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Efficiency in the delivery of multi-story timber buildings

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Abstract

The construction of wooden multi-story buildings was boosted by changes in building regulations in 2011, which allowed the use of wood in up to 8-story buildings. Thus far more than 50 wooden multi-story buildings have been built in Finland. The public sector has an important role in promoting wood-based multi-story building. Despite of intensive development, the experiences in wood-based multi-story building in Finland are still limited. Building processes may still suffer from some lacks in efficiency in terms of process management and use of resources. It may be possible to address different kinds of issues which would be able to make the process more effective and lean. The objectives of the research were 1) to find inefficiencies in multi-story timber building projects, 2) to address reason and causes for the lacks of efficiency, and 3) to make suggestions that might help to improve the lean nature of the process.

The premise of this research was that some of the following reasons may cause ineffectiveness in the delivery of wood based multi-story building projects: lacks in development and standardization of structural systems, lacks in the availability of BIM software for wood buildings, specific additional building requirements set for timber buildings, inexperience of different actors with regard to multi-story timber building and current project delivery and procurement methods.

The approach was to study recent literature, select two significant on-going cases which represent different structural systems, interview the representatives over the whole value chain and study the results against our hypothesis and make conclusions.

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Keywords: Multi-Story Timber buildings; Design and Construction; Lean Construction

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1. Introduction

The Strategic Program for the Forest Sector (MSO) was based on the former Finnish Prime Minister Katainen's Government Program and the main task of the MSO has been to promote the competitiveness and renewal of the forest sector. In accordance with its development targets the market share of wooden multi-story buildings should grow to 10% [1]. The construction of wooden multi-story buildings was boosted by changes in building regulations in 2011, which allowed the use of wood in up to 8-story buildings [1]. Roughly 43 per cent of all residences in Finland are in multi-story buildings and roughly 40 per cent of new dwellings (12,000–13,000 residences per year) are in multi-story buildings. Concrete has dominated the multi-story building market for the past 50 years but recently wood-based construction has undergone intense development in Finland. Development efforts have focused particularly on building of multi-story wooden buildings and on enhancing buildings' energy-efficiency [2].

The public sector has an important role in promoting wood-based multi-story building in Finland [3]. In addition to the government program, some cities also aim at promoting wood building. For example, the City of Espoo has a promotion program for wood building for years 2014 – 2020[4] and city of Helsinki has implemented several significant wood-based building projects [5].

Despite of active development, the experiences from wood-based multi-story building in Finland are limited and building processes may still suffer from inefficiencies in process management and use of resources. It can be reasonably assumed that processes could be made more effective and lean by identifying and solving such inefficiencies. Lean projects deliver the product while maximizing value and minimizing waste [6]. For building projects, for example, reduction of defects during different phases of building process can effectively contribute towards lean construction by eliminating waste [7].

2. Objectives, hypotheses, approach, methods

The following subsections introduce the objectives for this research, along with research hypothesis, utilized research approach and the research methods.

2.1. Research objective and research premise

The objectives of the research were 1) to find inefficiencies in multi-story timber building projects, 2) to address reason and causes for the lacks of efficiency, and 3) to make suggestions that might help to improve the lean nature of the process.

Our premise was that some of the following reasons may cause ineffectiveness in the delivery of wood based multi-story building projects: lacks in development and standardization of structural systems, lacks in the availability of BIM software for wood buildings, specific additional building requirements set for timber buildings, inexperience of different actors with regard to multi-story timber building and current project delivery and procurement methods.

2.2. Research approach and methods

The research approach was selected in order to fulfill the research objectives.

Our approach was to:

- collect and study recent literature results on the resource and process efficiency, with focus on lean construction of timber buildings in urban context
- select two significant on-going cases which represent different timber structural systems
- interview the stakeholders of the two cases over the whole value chain
- study results against our hypothesis and make conclusions.

The results of the recent literature and the results of interviews were assessed qualitatively against our research hypothesis.