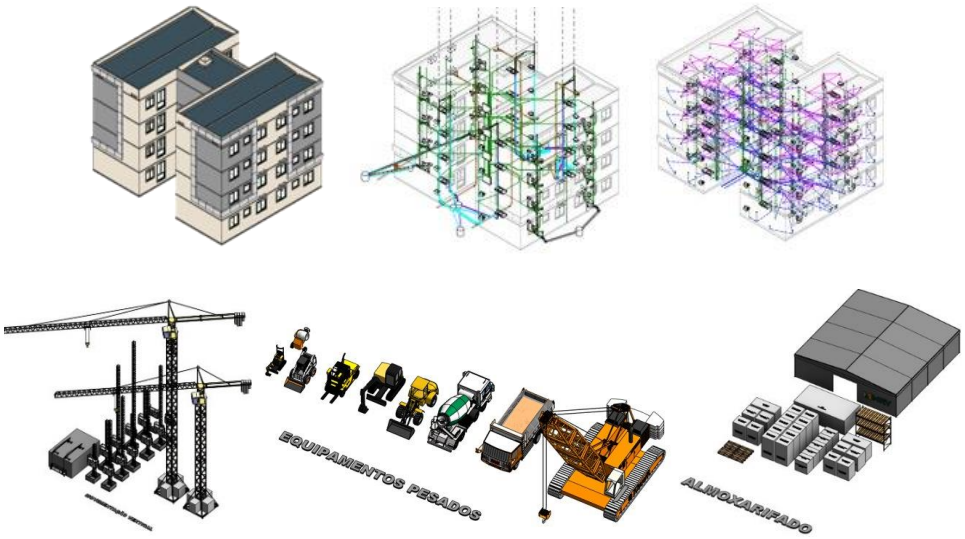
This standardization influences a lot the process of implement BIM in the company. As it was already said, nothing better than a standardizing product for a BIM implementation. The main factors that benefit us from this influence are:

- The creation of our own BIM library (templates, families, showrooms, standard modeling);
- A lot of opportunity for automation / plugins;
- The help in culture change.

Since the beginning of the implementation, we decided to deliver to our external consultant all the elements that has to be used in our projects. So, basically, we model every single piece, every family that has to be inputted in a model, in addition to parametrize all the templates, develop automations, and document all the processes in BIM Mandates, BEP's and manuals.

We benefit from standardization to automate all the repetitive processes and activities that exist during the design and analysis process. This brings us a huge return, as we were able to eliminate from simple to more complex activities, optimizing the project, reducing time, bringing more assertiveness and quality to the model.

Finally, the impact on culture change, which is perhaps the most painful part of implementing a new methodology. Everyone involved is greatly impacted, being forced to think outside the box, to act collaboratively and with assertive and precise communication, taking everyone out of their comfort zone. The influence of product standardization makes this process, in a way, lighter, because through standardization we can obtain many gains and optimize many processes using technology.



BIM MRV Library

Difficulty in establish KPIs and measure ROI in civil construction industry

Historically, comparing civil construction with other industries, we have an industry, in many places, that still very archaic and with slow advances. This historic still brings to the present day, a cultural difficulty in measuring things in civil construction.

Bringing BIM to reality, we added an additional difficulty in obtaining indicators and measuring ROI on the implementation. Without a history of indicators, consistent and structured data, we cannot prove the proper returns and gains that BIM can bring to the process used in question.

Precisely because we have this pain, we work to maintain the standardization of BIM use regardless of the project in which BIM is being applied. All construction that has BIM projects, or any other BIM uses at MRV, follow the same standards, processes, and data structuring. This allows us, through automation, to create ways to collect the data generated in different projects, allowing a data-driven management.

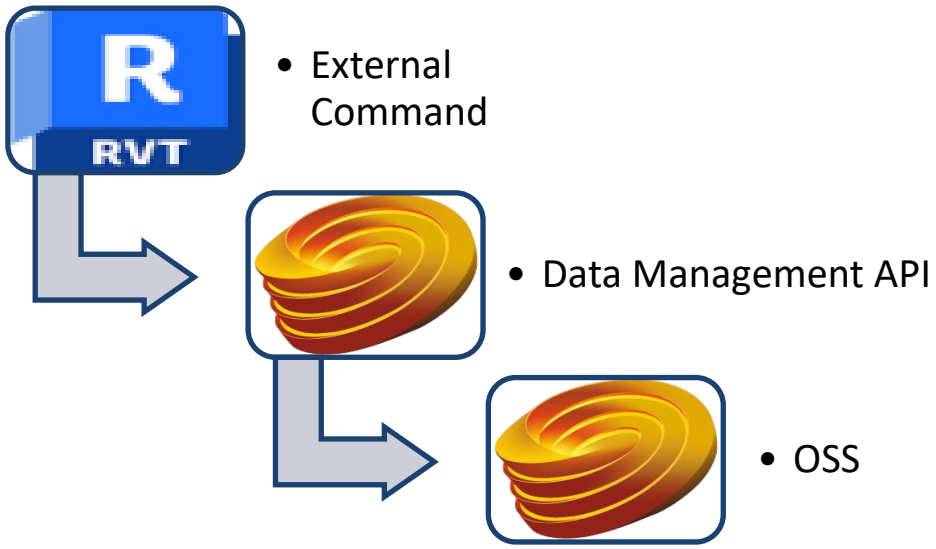
Tracking Revit Automation ROI

To track the usage information about an application the two main processes are: define which data should be collected and what platform will receive this data. With these two steps well structured, turns to be possible connect the data with other kind of business information and establish relevant metrics, to gather insights and ROI to drive decision making.

Plataform

There are a lot of different platforms that can be used to host logs of usage. In this way, the definition of which one will be picked, must be based on the environment that it will be used. It is important to think about where the users are from, if they are people from the same company only or not, to define authentication processes, data protection and other things.

In our case, we defined to keep the whole process inside Autodesk technologies, considering the volume and diversity of users, and the good connection between Revit API and Forge Data Management API. In this way, we have based our process in the Object Storage Service (OSS), to manage storing log files inside buckets through an execution of an External Command in Revit.

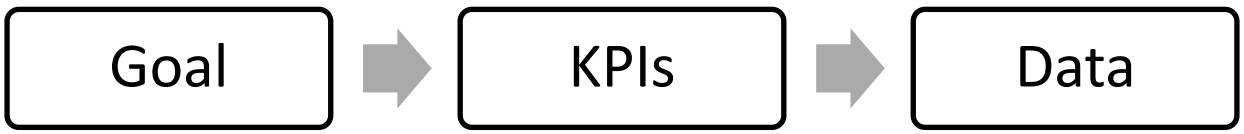


Flow to host logs at MRV Ecosystem

Data Collection

Defining which data to collect is the most important step, but also, the hardest. It demands to know clearly which metrics you should have, to help drive decisions. In this way, knowing what your needs are, and, other company information bases that can be connected to support the development of the metrics, can help you define the minimum amount of data to collect, also, avoiding collect sensitive information.

In the end of the day, our main objective, is to reduce working hours of design. With this in mind, our first step was developing a team goal based on that, “Increase the reduce of time with Revit Automation in 10% per quarter”. With the goal established, we had to define the KPIs to orient us, and with the KPI’s it became clear what kind of data should be collected to routinely refresh our goal status.



MRV’s macroflow

In order to increase the reduce of time with automation, we can act in two ways: develop new Revit plug-ins and maximize the use of the existing ones. Looking into this, all the data we collect, connect with other bases, is aimed to support decision-making in the prioritization of development activities, since we have limited resources.

Summarizing the flow of data, when the user hit the button to start one of our Revit External Commands, a .txt file begins to be written with information such as: date, Plug-in name, version, Document Title, Revit exceptions and so on, and in the end of the command, the file is sent to a bucket as an object, through the “Object Storage Service”. With all logs stored in known places, we can manage to resume it, and create the relationships with the other bases in Power BI, to highlight the performance and Goal’s results.

Data Driven Decision-Making

As in Optimization Study, we must maximize results based on our goals, considering our constrains. And a Data Driven mindset support the decision-making process, since it helps to explore different outcomes, guiding to paths that reach our needs.

To understand the connection of different bases of data, to generate insight for decision-making, there is no better way then diving into an example. All models have the same naming standard, and one of the information that is saved on log file is the Revit Document Title:

89ECAF23-FE9E-E811-B96E-009C02B0CB58-ARQ-02-00-15-ED. GARAGEM

With this structure, it is possible to identify from which project discipline and which building this file is from. Connecting this information with another base that indicates the location of each building, it can generate insights to us such as:

- plug-ins that were not well designed to fit in project standards of a specific Brazilian regions and can be improved;
- or Design Teams that could be using more plug-ins which points us to plan a specific training for these teams, since they are regionally defined.

MRV's plugins usage by project location

Furthermore, the manipulation of the data collected, guide us showing directions to improve KPIs with tangible actions: training, improvements in existing plug-ins or new developments. The expected impact of each action on the goals must be highlighted, in order to be prioritized on the right time.