

Abstract

The use of configurable system deliveries, based on the principles of Mass Customization, is described by many as a solution to the challenges of construction, which is characterized by low earnings, lack of development in productivity and poor quality. Technical University of Denmark (DTU), School of Architecture Aarhus (aarch) and Centre for Industrial Architecture CINARK at the Royal Danish Art Academy's School of Architecture, Design and Conservation (hereafter referred to as School of Architecture) are playing a central role in establishing a vision regarding the use of system deliveries in construction. These institutions have produced a series of publications describing the possibilities presented by the transfer to construction of Mass Customization, product platforms and the use of configuration systems, theories and methods developed in the production industry.

With this point of departure, this project has carried out work that, with an engineering focus and research approach, investigates the possibilities for realizing this vision. The work focuses on some selected areas within the following overall research question:

How, in a Danish context, can Mass Customization and the theories on which it is based realize the vision of industrialized architecture through the use of system deliveries?

An important element in Mass Customization, the establishment and use of product families, is modularization. Modules in construction lead most of us to think about the period with module and montage construction, when much construction was industrialized, but in order to build many large units of very standardized construction, a type of building for which a market no longer exists in Denmark. To expand understanding of modules in construction, a study was conducted of historical construction built according to the "Building Law for the Capital City of Copenhagen and its Suburbs". The study found that historical buildings, when studied using modern methods, could be described as comprising modules with standardized interfaces.

Buildings are very large products sold in a limited number of units as small as a single unit. At the same time, building construction is carried out by enterprises of limited size and capacity for development. This means that most enterprises, by far, must work with step-wise implementation of modules. Possibilities for implementing modules step-wise are described in several studies that work with a top-down approach that is based on the whole building, and a bottom-up approach that focuses on specific parts.

Step-wise implementation also leads to partial modularization, something that Mass Customization, on which it is based, and modularization theory only focus on to a limited extent. In order to create a framework for understanding partial modularization, this work presents The Module Application Matrix, which makes it possible to map completely or partially modularized products with completely or partially detailed modules.

Another central element in Mass Customization theory and in the vision is the use of configuration systems. Here, three different prototype configuration systems are presented to illuminate the possibilities for using configuration systems in construction – also including the possibilities and challenges that lie in configuring partially modularized and partially described products and products with infinite potential solutions.