

Seminar „The Future of Construction Processes“ (2023)

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## **Introduction**

In recent years, digitization in the construction industry got more and more present. Compared to traditional working methods, digital tools are expected to improve the efficiency of the construction process. Due to rising requirements like price pressure or environmental responsibility, construction companies need to improve their operation to compete globally. Implementing tools that can reduce costs, time and errors in the planning process is a challenge companies all over the construction industry are currently facing. For the third time experts in the construction industry digitization field presented the digital solutions for problems they face every day, at the seminar “The Future of Construction Processes”.

## **Future issues for construction management and operation**

University professor for construction economics and management Dr.-Ing. Frank LULEI points out that many industries where digitization plays a big role differ from construction. Production in a plannable environment requires an isolated, controllable environment like a factory hall. In such environments, pre-plan and pre-build all processes in detail are possible. Furthermore cause-effect relationships are mostly simple and linear. Environments like that allow to ask the question “How can it be done best?”. Construction sites are a more dynamic-complex environment with highly interconnected and changeable relationships with many external risks over time. Due to each project being built by a ‘temporary company’ the more important question in such an environment is “Who can do it best?”.

As for now the degree of automation correlates with the required level of education. Jobs at each end of the scale regarding the required education level are the hardest to digitize. That includes hard manual labour as well as complex analysis thinking. Both of which play a huge role in the construction industry. That shows just how difficult yet essential it is to find the right digital tools to implement on construction sites. To use the full potential of BIM, Lean Construction and digitization as a whole, new contract models need to be implemented.

## **Smart tools for the construction industry**

The company KanBo is a work coordinating platform. Its founder thinks that to stay on the market you have to be innovative. Once your product reaches its high and starts declining, an innovation window opens up, which can be seen in *Figure 1*. KanBo wants to be a part of this innovation progress by bringing together all stakeholders and offering a platform for interaction and coordination, clearly and logically.

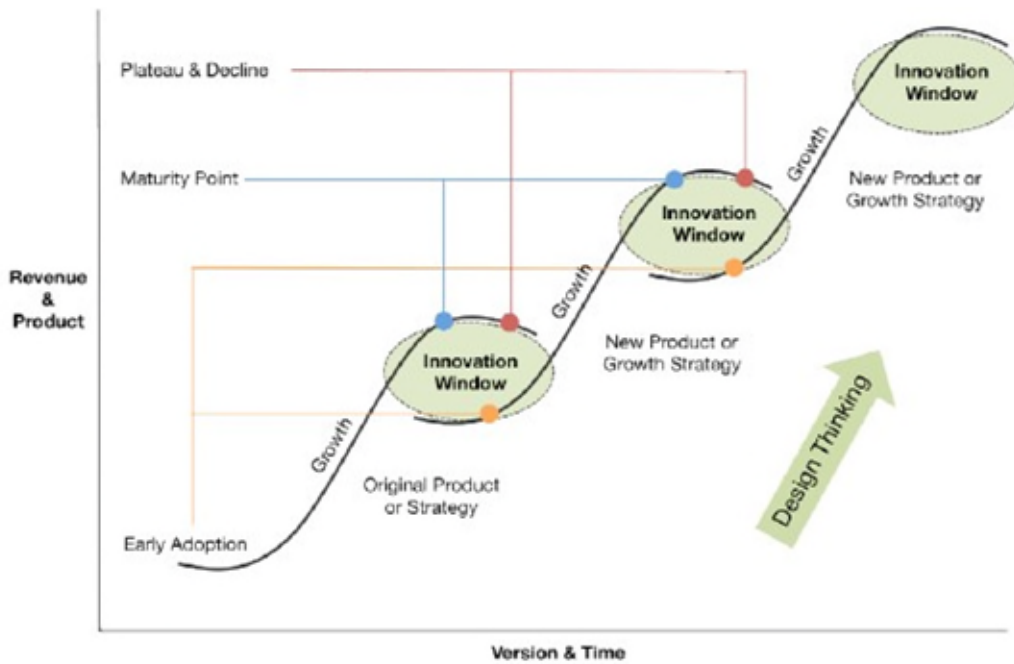


Figure 1: Constant Innovation

The company Insite IT specializes in digitizing industrial construction site processing. The main field of use includes tracking of materials, deviations, installation progress, daily reports and time recording. Digitization isn't meant to be the digital storage of every document and informing by sending various emails. Insite IT allows the focus on the necessary, ensuring transparency, implementing the right mindset, creating new methods of operation and using new technologies to reduce waste. Therefore adding value to the construction process by reducing waste. Insite IT focusses on balancing the demands of the management and the operating staff. A simplified project logistics with Insite can be seen in Figure 2. Insite allows you to collect data from your suppliers. Compared to traditional data gathering it only collects the necessary data for your needs. The software creates one packing list for the whole project which can be returned to the suppliers. This ensures that every element is described identically.

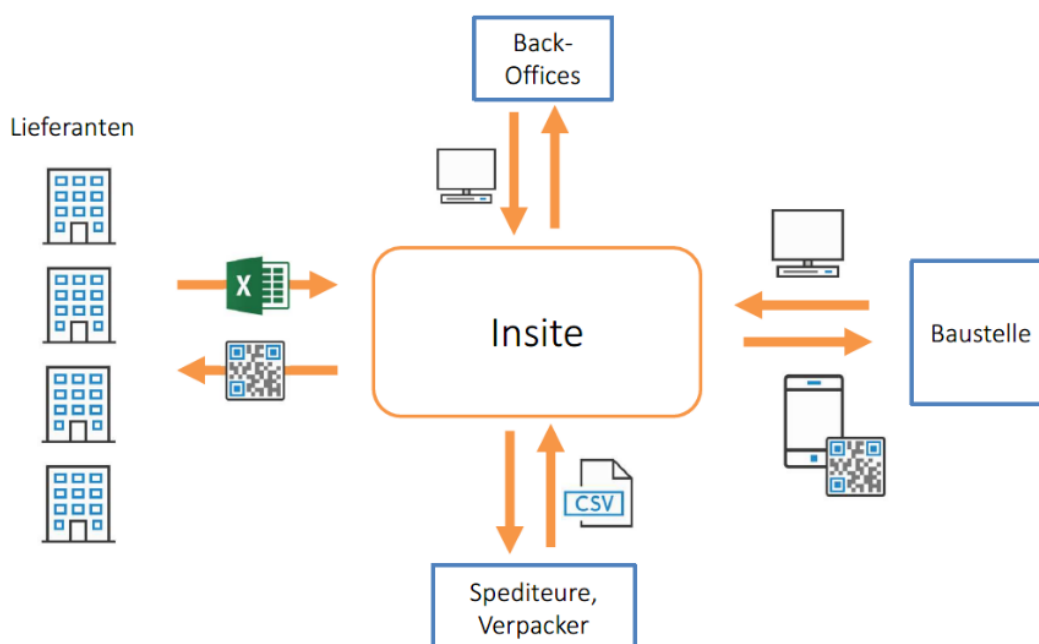


Figure 2: Project logistics with Insite

## **Future issues for design & engineering**

The company ode – office for digital engineering – is one of the leading experts in the field of BIM. When implementing BIM in a project it should be clear to all participants why it is used and which potentials come with it. The main advantages are the information flow throughout all project phases, the increased quality and efficiency, meeting the requirements of the circular economy and the improved communication of the stakeholders. To implement BIM there needs to be a robust project framework. This contains the standards and guidelines, the level of information needed, the used interfaces, the project processes, the data itself and the tools. A major obstacle for using BIM in a construction project is requiring a transformation of processes and workflows. It is not enough to implement BIM and leave the rest of the project organization as it is.

The construction company Swietelsky shared some of their solutions for a more optimized planning. Considering the high costs of a helicopter an innovative way of exploration was needed. With the use of drones geologic structures can be scanned without the high investment that comes with the use of a helicopter. The information gathered by scanning the geological structures, such as a rock slope, can be used to pre-plan the safety means in detail, like the length of a rock supporting net. This leads on one hand to a reduction of material cost and on the other hand to less flying hours.

## **Research Projects**

The institute of construction process and construction economics gave an overview over some of their current research projects. 'BIM in tunnelling' is one of the research projects with a focus on the New Austrian tunnelling method (NATM). The benefits of implementing BIM in tunnelling projects are improved monitoring, the enhanced safety, optimized resource allocation and planning, efficient collaboration and streamlined documentation. Some tools that can help achieve these advantages are the Internet of Things (IoT), big data and AI, data analytics, additive manufacturing, robotics, cloud computing and Augmented Reality (AR). Currently, round reports and shift reports are mostly done handwritten. With the use of Tunnelling Information Management System (TIMS) these tasks can be done digitally, thereby saving time and costs. TIMS was designed by the research project of 'BIM in tunnelling'. TIMS can be used in all phases of a tunnelling project. The construction workers gather information on their frontend devices and send it to the backend server. From there it can be exported for the processes needed. This can be seen in *Figure 3*. How the use of TIMS can look like on the construction site can be seen in *Figure 4*.

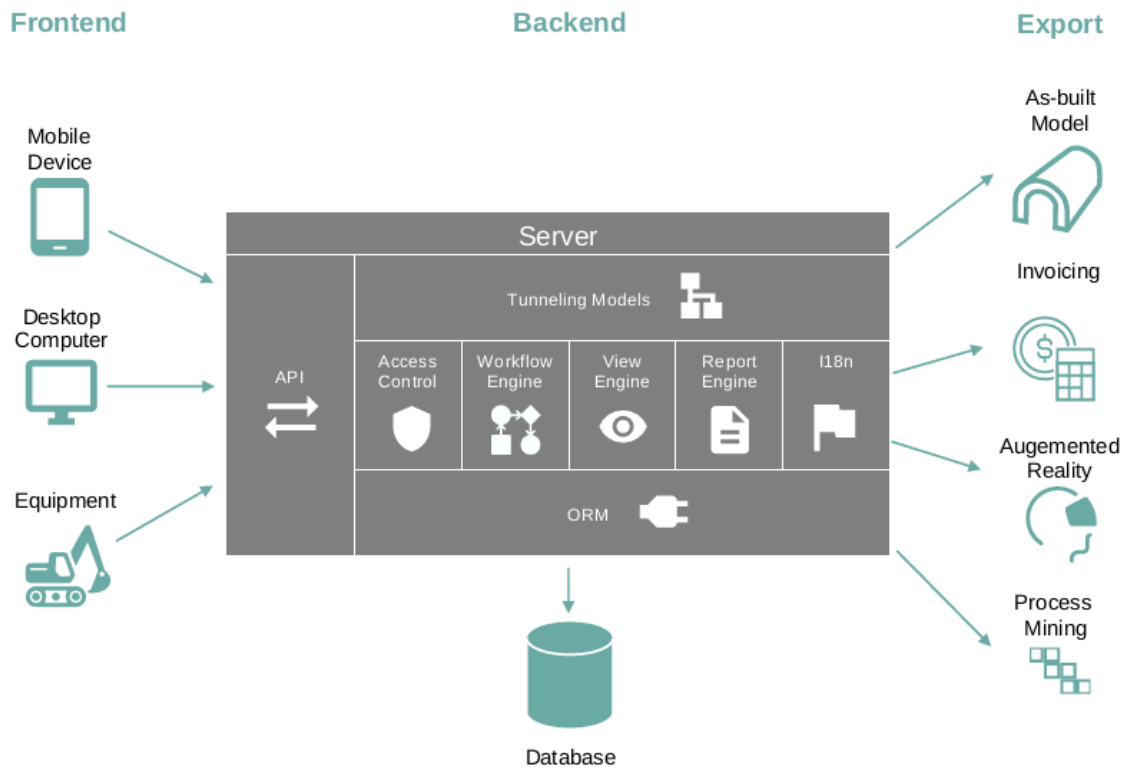


Figure 3: TIMS Software



Figure 4: TIMS use on construction site

Another research project of the institute of construction process and construction economics is called 'Carbon-neutral Construction Sites'. This research project was founded recently and builds up on a previous project. The provisional project focused on the use of battery-powered construction machinery and on energy production on the construction site. The goals of the recently founded project are to identify the emissions on construction sites, demonstrate the framework for conditions and technologies needed while focusing on urban areas, derive needs for further research, and, most importantly, determine possibilities to decarbonize construction processes. The cost and the compliance to set deadlines are by far the most influencing factors when selecting a supplier. This has a survey of experts shown. As for now environmental factors don't have a big role in the selection of suppliers. While mostly agreeing that measures to protect the climate should be required by law, only a small percentage of an online survey states that current contracts include such measures.

The presentation of research projects was concluded by the project 'From PIM to BIM' which is done in collaboration with Wienerberger. In recent years the approach of production companies to the digitalized building process has changed dramatically. Thereby opening up for new business cases.

PIM stands for the product information management. When speaking of PIM the product is understood as a combination of the product itself and the information related to the service. BIM is about information management. It's a working method where collaboration and data sharing are key and not a software. It must be kept in mind that different use cases require different information. The BIM data model is object orientated and information can be allocated to those objects. New business cases will be based on the information and other digital services. AI bears a huge potential for implementation in those new business cases.

### Excursion

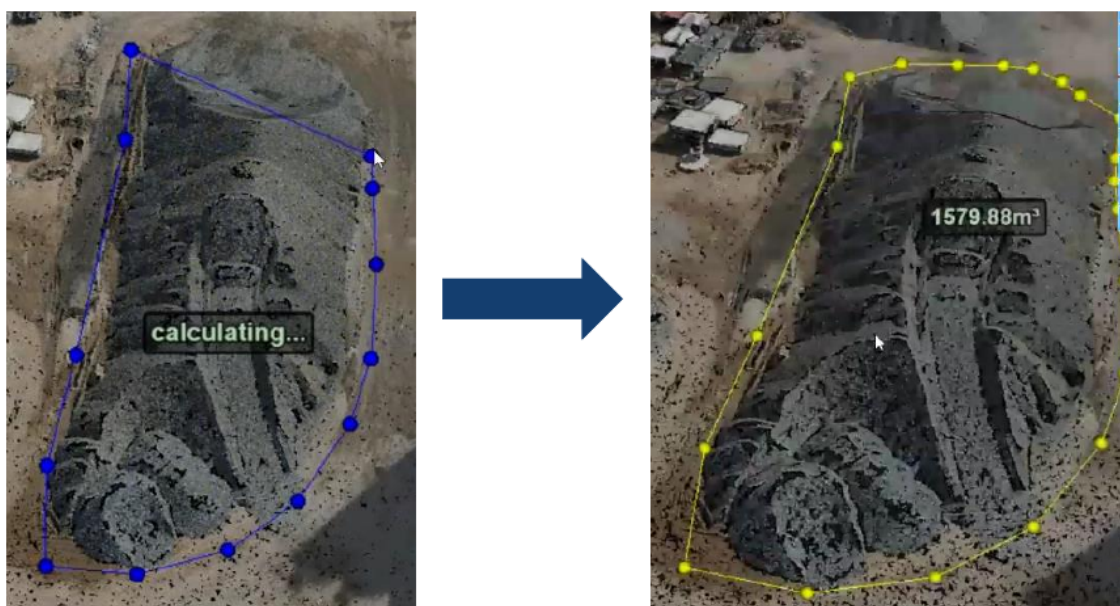
On May 31, 2023 the companies iC and the SIGNA Group offered us the opportunity to visit the construction site of the Lamarr house. The construction site is located on the site of the former Leiner building in Mariahilfer Straße. More information can be found with using the following link:

<https://www.tuwien.at/en/cee/ibb/activities/news/aus-leiner-wird-lamarr>

### Future issues for the construction

On the last day of the seminar, the dean of academic affairs of business informatics at the TU Vienna Dr. Huemer pointed out relevant aspects of interdisciplinary communication in a project. As a computer scientist, he uses different language and has a different problem-solving strategy than civil engineers. For example, for the modelling of processes, computer scientists use the business process modelling notation BPMN, which as for now isn't widespread in the construction industry.

A representative of the construction company Porr held the last lecture. For them, one of the biggest challenges for the future is to combine the available technologies with relevant processes on the construction site and most importantly get the people on board and show them the potential benefits. Gathering data just because of the sake of it isn't useful. Today the global data amount of 2012 is generated within 10 minutes. An example of a tool that is successfully implemented in the day-to-day working process of construction sites is photogrammetry via drones. This tool allows accurate mass determination by scanning an object to 2-3%. This can be seen in *Figure 5*.



*Figure 5: digital mass determination*