# PD lab

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## Abstract

PD Lab explores the applications of building sector related product development.  PD lab investigates and tests digital production technologies like CNC milled wood connections. It will also act as a platform in its wider meaning to investigate the effects and influences of file to factory production, to explore the potential in the field of sustainability, material use, logistics and the interaction of stakeholders within the chain of the building process.

## Keywords

PD lab; CNC; plywood; prefab; milling technologies; 3D printing; architecture; product development; building technology


Bilow, M., Entrop, B., Lichtenberg, J., & Stoutjesdijk, P. (2015). PD Lab. SPOOL, 2(2), 5-8. doi:10.7480/spool.2015.2.962

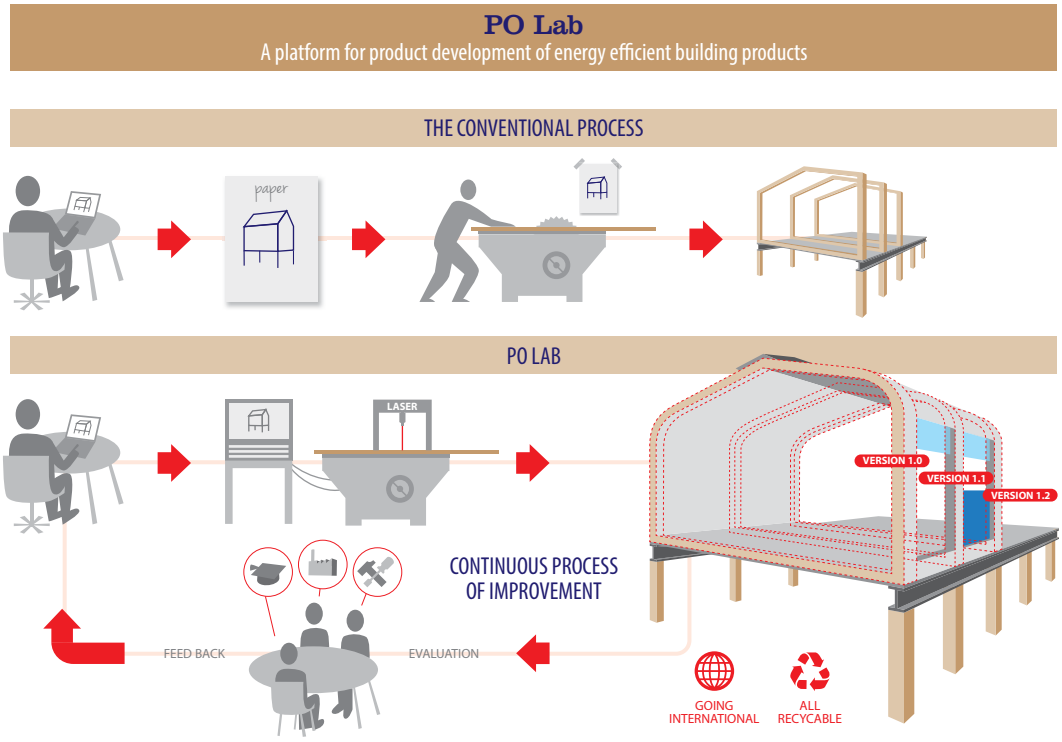


FIGURE 1 Graphical abstract

# Background

Since the last century the world has seen impressive innovations, strange to see that the way our buildings are build did not changed that much. Architects don't draw on paper with a pencil anymore, but on the building site the quality is often still relaying on the sharp point of the good old pencil.

While most of the world around us as also our consumption goods are digitally designed and made with highly advanced fully automated production technologies, the building sector seems to work still a bit old school following the rules of the trade and craftsmanship.

Of course, that's not totally true, there are the pioneers, and we read about 3D printed houses, constructions made with robots and architects proudly telling that not a single piece of the entire facade is made out of the same shaped part. These are often expensive prototypes, experiments, often challenging and demanding projects but worth it if millions of visitors come and look and bring the economy in full swing.

At the end, we don't buy cars or furniture's because they are build by robots, but we know we are able to afford them due to this fact. The conclusion is simple: Don't use expensive technologies to make even more expensive architecture, but use the potential of theses technologies to create high quality, low energy consumption affordable buildings that respond to our demanding challenge towards an energy neutral future.


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# Concept

With this lighthouse project a platform will be developed to explore the applications of building sector related product development – the PD Lab. In fact a platform will be developed literally to investigate and test digital production technologies like CNC milled wood connections, but also a platform in its wider meaning to investigate the effects and influences of file to factory production, to explore the potential in the field of sustainability, material use, logistics and the interaction of stakeholders within the chain of the building process.

CNC milled connections with plywood sheet good is invented at the MIT in Cambridge ten years ago. Within this method friction fit connections of plywood sheets can be easily assembled like a puzzle, made possible by the precision of the cutting machine. We intend to use CNC milling technologies that Pieter Stoutjesdijk picked up by himself during his studies at the MIT to increase the quality of the building process and the product itself. It's the question how this method or process can contribute to an economy and ecological advantage for the building sector.

This  technologies deliver accurate precision which allows airtight construction details, an essential key factor to create low energy consuming buildings with a high comfort. Due to this accuracy an easy and fast assembly is possible.

The idea will be based on a prefab system that is set up under a set of to be defined restrictions.
The elements of the system can be quickly assembled on site in a precise manner despite poor weather conditions. Insulation, inner and outer layers are already preassembled therefore wall, floor and roof elements will directly perform according code and requirements.

Milling technologies can handle a variety of sheet good, the system will be produced out of environmental friendly plywood or natural fibre based plates which comes from waste cycles. The materials will be chosen according to the position and requirements of the different layers. The use of these materials will reduce the embodied energy.

While the use of standardised building components accepts the reuse of the components like Lego blocks, the building itself allows a high amount of flexibility over time. Due to the use of environmental friendly materials the blocks itself can be easily disassembled after its lifetime and brought back into the ecological cycle.

The digital process offers the advantages of modularity, predictability and precision which will be key features on the building site. The digital engineering phase allows a constant overview of material flows, energy consumption, production time and embodied energy. Former problem solving on site will be reduced by the control of the digital design before hand in close collaboration within the design team, this will reduce failure costs.


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# Follow-up

The goals of the team are clear but also demanding. It's not about following a trend, or the fulfilment of an architects dream. The current situation on the market asks for smart use of technology and material, which adds up together higher than the sum of its parts. Its about testing how far a system has to be developed to create the future of our buildings. Who is responsible, who makes the decision and when do we have to make them, will standards limit us or bring us further. It's about integration of components and functions, but also about the implementation of knowledge that will enhance the building system step by step.


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