AUTODESK UNIVERSITY

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A Framework for Creating an Autodesk Forge-Powered Innovation Hub at VINCI

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Learning Objectives

- Discover the challenges of federating Autodesk Forge-powered tools into a single platform
- Evaluate common workflows in local industries
- Learn about designing a web platform as a hub that answers stakeholders' and professionals' needs
- Learn about implementing strategies to develop a road map for creating specialized and automated construction-quality tools

Description

We can use Autodesk Forge to develop infinite ways of customizing workflows and new features for designing, viewing, analyzing, processing, and editing 3D models. But how do we centralize these features in a single work environment? In this industry talk, VINCI will present a framework to federate Autodesk Forge-powered tools in a single environment, fostering collaboration between several sectors in the construction industry-from design engineers to field workers, passing through cost estimators and MEP (mechanical, electrical, and plumbing) specialists.

Speakers

LinkedIn: https://www.linkedin.com/in/andre-deandrade/

André Santos de Andrade is a Product Owner at VINCI, working with custom cloud applications for the construction sector for 2 years.

A Civil and Urban Engineer by training, he worked in rail, mining, and building projects, always leveraging BIM as a methodology and automating key work and data flows. He moved to digital projects and honed his product and technical skills as a self-taught web developer, delivering cloud-based applications for BIM, CIM (City Information Modeling), or GIS (Geographic Information System) related activities.

André truly believes in the impact digital tools and cloud platforms might have on day-to-day productivity, especially in such an unexplored and underdeveloped sector, regarding the maturity of its digitalization.

LinkedIn: https://www.linkedin.com/in/anthony-hindi/

Anthony Hindi is BIM Manager at VINCI Construction. Working as BIM Manager for almost 7 years on many projects, he was able to consolidate a business-oriented view of the missing blocks in construction today.

We started as a BIM Architect in Lebanon, then he worked as a BIM Consultant in Taiwan, going on to work as a BIM Coordinator and BIM Manager in the French market since 2017, he has a unique point of view about how BIM and Forge can help build tomorrow's tools.

He is an architect who graduated in 2015 at the Holy Spirt University of Kaslik, master of BIM, integrated conception and building life cycle in both Ecole des Ponts ParisTech and Ecole spéciale des Travaux publics, du Batiment et de l'Industrie.

LinkedIn: https://www.linkedin.com/in/moreiraeric/

Eric Felipe Araujo Moreira is the Lead BIM Developer Engineer. The BIM Engineering department has two teams: One develops business applications in BIM and the other brings expertise for BIM projects within VINCI Construction.

Eric's main mission is to manage multiple development projects and ensure their conception, development, deployment, management, or termination. He contributes to the definition and quality of development projects by integrating innovative solutions while remaining pragmatic and concerned with the financing of projects.

He is a master's in Civil Engineering (UFMG); Urban Engineering (EIVP) and he has a technician degree in Computer Science. He also worked for a research laboratory at UFMG that researched BIM and the technologies it derived.

Day-to-day tools: Autodesk Revit; Autodesk Forge platform; Python; C#; JavaScript; Visual Studio; VS Code; Microsoft Office Pack; Microsoft Power BI; and Data Visualization Tools.

About VINCI

VINCI is a world leader in concessions, energy, and construction, active in nearly 120 countries and powered by the engagement of 260,000 employees.

Our ambition, in response to the climate emergency, is to accelerate the transformation of living environments, infrastructure, and mobility.

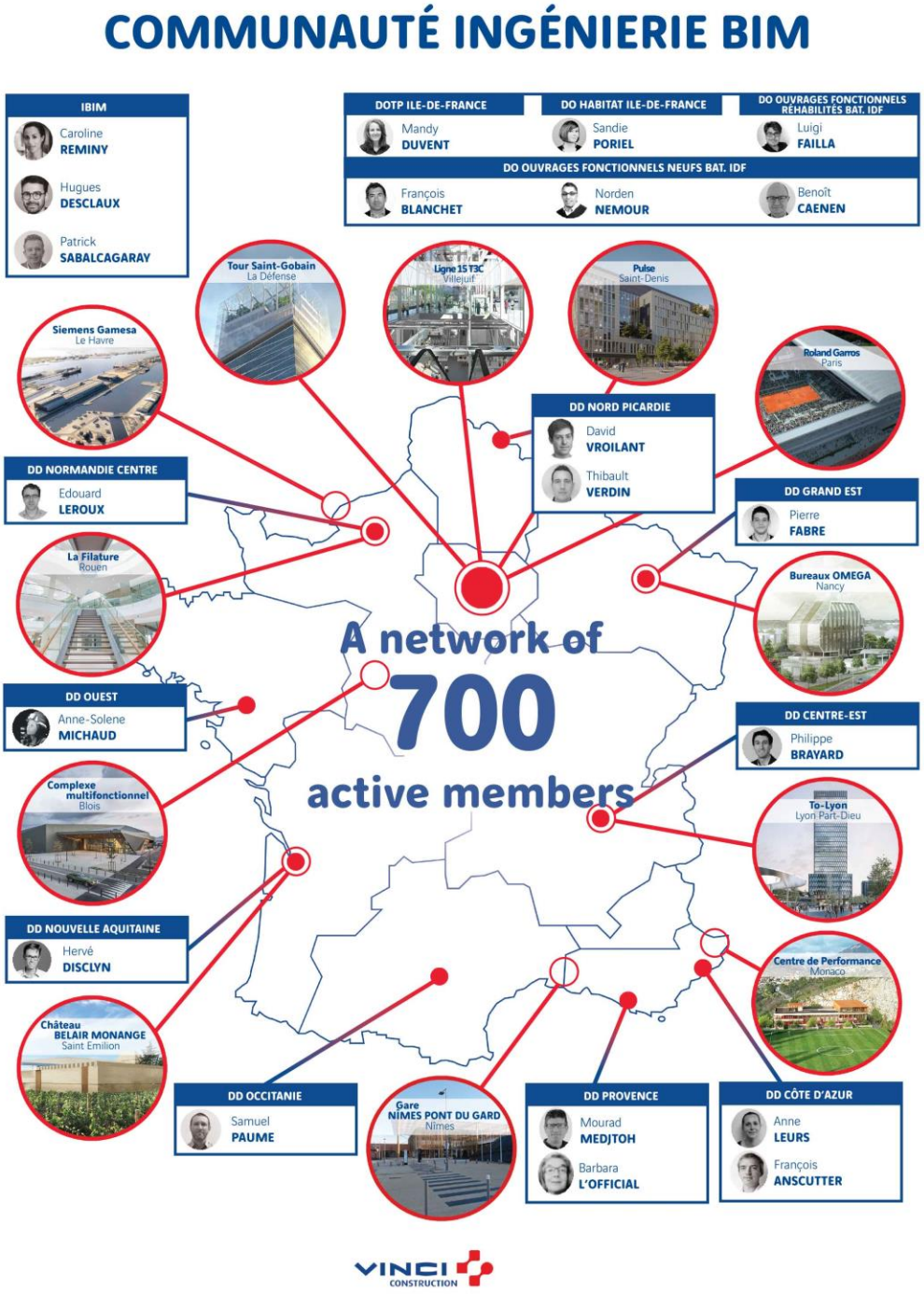
We also aim to foster social progress by being a humanist group that exemplifies inclusion and solidarity. Powered by our economic performance and the engagement of our 260,000 employees, we forge a more sustainable world and fully embrace our role as a private sector partner working in the public interest.

About I-BIM – BIM Engineering / Ingénierie BIM

I-BIM is a centrally located design office of committed experts, specializing in major projects at the national level, which assists the regional DRTOs.

Serving the worksites in terms of BIM management, coordination, and modeling with the project teams, but also in terms of development and deployment of BIM tools with the development teams for engineering, VR, AR, data acquisition via scan and drone, and marketing.

I-BIM is also the activator of the global BIM community of almost 750 members. These members were brought together by the tools, methodologies, families, and many other contents custom-made for VINCI workflows.



Community members based in France

Same industry, different practices

I-BIM projects are mostly based in France. However, some aspects of our working culture make us very aware of global trends in construction and BIM in general.

First, VINCI is a truly global group, with ongoing projects on all continents. **Each project is managed differently and has different contractual arrangements.** These differences are natural. They are a direct consequence of the local market, actors, and partners, which have different skills and techniques for building skyscrapers, bridges, canals, and so on.

Secondly, the I-BIM team is made up of people from all over the world: France, Lebanon, Brazil, Vietnam, Senegal, and many others. Four of five continents are represented in the team. They have valuable work experience worldwide, either in their country of origin or even abroad. **The accumulated global industry knowledge helps us to come up with uncommon practical ideas for the local market and propose better solutions for our clients.**

Finally, the digital platforms available for BIM projects in the market usually have a global reach. It is not unusual for our team to work with platforms developed in the United States, United Kingdom, or the Netherlands and end up learning new arrangements and ways of collaborating, simply because this is the way the tool is meant to be used there.

France tends to follow a "design-build" logic, where the builder and designer work together to provide design, engineering, and implementation services. This project arrangement allows early and frequent collaboration between architects, engineers, estimators, and construction teams. This collaboration in design between the architect and the contractor continues throughout the project.

Since it is a very common arrangement in the local market, contractors tend to form optimized teams for this type of project, especially the big ones. **VINCI Construction, for instance, has internal design teams** for several disciplines in the building and infrastructure construction sectors. Other important actors also have internal support in the design part. This is just an example of how companies adapt to the market they work in.

In other countries, "design-bid-build" logic is prevalent. In this arrangement, the design team delivers 100% complete design documents, and the contractors perform the documented scope of work. Both designers and contractors are hired separately and have no contractual obligation to each other, therefore the owner assumes all associated risk and is free to search for the most advantageous bids.

As the construction collaboration terms are inherently associated with the local market rules, the tools that are built upon these rules have unique workflows. **These unique workflows imply that sometimes the tools developed in one country may not fit another one.** There is an effort to dynamically adjust these tools to fit every market but there is a problem with that.

When these were developed, the development team needed to set a reasonable number of hypotheses. These hypotheses were based on the current market so the tool can answer its needs. The truth is that they are embedded in the way the tools were built. **Also, they are embedded in the way they will evolve.**

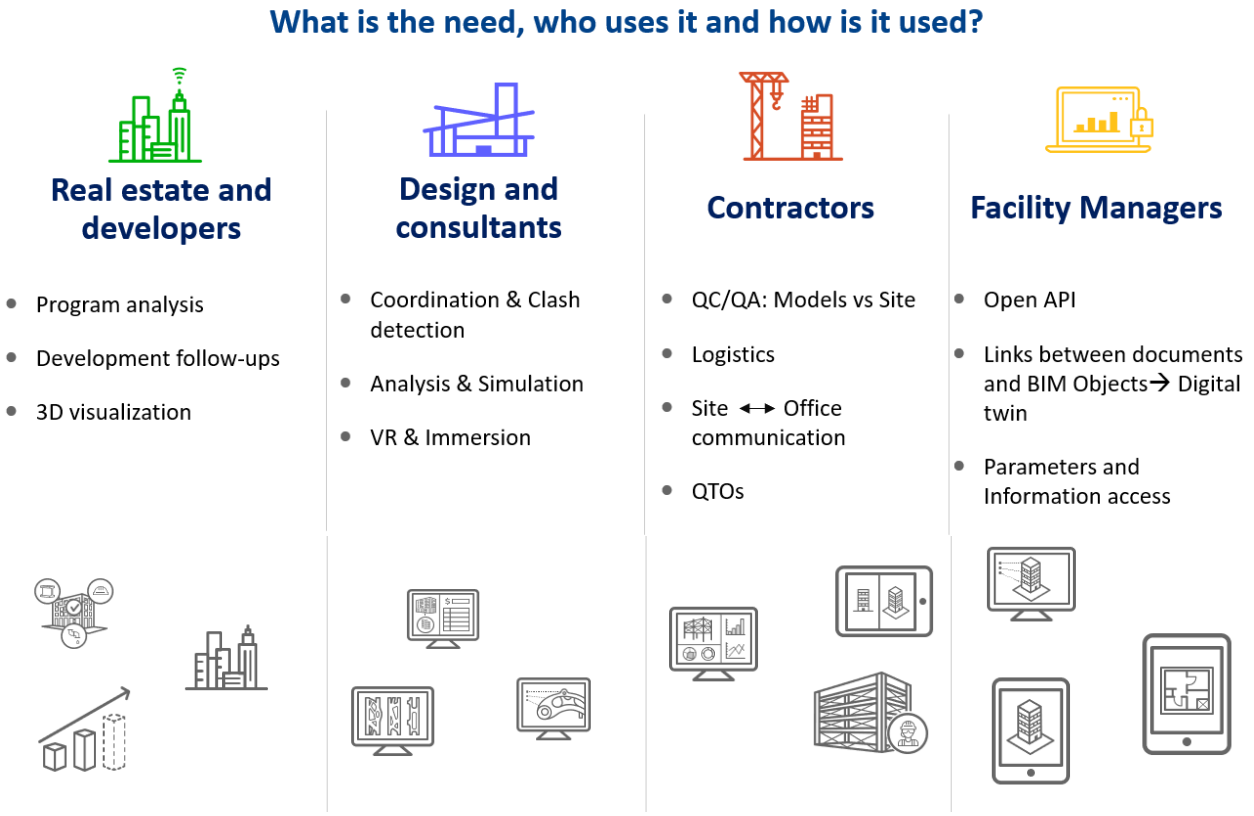
We need to give back control of the technology to the construction worker so tools will evolve hand in hand with on-site experience. **The digital transformation needs to be bottom-up, so we can have tools that fit our local market needs.**

One size does not fit all.

The final goal (and the roadmap to get there)

The first question one needs to ask is: What are exactly the needs of the local market / your potential clients?

The first step of our path was to define exactly what the essentials for each one of the local market partners were.



We found many companies that develop platforms and tools for each one of these actors. Each one had its advantages and disadvantages. Also, we found that these tools didn't communicate enough with one another. So, the pieces of information that one partner stores in his tool aren't shareable with other partners.

The purpose of our tool is to be fully open BIM. Thanks to Autodesk Forge, our BIM viewer is compatible with more than 70 formats.

Also, we don't want to answer every need of each partner. We want to fit their essential needs and assist them with a custom and collaborative experience.

Each team needed a specific set of tools. The data flow between the different actors and everyone gets to access the pieces of information about the project.

Some of the first achievements

- The digital as built (on steroids)
- A logistics tool for construction workers
- Takeoffs
- Quality control of drawings and models

You can check out more about these achievements in the presentation file.

The challenges to getting there

- The rationale behind the first steps

We needed to involve our community each step of the way.
We started by setting the internal community at the center of the project.
We would only develop things that they needed.

- The organizational challenges

At first, we faced some **organizational challenges**.

We didn't dispose of the **internal resources** to address this challenge, so we start the recruitment process.
We needed an **experienced partner** to speed up the development, we searched for innovative companies to partner with us.
Also, the **Project Management** method should establish cross-functional communication and step-by-step delivery to our clients.

Our goal was to combine the needs of Real Estate, Design, Contractors, and Facility Management in the process.

We had three key requirements: The partner should have development knowledge, construction industry know-how, and ideally, experience in CDE development.

We search for trustworthy certifications in the market as the Autodesk Forge Certified Systems Integrators and our final choice: DB-lab. They are a web development company specializing in BIM and based in France.

- The operational challenges can be split up into three
    - The technological choices we had to make

Our technology should be able to answer 3 key needs of our users: a BIM Model Viewer, a Document Management, and a Multiplatform tool.

To avoid rework, we picked a technology that allows us to deploy the app to several devices with a single code base. We followed our IT team's suggestion on picking Microsoft Azure to manage our infrastructure and data and we used Forge as the engine of all BIM activities. We use Revit in nearly all our modeling activities and Forge is THE best solution dealing with Autodesk formats

- How to deal with the data we produce

It's cliché but true: data is an expensive commodity.

Owning our data is a strategic decision and the actions we take to reflect this ambition
There is also pressure from regulators on this matter in some projects, especially in some sensitive areas such as the army or prison system projects. They require all project-related data to be stored in France

- The cybersecurity precautions we took

We partnered with the Vinci IT team to ensure our CDE was secure, and several penetration tests (or hacking attempts) were made. Each test came with a list of corrections, that were carried out for several months until we checked all items. Another major outcome is a "best cybersecurity practices in web development" guide, that will save us time when developing future cloud applications.

Key takeaways and links that can help you overcome them

- **Acknowledge differences** in managing construction projects is key

- Assess internal skills and **partner** firms' availability for the project lifecycle.

A JavaScript developer can learn how to use Forge easily. But if you want an experienced partner, search for Autodesk Forge Partners: Partners | Autodesk Forge

- **Beware of operational challenges** in the long run

Every tool needs to be maintained. To build a reliable tool, you'll need to partner with your internal IT team and keep them in the loop about everything. A good tool needs to be polished from time to time.

- **Keep active communities** of people who are interested in a new product for their activity

Building a set of software tools (for example, plugins for Revit), unified methodology, families, and other contents can help people get together around the same workflow. Their feedback is essential along the development project.

- Develop features that are **sponsored by internal clients**

If a client needs a new feature that will serve him well, usually he will be inclined to partner with your project. It is possible to build "doors" in your platform so the client can make a data exchange for example. That makes the platform more flexible and improves interoperability.

- **Validate** results with the same internal sponsors who asked

Always keep them in the loop about what exactly is in your roadmap so they can get the vision behind it. And they can help you build this vision and set the right course for your project.

- **Resist** the temptation to reinvent the wheel

Sometimes you don't need to create everything from scratch. A web development team can use frameworks to gain time. Also, the market already has many applications that can do specific parts of the workflow. A partnership between your tool and other tools of the market needs to be enforced so you save time, and your clients have a final product quickly.