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## Inefficiencies in Norwegian small-scale construction, or the problem of too long trucks?

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### Abstract

“When the truck arrived at the construction site it could not unload the material because it [the truck] was too long, we had to send it away [...], this happens all the time in Oslo where we have to build on very small plots.” (Carpenter, Oslo). As the quote illustrates, inefficiencies and resulting low productivity remain a challenge for today’s small construction businesses. While the reasons for inefficiencies are not completely understood, various techniques for project planning and control have proven their practical value in mitigating them. Lean construction has been articulated as one of the concepts that can solve inefficiency problems. The national initiative “Lean construction Norway” initiated by government, academia, and industry, seeks to diffuse lean production principles in the construction industry. However, small to medium sized contractors remain largely excluded from the innovative practices. This article sets out to study what a small Norwegian contractor enforcing lean concepts in addressing construction inefficiencies may gain. Ingrained in the concept of muda we exemplify waste related to waiting, overproduction, defects, inventory, motion, over processing, and transporting. We ran a case study in a small industry standard type of residential project executed by a small contractor. Data were collected based on a series of qualitative interviews conducted with the on-site personnel. The findings illustrate a variety of inefficiencies resulting in low productivity. We expect that management inspired by lean principles in conjunction with modern planning methods such as building information modelling may improve project delivery in Norwegian small-scale construction.

**Keywords:** Muda, lean, SME, residential construction, construction management

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## 1. Introduction

In contrast to many other industries, the construction industry has not been able to increase its labour productivity over the past four decades. Construction has failed to innovate its supply chain and is notorious for bad planning [1]. According to a recent study conducted by the research institute SINTEF, Norway's construction labour productivity has not just stagnated, it has declined over time [2]. Scholars argue that constant market pressures, such as having to build cheaper and faster, have had adverse effects on construction productivity [2]. Innovations such as computer aided design, building information modelling, and lean construction have all been hailed as game changers for construction productivity. However, none of these innovations seem so far to have delivered on their promise.

Moreover, construction management researchers have produced a wealth of studies seeking to advance new processes and technologies to improve productivity. Some of these efforts introduce concepts borrowed from other industries such as manufacturing. A prominent example of this is the attempts to apply lean manufacturing ideas in building construction [3]. However, such innovative practices are seldom embraced in practice, and especially small to medium sized construction firms appear to struggle when implementing new ways of doing business. Our article contrasts present-day practice in an industry standard type of project executed by a small construction firm with the ideals of lean manufacturing. This article is yet another attempt to understand, rooted in the realities of our projects, why practitioners have a hard time improving productivity in their projects. The research question asked in this article is: *What are the prospects for curbing non-value adding activities in small-scale Norwegian housing construction?*

To answer this question, we ran a series of interviews in Norwegian residential projects in the Oslo area of Norway. The case projects are industry standard type of construction projects executed by small-scale construction companies. We informed our study by muda, a framework developed for identifying deviations from optimal resource allocation in manufacturing. Muda provides a structured way for identifying and eliminating non-value adding activities in manufacturing. Thus, informing our study in muda provided us the opportunity to identify where concrete improvement in a building project is feasible. Our findings suggest that much of the on-site work suffered from poor planning and coordination. The answer to our research question would seem to be that in almost every aspect of the project, delivery resources were wasted.

Similar to what others have found before us, we find small-scale construction companies to continue struggling with plenty of issues seemingly resolved in the construction management literature. When discussing the findings with the case companies' management, they stated that: "these or similar problems can be observed in most small projects in Norway, which is why we have no problem with you publishing this" (project manager #1). Following up on this research, the company called in an 'emergency' board meeting to discuss the findings presented in this article and implement change in their company. Why small companies continue to overlook inefficiencies in their daily work and how there appears little to no awareness in firms' management of how to improve practice are areas in need of further research.

Researchers may find themselves asking "for whom do we toil?" if none of the discoveries made in project and construction management seem to materialize in industrial practice. How can it be explained that in 2016 in a modern western economy like Norway, where knowledge is widely available through the internet, that construction firms continue to operate seemingly without any managerial concepts? The questions that must be asked are how can we reach out to the industrial communities in need of our work? Are our journals and conferences the right means for disseminating knowledge on how to run construction projects? What can be done to make our research count? Our article is structured as follows: first, we introduce muda and its concepts of waste, second we present the method of our inquiry, third we present the results of the interviews, and last we discuss and conclude our article.

## 2. Theoretical lens

There is much research reporting from the application of lean manufacturing ideas in the context of building construction. In this article, we apply one of the main concepts of lean manufacturing, namely "Muda", to study industrial practice in a construction project. Muda is a core concept of the Toyota Production System and means "futility; uselessness; wastefulness"[4]. The origins of the concept can be traced back to Henry Ford's work which found waste reduction to be an effective way to increase profitability. Toyota adapted Ford's initial ideas and coined the term muda [5], which is in Japan widely recognized as a reference to a product improvement program or campaign.

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