Master's thesis in Civil Engineering

Candidate:
Anisa Kazimi
Roya Noori

Title:

# Digitalization in the building and construction industry

Supervisor:
Rein Terje Thorstensen, UiA

## Introduction

The construction and building industry is behind when it comes to the adoption of digitalization compared to other industries. Digitalization within the construction and building industry can be associated with the usage of digitalization technologies. These technologies have the ability to aid the sector with several opportunities.

This master's thesis' research topic is about digitalization in the building and construction industry. The challenges are to investigate how digitalization technologies within the wide topic digitalization affect the mentioned industry, which is the main aim of the report. This will be conducted by detecting and collecting knowledge about the different digitalization technologies in the industry together with their opportunities and challenges.

## Research question

*"How does the usage of digitalization technologies affect the building and construction industry?"*

The following sub-questions have been formulated in order to answer the research question:

- *What opportunities does digitalization technologies entail?*
- *What challenges does digitalization technologies entail?*

## Methods

Three different research methods were chosen and conducted in this thesis in order to answer the research question. These are the following methods:

- Literature review
- Semi-structured interviews
- Case study

## Results

Fourteen different types of digitalization technologies were detected, where drones and wearable technology appeared among these. Drones are referred to as flying robots. These flying robots have sensors and cameras installed to serve in different fields such as the building and construction industry. The different tasks that can be conducted utilizing drones are for instance maintenance, data collection and project monitoring. It has been highlighted that increased work safety can be obtained by limiting injuries and accidents related to dangerous work environments with the use of multirotor drones.

**Figure 1: Illustration of a multirotor drone**

Wearable technology can be anything installed with electronics, sensors, computers, and software that a construction worker wears to help with carrying out heavy tasks and upgrade their safety. Some examples on what a wearable technology would be in the building and construction sector are smart watches, glasses, and helmets in addition to exoskeletons.

**Figure 2: Person wearing an exoskeleton shown**

## Conclusion

***What opportunities does digitalization technologies entail?***

- Risk evaluations, time predictions, enhanced profit, improved cost, time, quality and construction safety management, reduction of mistakes, increased productivity and efficiency
- Conduction of dangerous and heavy tasks, work progress monitoring, real-time collaboration, better communication possibilities and sustainable utilization of materials
- Waste reduction of materials, improved visualization of project models, aid in better decision- making, up-to-date information retrieval and early collision detection
- Better reinforcement interpretation, real-time information and data, effective collaboration, convenient usage, aid in employee training and enhanced accuracy

***What challenges does digitalization technologies entail?***

- Large data and power usage, high costs, technology failure, loud noises decreasing concentration, fear of replacing human workers and stakeholders being less open to new technologies
- Immaturity and unpredictability of technologies, costly automated equipment, limited suitable materials and methods to 3D print and adjustment difficulties
- Lack of training, interest and standardization, data, privacy and virus concerns, requirements of larger data to function, IoT's requirement of Internet connection and costly equipment maintenance
- Low motivation and familiarity challenges between the users in addition to time and equipment demand

***"How does the usage of digitalization technologies affect the building and construction industry?"***

When observing the two sub-questions in context, it can be concluded with that the positive effects of digitalization technologies on the building and construction industry overweigh the cons. Traditional methods of executing projects are familiar, however the sector will obtain new possibilities by utilizing digitalization innovations in future projects. Hence, the industry will gain profit in their projects by the usage of digitalization technologies as mentioned. Even though it has been shown that the different technologies are costly, the effects that they bring to the industry are far more beneficial in the long run.