

PRODUCT DEVELOPMENT THROUGH LEAN DESIGN AND MODULARIZATION PRINCIPLES

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ABSTRACT

Customers' demands regarding quality and cost efficiency caused the Swedish construction industry to increase its levels of prefabrication. However, the main focus has been on the structural design and production in the development of these new building systems, and very little attention has been devoted to customer needs and requirements. This has created a situation where ad hoc solutions have been introduced to adapt the building system to match the project requirements, causing problems in the production process with waste and quality problems as a result.

Therefore, a development project was initiated with the goal to design a new building system for multi-story timber housing that could match the client needs and requirements. This paper describes how this development process was pursued using lean design methods and modularization principles.

A multi-skilled development team worked for over 6 months in developing a technical and a process platform for a flexible building system. The study shows that it is evident that modularization principles can be used in order to develop flexible building systems that better can match the requirements from an individual project. From a set of rules, the architect can configure and design a unique building which enables the manufacturability of the building system and ensures a smooth assembly process of the prefabricated modules on the construction site.

KEY WORDS

Lean design, modularization, configuration, prefabrication, product development.

INTRODUCTION

An ambitious housing programme implemented between 1965 and 1974 by the Swedish government with the goal of producing 1 million affordable dwellings, resulted in a dramatic increase in the use of prefabricated components. The impact on productivity and quality was tremendous (Bertelsen 2005). The Swedish single housing industry also introduced a number of new prefabricated building systems based on mass production principles from the manufacturing industry. The demand on production volume and low cost resulted in technical solutions with low flexibility and no possibility of customization, (Höök 2005). Since then, customer demands have increased dramatically and according to Veenstra et al (2006), "Customers are demanding products that match their individual preferences and tastes". Thus, initially well designed standardized solutions have deteriorated when ad-hoc solutions have

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