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Scaling BIM process in Light-speed projects

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Learning Objectives

- Design a streamlined BIM process
- Explain the basics of BIM management automation
- Learn about the priorities for all teams involved in a project
- Describe best practices for managing consultants in cloud-collaborated projects

Description

How do you successfully implement BIM processes in projects with an uncompromisingly tough deadline? In a lightning-fast project environment, certain challenges present themselves repeatedly. At Wework, we have delivered close to 3 million square foot in the last two years in London alone. We are using Autodesk products to deliver a better product with a shorter deadline through constantly iterating on the design and delivery process. This session will look at ways Wework facilitates collaboration and streamlines the BIM process using BIM 360, Forge and Revit.

Speaker

Agata is a Senior Design Technology Lead at Wework, helping implement BIM process in projects from London to Moscow and beyond as well as developing workflows and tools to help design teams across the EMEA region. Originally from Poland, Agata graduated with an MEng in Architecture and Environmental Design from the University of Nottingham in 2011 and has worked in practices in Poland, China and UK since – first as a designer and later as BIM specialist.

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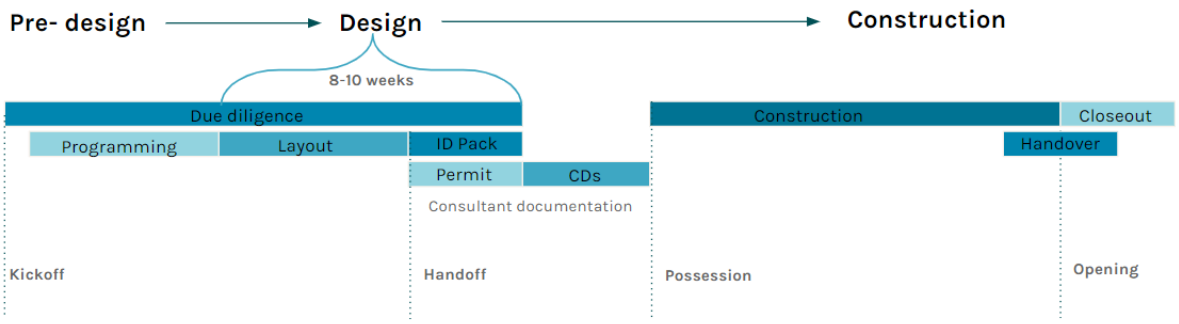
Contents

0. Introduction: Light-speed BIM – The Overview

Wework currently has multiple buildings in 111 cities globally, in the EMEA region that translates to 117 completed projects.

Managing and maintaining the BIM process in a practice always comes with challenges, regardless of the size of the project or its timeline. There are always things to juggle and tinker with, things to improve and get right. This becomes even trickier when your typical project takes under a year from the start of due diligence to opening as it is in Wework's case. There are wonderful improvements in the industry to streamline the construction phase which typically takes the longest. However, for the time being, we haven't experienced meaningfully reduced construction times across projects. Therefore, this isn't the phase I am going to be covering in this class. Instead, this class will focus on the part of the process that has fewer physical constraints – Pre-design and Design phases is when we found we could push for improved workflows and automation.

The diagram below shows a simplified outline of a typical project in Wework. The core Design phase currently takes between 8 to 10 weeks from briefing to producing the drawing pack. That 8-10 week phase is our focus for making sure the process runs flawlessly.



Typical project outline

Software

This section is not a guide, but it can provide an explanation as to why particular solutions were chosen in later parts of this class. Software choices are an individual choice for companies but in my case, Design Technology team at Wework uses (amongst other programs):

Revit

Revit 2019 is used across our design teams globally. That means that not only architects but also interior designers, engineers and design managers use it as a design tool and a collaboration platform. From BIM/Design Technology perspective our systems are set up in a way to support it and to extract information from the models via Revit API

BIM360 Design

Our live Cloud Common Data Environment – all of the project information is shared with the teams trough a BIM360 project. All models are cloud-shared live to support teams that might travel or work remotely.

Airtable

Design Technology team uses Airtable to manage a variety of things, including parameters, project trackers and other automation efforts. Our in-house teams across the departments know the application interface well, which makes sharing information with stakeholders easier.

However, for the context in which I will mention Airtable in this class, Excel, Google sheets or similar software will be just as good. Notepad-made CSV files will also work if you choose to capture and store information that way.

1. Designing a streamlined BIM process

What does ‘streamlined’ mean? A case of BIM at Wework

As mentioned above each project’s kickoff to opening time is typically under a year. Streamlining our BIM process meant simplifying it, focusing on eliminating errors and creating a culture of accountability from all stakeholders. In practice that came with standardization, automation and clear delivery framework that reduces confusion and saves time on the usual back and forth once external consultants are involved. Although we are fortunate to have in-house cross-functional design teams, the diversity of markets and experiences across them mean that an easy to understand and follow process is vital.

Because of Weworks' near-identical project typology, we have a uniquely repeatable window of opportunity in which to benchmark projects performance. It is an 8-10 week period with the same inputs and outputs. It is because of this controlled environment we can see the outcomes of tweaking certain variables. This is where we have made iterative improvements to our BIM process in rapid succession.

Efficiency is the key driver in our BIM process, the data we collect is then shared with Real Estate, Sales, Community and Facilities and we need to make sure it’s consistent across the board. This is why we create and maintain thorough internal standards.

Why would you want it?

Why would anyone not want more clarity in the modern design and construction world? If the management in your organization is interested in Agile solutions for other areas of the business, it might be worth suggesting the implementation of some of those principles into the design process. We are often told BIM is there for information sharing and reducing the cost in the long run, why not push it an extra mile?

All that BEP

BIM Execution Plan is the document that explains the BIM process, roles and responsibilities, LOD and LOI (level of detail and information) for the deliverables and software versions just to name a few. For large projects (infrastructure, public projects) this will be created specifically for that project as a blueprint for all parties involved in it to be familiar with standards and expectations. For us, the BEP is region-wide. Given the project baseline is standardized, there isn’t normally a need to create a separate document. The bulk of the standards (especially as software and work-sharing are concerned) are the same globally, unless there is a strong case for customization.

Regional differences

Europe differs significantly from the United States in terms of the construction process and legislation. Although there are differences in this regard between the states, country

to country differences throughout Europe are usually far greater. Because of that, we have developed a regional BEP that is very specific when it comes to data management standards, it gets a bit more open however where we can allow it, like the graphic standard.

What do you want?

To establish a clear, streamlined process, you need to define priorities that are right for your projects. What are the requirements you need to fulfil? Are you trying to do things according to a standard or are you relatively free in designing your process?

Be extremely clear on your goals here as that will determine everything you do after. For my team, given the type of projects we are involved in, our primary objective was not to comply with an industry standard. Our key priorities are reliable information in our deliverables, production speed and structured data that would be used for subsequent analysis.

Whatever it is in your organization, it's good to define the three key items you want to focus on in your process and review those periodically. Business needs change and your process will need to reflect that.

Standardisation

Standardisation can be an unpopular word in design-led organisations. However, when it comes to process, especially if well documented, it can be enormously helpful. The standardised baseline in project delivery will allow you and your team easily follow through with the process without having to clarify every step of every project. With a clear basic process, custom requirements for a project are very apparent and can be accommodated and costed appropriately. For a BIM manager, this starts with templates and content. Standardisation also lets you prepare and front-load typical tasks associated with the projects.

It is hard to advise on what to standardise in your organisation without having intimate knowledge on your current process but I invite you to reflect on this. My team's take on that was to standardise the core of our design documentation process with a template designed for each business line that fulfils the design and data requirements. The template then can be injected with the curated content, available to the teams via a content management platform.

What can you automate?

Automation relies heavily on standardized information and formatting, which is another reason why standardisation is important, in whatever degree you can implement it. In thinking about what processes you might be able to automate, consider your current sources of information. Maybe you already have a file with the list of your projects, locations, families, parameters etc? As an example, in my team, we use an Airtable tracker that has projects' names, addresses, teams and external companies' teams in it, as well as the status of the Existing Conditions model, Reality Capture and more.

2. BIM management automation

The use of scripts to automate repetitive tasks is increasing across the industry. Software companies are developing more and more API endpoints every year to allow their users to tailor certain functionalities to their use.

Why do you need it?

Your team's time is valuable. Especially when working with highly skilled individuals, you want to make sure that it is spent on solving real problems rather than admin tasks, waiting for access to platforms or chasing missing information.

Data management

Automation can come into play only after your data management strategy is thought through. I touched upon this in the previous section, but it is important that you keep a neat record of items that will play a role in your automation efforts. If you are a BIM manager, you likely already have this section under control.

Goals

- Streamline day-to-day support
- Reduce manual admin tasks
- Cost-saving
- Gain more time for innovation

Tools

There are many options to choose from as far as tools to help automation go. As I specify in the class description that it focuses on Forge and BIM360, my tool selection reflects that approach.

APIs

API stands for Application Programming Interface – you can think about it as an interface connecting two pieces of software. In other words, you can get information out of an application without the need to open it or otherwise go through the User Interface. An application might have several API endpoints developed that will allow you to read or write information to it via API methods:

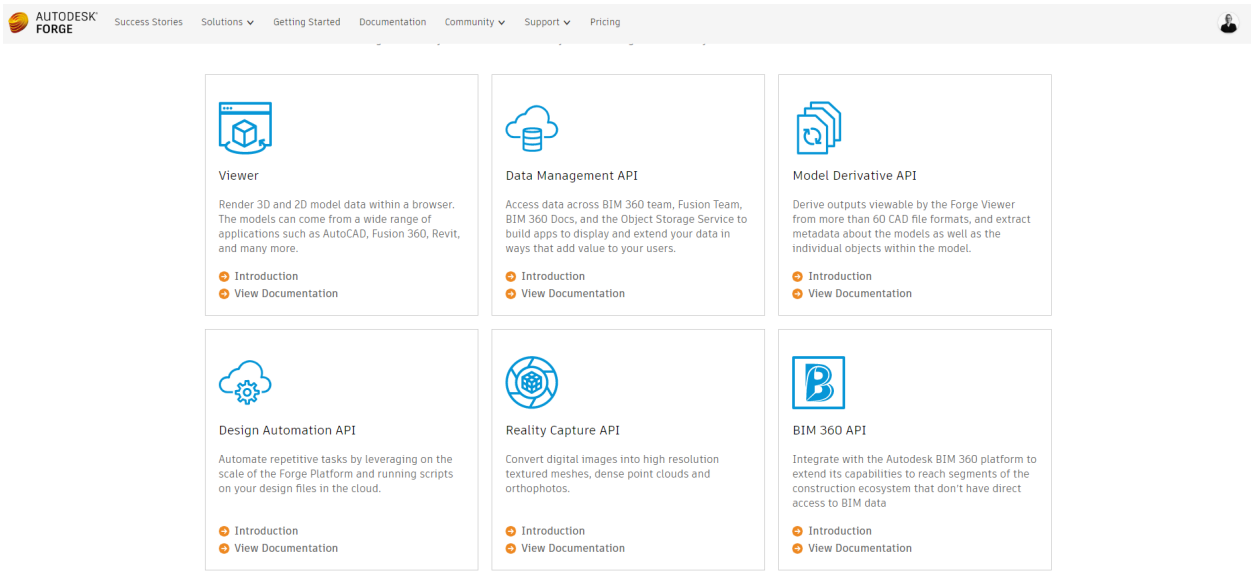
- **GET** – this method instructs the application to retrieve the information you requested.
- **POST** – this method requests that the application create the input you are sending.

- **PUT** – this method requests that the application completely replace an existing record.
- **PATCH** – this method requests that the application update an existing record.
- **DELETE** – this method requests that the application delete a record.

Forge API documentation

Autodesk Forge has developed several API endpoints across the Autodesk applications. Depending on your software solution,

My team uses the BIM 360 and Design Automation API endpoints (https://forge.autodesk.com/en/docs/bim360/v1/reference/http/) to build our tools as that's compatible with our software but if you don't use Revit, the other sections that Forge has developed can be of your interest, and I highly recommend checking out their webpage for details



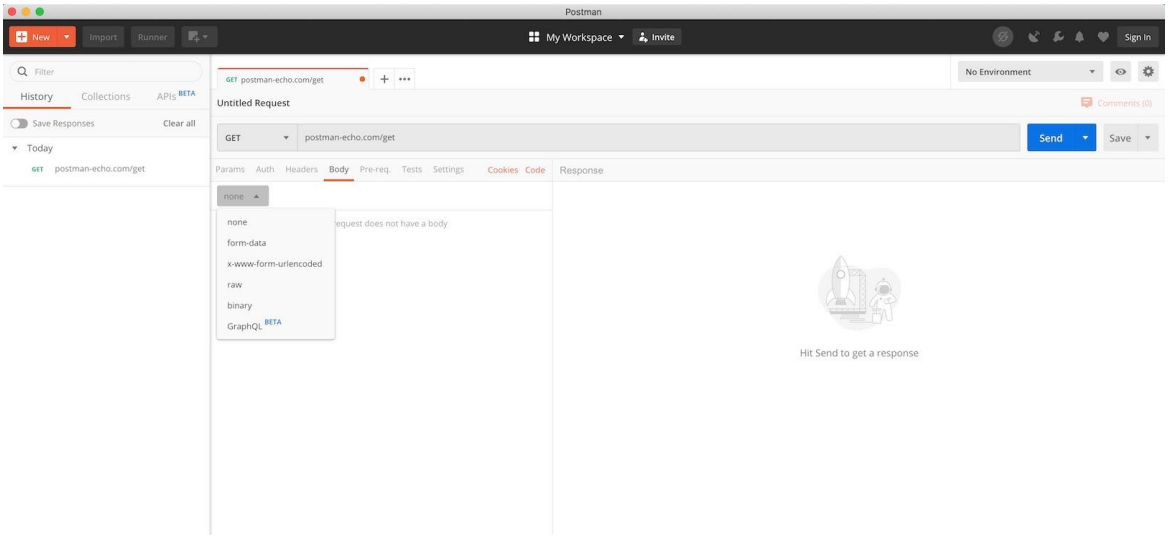
Autodesk Forge website (www.forge.autodesk.com)

Once you pick the right section, under View Documentation you'll be able to see the list of methods available as well step by step tutorials. It's worth following a couple of tutorials to get familiar with the process, given you might need to get authorization for your app to interface with secure BIM 360 hub or other protected information.

Postman

Postman is a great tool to get started with API requests. No code is required to quickly go through main API requests. It allows you to quickly test your call and see whether you

are getting the anticipated response. For example, if you are trying to test **GET PROJECTS** method, you will expect to see some project information in your response.



Postman interface (www.getpostman.com)

Make an App

You'll need to provide some basic information about your app, like the name and description (and a callback URL for 3 legged authentication – see appendix) – that is all I takes to get your client ID and client secret to use in your Postman test call.

Quick test

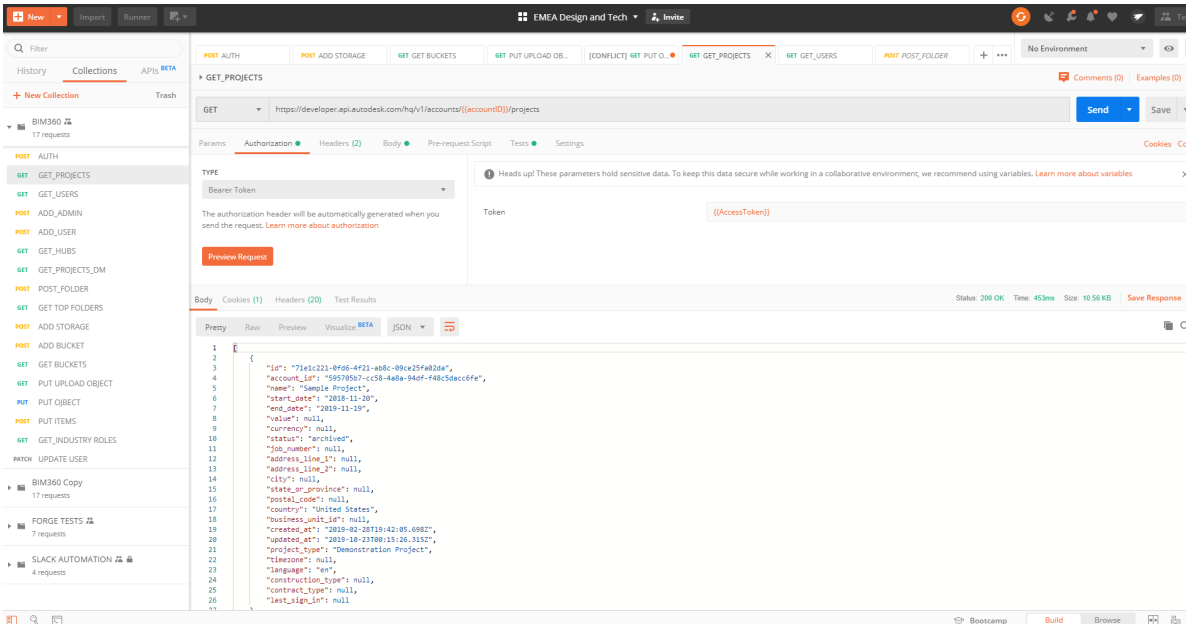
This exercise will give us a file that lists all projects we currently have on BIM 360

POST AUTH

This method will get you an authorization token that your app will use to access your BIM360 hub – you will not be able to achieve much without going through this process first.
https://forge.autodesk.com/en/docs/oauth/v2/tutorials/create-app/

GET PROJECTS

You will use the token you got from the POST AUTH method here in the Authorisation tab you will also need your account ID
https://forge.autodesk.com/en/docs/bim360/v1/reference/http/projects-GET/

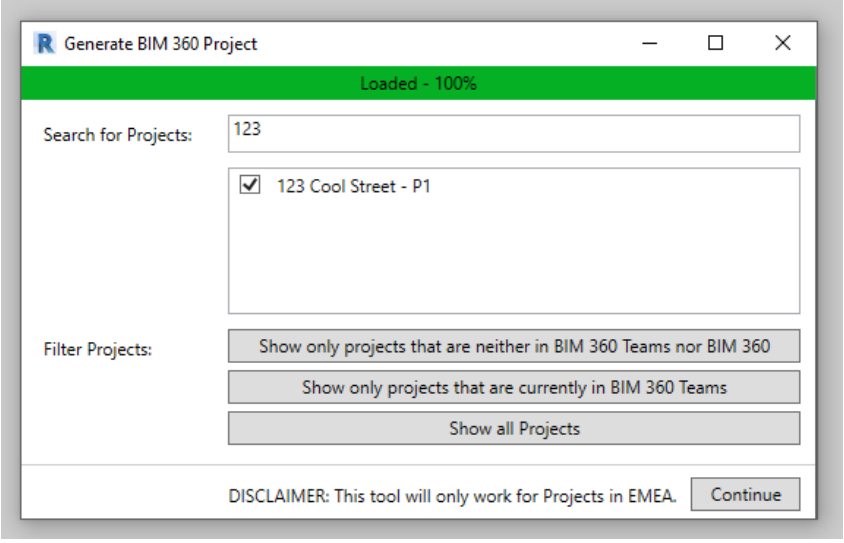


GET PROJECTS response example

Examples of automation

All of this might not look particularly impressive just yet but it is just a beginning – I included links several resources in the appendix for you to experiment in your own time. You can then start integrating API calls into more robust tools for your organization. Below I have shown a couple of examples of what my team has implemented in the last 6 months:

Generate BIM360 Projects



Generate BIM360 Project

We have identified a lot of time was wasted between projects coming live and being set up in BIM 360 with the team invited and the folders that we needed. Generate BIM 360 Projects reads the list of projects from a tracker, filters the ones that have not a BIM360 folder attached, then creates the project in BIM 360 hub, adds the people listed in the database as the project team and adds folders we've defined for it.

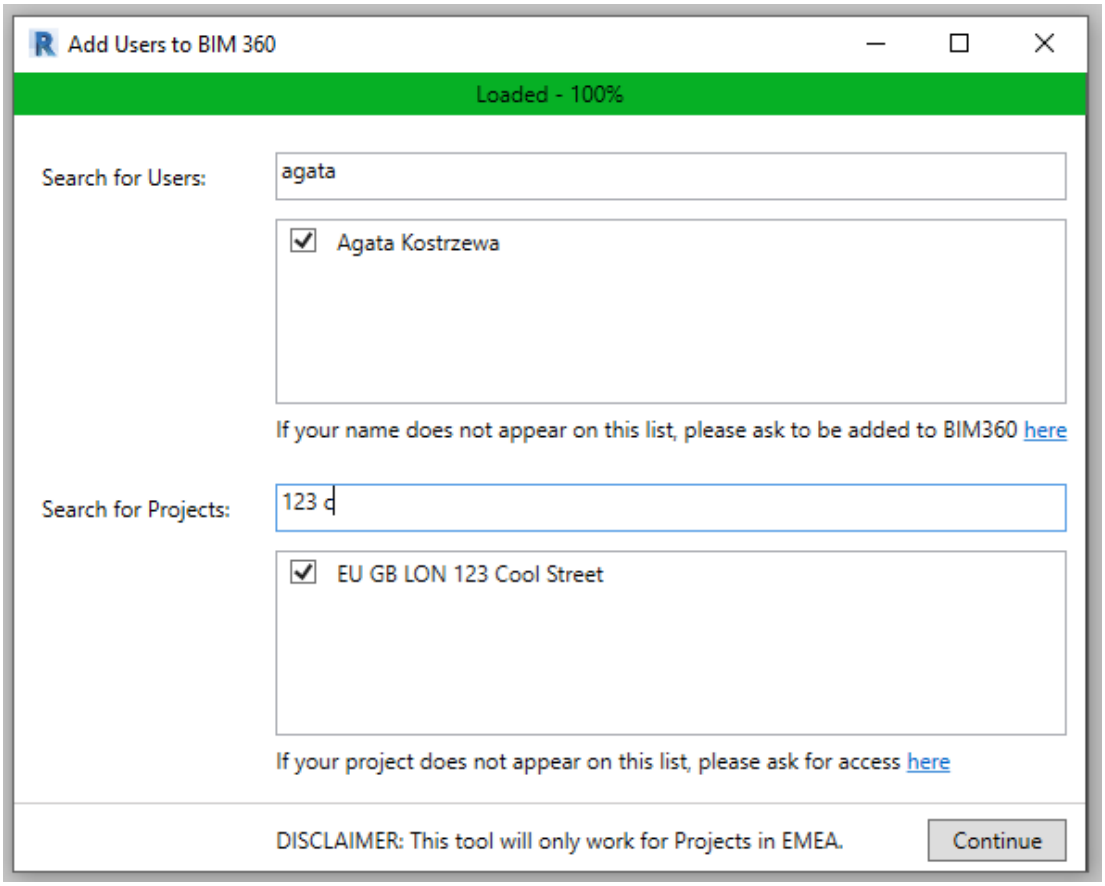
This tool uses the following POST methods from the Forge API documentation:

- **POST PROJECTS** – we need to request that BIM 360 create the project with the information that we pass. As per the documentation available here, we can see that the required body structure keys are **name**, **start_date**, **end_date**, **project_type** and **value**, whose values will be used in the project creation in BIM 360. In the case of our tool, those come from the Airtable records associated with the project name.

- **POST USERS** – after we have our project, we can follow up by adding the users to it. To achieve that, we need to request that BIM 360 add those users as per instructions listed here. In this case, the users need to be added to BIM 360 hub already, otherwise, we need to use this POST USERS method which will create a new user in your BIM 360 hub:

- **POST FOLDERS** – with the project created and users added we can then create the folders we need in the Plans or Project Files folders. The documentation for it can be found here – please note that

Add Users to projects



Add Users to BIM 360 Projects

Project teams are dynamic and architects and interior designers from other teams step in to help often. As they're not listed in the database as the core team working on a given project, they will not automatically get access. As a result, Design Technology team was swamped with requests for access to BIM 360 via Slack or email, so we built a tool that lets people add themselves to project with the right access level based on their role as defined in the database. This tool is based on the previous Generate BIM 360 project tool but focuses on filtering the projects that are already created and uses the **POST USERS** method from the Forge API documentation as per the last tool. You can build on the same methods to customize your tools. As described, this tool is for the wider team to use and the Design Technology team wanted to limit the potential of it to just adding people to an existing project rather than giving everyone free reign to create new projects. Automation can be a powerful tool so it's essential to consider the consequences of deploying new solutions to your team.

These examples show that automation in practice starts in identifying the simple tasks that are repetitive and figuring out a way to make them take care of themselves. For example, in the case of **Generate BIM 360 Projects** tool, a similar script runs automatically on schedule once a

day to generate a BIM 360 project for all new projects that have come online in the last 24 hours. Nobody has to spend time clicking buttons unless there is an edge case situation where a project needs to be created immediately – that's where the Revit tools come into the picture. In short, your roadmap would look something like this:

- Identify a simple task you would like to automate
- Identify an API method that would help you achieve it
- Test in postman
- Build into a Revit button
- If applicable, put on the scheduler

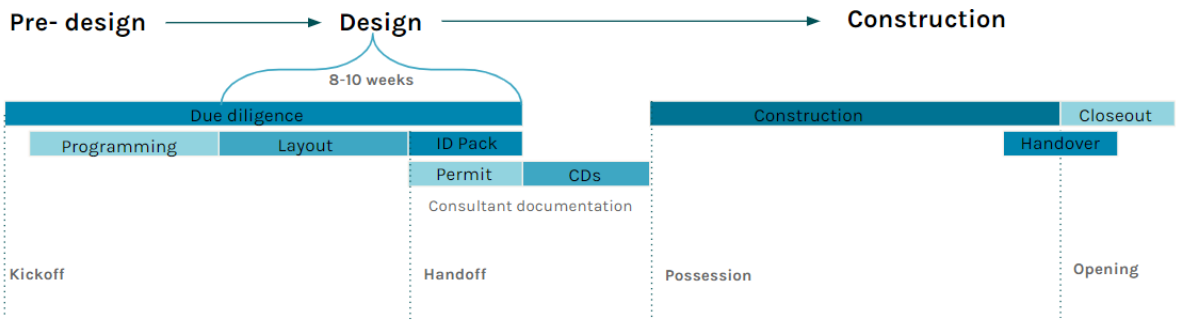
Refer to the **Appendix** for extra information on this.

3. Priorities for the teams

All disciplines (architecture, MEP, cost management etc.) must know what is happening in the project at any given time and any changes that are being implemented. Any change that is not communicated clearly and immediately will have a cost implication. Transparency in the process, as well as reporting, can help reduce some of that.

The circle of (project) life

Project Delivery Framework must be clearly defined. As an example, I have included a visual in the introduction (repeated below), that outlines the typical project stages in Wework. Starting with a basic overview, each discipline builds out a list of deliverables they produce and require for efficient work. This then gets organised into a list of dependencies, which is used as a blueprint for planning each project. Later, that is shared with external consultants as well to communicate expectations and key dates.

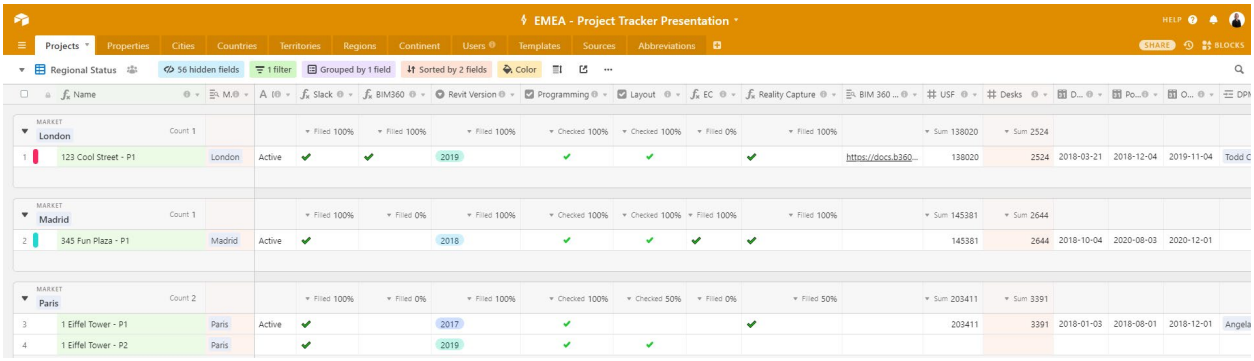


You've seen this before – Wework's typical project outline

Project tracking

To keep on top of their tasks and have priorities visible, your team members need a project tracker they can trust. Ideally, that should mean one tracker for the entire team rather than each person (or even each discipline) having their own. A multitude of trackers relying on manual data entry is an easy way for the confusion to creep in. The solution is to limit the manual data entry to the central tracker and allow linking its information to the secondary trackers.

In our department, we use a central tracker in Airtable that sends out the updates to dependent trackers for each discipline via a custom script using Airtable API. The manual input is limited to comments and form inputs so that every change is tracked and immediately distributed to other teams. Excel and Google Sheets have the built-in functionality to link documents together – if you can control and protect the central tracker's location this might be a good solution for you. Sometimes this process is less about finding the perfect tool, but rather embracing the possibilities that the software you already have might offer.



Project Tracker personalized for Design Tech needs

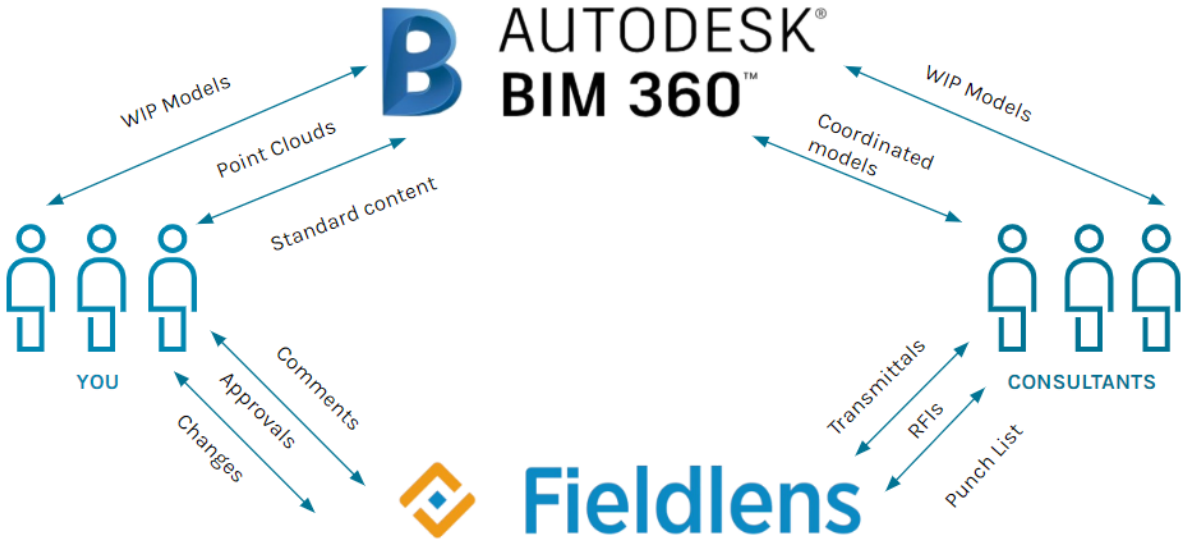
4. Best practices for managing consultants in cloud-collaborated projects

It might be hard enough making sure all your internal teams are complying with the BIM standards you set for the project, but it becomes even more tricky the moment external consultants are engaged. Coming with their own set of standards they are used to and their particular way of doing things, it is important to establish expectations early on, all the negotiable vs. non-negotiable items, the level of detail for all project deliverables as well as the quality of the final product. When your process is streamlined and stripped back, you need to find the consultants that understand your priorities and are happy to follow the standards you set

Why bother with cloud collaboration?

Cloud collaboration is a fantastic tool for design teams, allowing everyone involved to always work with the current version of the model simultaneously. We require all our teams, internal and external to work in this way. The team can workshare when working remotely and it is easy to troubleshoot corruption and manage model versions for all parties involved. There are no set days for coordination meetings before construction starts as that happens organically on a daily basis as work-in-progress models from all parties involved are linked in and problems are spotted on an ongoing basis. This helps us save time compared to the traditional practice of all parties publishing their models once a week or so.

Cloud collaboration is not limited to models. To reduce the amount of email that gets received and ignored, we have decided to mandate the use of construction management software in our BEP. We chose Fieldlens but there is a variety of options available on the market. This solution makes important information visible to entire companies rather than individuals while still allowing individuals to be linked to tasks and held accountable for them, with due dates assigned to each task.



Information exchange structure – avoiding email

What do you need?

An answer to this question goes back to your BEP and the priorities you set for your process. You then need an external team who will understand and comply with those. It is a good idea to make sure the BEP compliance clause is included in the Master Agreement. If possible, you should attempt to get involved in the tender process to be able to verify immediately whether the key requirements in your BEP are achievable for the consultants competing for the project.

When delivery speed is the key, backing out of a signed contract will likely harm the completion timeline.

What do they need?

Your consultants are your partners in delivering a product you want to be proud of and should be treated as such. Some of the external teams will have a BIM manager, but you need to prepare for the possibility that there just won't be one. In either case, it's good practice to have a presentation outlining your process and timeline. A lot of the teams will also be new to cloud work-sharing. Even if they are used to working simultaneously in a live model on their internal server, stepping into cloud collaboration territory can be a challenge. It is extremely important to navigate any knowledge gaps carefully, especially when dealing with consultants from a cultural background that is different from yours.

Cultivating a culture of trust

As mentioned above, at Wework, we mandate a high degree of openness and trust from our consultants. To do that we need to establish a respectful working relationship and explain our process as clearly as possible. To do that, we go through onboarding with them – consultants get invited into our space to gain an idea of the product they will be asked to help deliver and meet the team before the work officially starts. They get taken through typical deliverables and BEP page by page and have a list of all software versions, get full BIM onboarding as well and get invited to all the cloud platforms. BEP and other relevant documents are sent to them in advance but in my experience, those meetings are helpful to go over the details again and make sure the documents we sent over were read and understood. It is always easier to address any questions and confusion face to face. A software solution might help but ultimately cannot solve communication issues.

5. Appendix

I have included some additional resources below – all of these are related to the automation section of this class.

Python
https://wiki.python.org/moin/BeginnersGuide/NonProgrammers
https://docs.python.org/3/

API Authentication
https://forge.autodesk.com/en/docs/oauth/v2/developers_guide/basics/

Postman
Getting started with Postman:
https://learning.getpostman.com/docs/postman/sending_api_requests/requests

Setting global variables:
https://learning.getpostman.com/docs/postman/environments_and_globals/manage_globals/

Forge
Intro to BIM360 and Forge API:
https://www.youtube.com/watch?v=dwxKHOMi2xM&feature=youtu.be+Next+Step+2
https://www.autodesk.com/autodesk-university/class/What-Heck-Forge-2017
https://forge.autodesk.com/en/docs/bim360/v1/reference/http/

JSON API documentation
What do your API responses mean
https://jsonapi.org/

Revit API docs
https://apidocs.co/apps/revit/2019/d4648875-d41a-783b-d5f4-638df39ee413.htm

Revit Python Wrapper
To write Revit API code in Python:
https://revitpythonwrapper.readthedocs.io/en/latest/#