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Prospects of digital transformation in construction

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By Taina Eriksson, Titiana Ertiö, Roosa Lahtinen,
Eeli Saarinen and Aino Saaristo



**UNIVERSITY
OF TURKU**

Turku School of
Economics



Summary

This report looks into the current situation in the construction industry and provides an analysis of the prospects of digital transformation. The construction industry has lagged behind in the field of digitalisation, with most construction companies still struggling with the early steps of this process. Here, we examine the realities construction site managers, whom we identify as important players in digital transformation, face in their daily work.

The prospects of digital transformation can be looked at from various perspectives, and in this report, we concentrate on three focal angles perceived as related challenges:

- 1. The unquestioned conventional perceptions of older professionals;**
- 2. The perceived burden of digital tools;**
- 3. Management of the conditions for digital work on site.**

By discussing the phenomenon from these angles, we argue that the prospects of digital transformation in construction are significantly impacted by the need for improving quality, involving craftspeople, overcoming discouraging technology experiences, taking ownership of the changing job role and engaging in active upskilling.

Digital transformation in construction will materialise sooner rather than later. Therefore, there is urgency in conceptualising the use of digital technologies, first as an integral part of the site managers' job description and thereafter as part of every construction professional's daily work. Top management needs to be hands on when it comes to creating the conditions for digital transformation, offering site managers the support needed but also demanding consistent utilisation of suitable digital tools once they have been found.



Introduction

In this report, we investigate the construction industry's prospects for digital transformation in Finland. In the European Union (EU) alone, the construction industry directly employs 18 million workers and amounts to 9% of the EU's GDP (European Commission, 2022). In Finland, the construction industry employed over 180 000 workers and accounted for 6.5% of the GDP in 2021 (Rakennusteollisuus, 2022). Here, we take as a starting point the findings of previous research that the construction industry lags behind other industries in digital transformation (Oesterreich & Teuteberg, 2016; Sadeh et al., 2021; see also Table 1).

From our work with the construction industry, we have observed leaps into digital transformation with the uptake of 3D modelling, building information modelling (BIM) and project and quality management software. However, the use of the most advanced digital technologies is limited to pioneering

companies, only a very few of which have engaged in the in-depth integration of such technologies into their operational methods.

Most construction companies still struggle with the early steps of digitisation. A national survey of Kotopro (a leading documentation software solution for property and construction management) found that before switching to modern digital tools, 56% of respondents were still using a pen and paper (Heikkonen, 2022).

Having information available in a digital format is certainly an initial step towards digitalisation (see the box below). Today, other industries, such as automotive and manufacturing, are well on their way towards digital transformation. For the construction industry to capitalise on digital opportunities and shift from the reactive stage of adaptation towards digital transformation, the systematic and in-depth development of a whole suite of business and technological skills and competences is required.

Stage	Digital technology use
Digitisation	changing the format of information from physical to digital
Digitalisation	improving business processes through data and technologies to increase efficiency
Digital transformation	leveraging (new) technologies to drive fundamental changes in leadership and culture, creating new business and operating models that reorient strategy and value propositions

Table 1. Stages of digital transformation and their corresponding use of digital technology

Due to the **complexity** of the industry, the digital transformation in construction can only happen when five focal sub-systems (products, processes, organisation and people, information systems and value creation models) are all developed simultaneously (Peltokorpi et al., 2021). Without diminishing the role of other sub-systems, we focus here on the role of people. Based on empirical evidence from multiple research and development projects, we have observed that people

play a key role in the forthcoming digital transformation in construction. In particular, site managers act as liaisons between professional workers, such as carpenters or electricians, and their firms and the designers. Thus, this insight report regards construction site managers as important enablers and orchestrators of digital transformation in the industry and looks at how this conception is reflected in daily practices.



Focal angles on the realities site managers deal with in digital transformation in construction

We conducted interviews with site managers at Finnish construction companies from 2021–2022 as part of our research and development projects. Based on these interviews and the work done with the companies, we present three perspectives to understand the challenges of digital transformation in construction.

Angle 1: The unquestioned conventional perceptions of older professionals

Generational differences in technology adoption and attitudes towards technology use, which can be observed in the population at large, are replicated in the construction industry. Older generation workers tend to be more hesitant and sceptical about technology compared to younger ones. They may even refuse to use digital tools or lack the necessary skills to take full advantage of the features of technologies, or both. As a result, the combination of such attitudes and lack of skills further entrenches an already conservative industry in the past. Moreover, there is a persistent belief in the existence of such attitudes, which means that older professionals may be excluded from digital work entirely. The older generations of workers are assumed to be sceptical of digital technologies, and the conception of their unwillingness to adopt new solutions is not questioned. Such individual attitudes aggregate both at the firm and industry level. Several site managers in our research projects mentioned the low adoption rate of mobile technologies in their construction companies. Antiquated attitudes are further exacerbated by a culture that often values experience and seniority over the drive for innovation.

The Finnish construction sector also suffers from labour shortages. Every skilled professional is in high demand, and site managers are a highly valuable asset to construction companies. So, fearing they might lose skilled employees to competitors, construction companies are reluctant to enforce the use of technologies.

Site managers enjoy relative autonomy in their work – a perceived perk of the job – which they can leverage to address the sceptical attitudes of older professionals.

Angle 2: The perceived burden of digital tools

New digital tools are easily seen as adding an extra layer of work that takes time away from the “actual” on-site work. This is not surprising, since even for knowledge workers engaged in remote work, the use of digital tools has been seen as difficult (e.g. zoom fatigue during the pandemic). The uptake of new technologies is seldom frictionless. In addition to the issue of relatively low digital skills, frustration may arise, especially in the beginning of the uptake process.

In the experience of many site managers and construction workers alike, their workday does not become more streamlined by employing the digital systems currently in use; in fact, they perceive that their workload increases. When the workload stemming from the use of digital technologies is perceived to be too heavy (whether in terms of the number of actions required or psychological strain), the expected benefits are not realised. The factors that lead to such experiences are various, including the increasing documentation requirements in the industry, as well as a lack of integration between the solutions currently in use. We have also learned that documentation with digital tools is more thorough now than in the past, which naturally has its benefits, but it also translates into more work.

Site managers can better manage on-site quality controls when they can access information digitally and in real time. Explaining the reasons behind the use of technology and helping everyone align on quality control will help employees perceive digital work as part of their “actual” work.

Angle 3: Management of the conditions for digital on-site work

Construction workers usually contribute very little or not at all to the digital information amassed during a construction project. They may send photos to the site manager, but the site manager usually uploads the photos onto the digital documentation systems. Documenting what has been done with the help of mobile technologies is not seen as an integral part of the workers' jobs (neither by the workers themselves nor their employers); consequently, they are not equipped by employers with smartphones or tablets. This is partly because of the physical conditions of construction work. Construction site workers often have dirty or wet hands, which makes it difficult to use touchscreen devices. Even taking off work gloves to use a smartphone, for example, can be seen as extra work and frustrating (although this can also be just an excuse for opposing the use of digital devices). Workers are also worried about dropping or damaging the devices, adding to the reasons why workers do not want to use their own mobile devices at work. A significant portion of construction work is done outdoors, which also means, for example, that the devices need to function in the harshest weather conditions. The same applies to digital systems operated

on site from mobile phones or tablets that require an internet connection to sync files and access up-to-date information.

The problems are not limited to difficulties within the construction company, since the structure of the industry is such that it does not support the comprehensive use of mobile technology across contractor networks. General contractors are individually responsible for their own workers, and site managers do not necessarily want to enforce the use of technology for sub-contractors – even when it has been formally agreed upon in the sub-contract agreement. Furthermore, the sub-contractors and their workers may lack the necessary digital skills. This means that even if the general contractor utilises mobile technologies and digital tools in their everyday work, the full benefits are not realised, since a significant portion of the sub-contractors on the project do not.

The site manager thus becomes the principal or sole user of the digital tools on site. All in all, site managers are the key players in managing information flows on site and beyond for their companies and stakeholders.



Moving the needle in the construction industry

To take stock of digital opportunities, construction companies need to couple their technologies with investments in their workforce – not only as a strategy to advance the overall digital transformation but also on a tactical level at each construction site. Managers in construction firms are looking into each detail of project delivery, all while recognising digitalisation cannot be ignored. But without talent and digital competences, as well as the appropriate mindset, digital solutions are underused, thereby leading to missed productivity opportunities.

It can be challenging for both managers and employees alike to see the benefits of new applications and digital systems when they are perceived to result in an increased workload. For this reason, it is important that companies

manage expectations realistically and allow sufficient time for employees to familiarise themselves with and internalise the use of new digital technologies. Companies should restructure their digital strategies based on the feedback received from construction sites and phase rollout as necessary.

It is vital to gain clarity about a construction company's digital strategy, and site managers are uniquely positioned to peel back the levels of uncertainty because of the information advantage they possess. **Site managers can speed up the digital transformation by recognising it as a joint effort between the company level (digital strategy development, tools and support given to employees) and the individual level (attitudes and willingness to develop one's own skills).**

The prospects for digital transformation in construction are manifold, and it is important to consider that such changes will take place sooner rather than later. Site managers are at the centre of strategic development and practical implementation in this industry, not only for the “actual” construction work but also disseminating digital technologies and reaping the benefits from digital transformation. There is an urgency to conceptualise the use of

digital technologies, initially as an integral part of the site managers' job description and then as part of every construction professional's daily work/requirements. At the same time, top management needs to be hands on in terms of creating the conditions for digital transformation, offering site managers the support needed but also demanding consistent utilisation of suitable digital tools once they have been found.

Below we outline five themes critical for the prospects of digital transformation in construction:

- 1. Improving quality:** Site managers are well aware of the quality controls required for project delivery. Having digital tools in place to access real-time information and document processes with timestamps and visuals helps ensure quality, appropriate reactions to surprising situations and ultimately the delivery of projects in a timely manner.
- 2. Involving craftspeople:** Whether it comes to one's own employees or sub-contractors, helping people navigate the changing nature of their craftsmanship will be essential for enabling digital transformation. At the level of personal attitudes, starting with easy to use and familiar technologies increases confidence in one's own digital skills and builds interest in expanding them. Site managers can both encourage the use of technology and champion upskilling training. In fact, site managers' work would benefit from greater flexibility once digital skills become embedded in workers' on-site routines.
- 3. Mitigating negative technology experiences:** Negative experiences with poorly functioning devices and/or software deter site managers and workers from using technologies and create distrust towards technological solutions altogether. In addition, digital technologies are perceived to create an extra layer of work on top of the "actual" work that needs to be carried out on site. So, technologies that function properly are required, and perhaps more importantly, workers must all understand the reasons behind their use.
- 4. Taking ownership of changing job roles:** Site managers have detailed information on all on-site activities, including what functions well and where improvements are needed. When they have knowledge of technological possibilities, they may also have a vision of which activities would benefit from digitalisation (and which would not). With the onset of the digital transformation, their new job role will increasingly require them to address technology and skills needs as they would in other resourcing areas (such as materials or personnel).
- 5. Engaging in upskilling:** Site managers who are not tech savvy must be included in the process if the company is serious about the benefits of digital transformation. Offering opportunities to slowly familiarise themselves with the digital tools, to get support from their peers and to experience small wins with digital technology are important steps forward. Also, identifying what motivates individual site managers can be helpful in engaging them in developing digital skills and capacities for themselves and their teams.



Background information about the Insight

This insights report was carried out by the Disruption Lab Research Group from the Centre for Collaborative Research CCR, Turku School of Economics at the University of Turku, Finland. It is part of on-going research and development projects which delve into digitalisation in the construction industry.

For more information (in Finnish), visit » <https://sites.utu.fi/digiraksa/>.

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Taina Eriksson works as Research Director, Titiana Ertiö as Research Manager, Eeli Saarinen as Development Manager, and Roosa Lahtinen and Aino Saaristo as Project Researchers in the Disruption Lab Research Group at CCR.

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