REMOTE WORKING IN CONSTRUCTION: ASSESSING THE AFFORDANCE OF DIGITISATION

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Purpose: As remote working becomes increasingly popular, it could unlock new ways of working through digitisation. However, the construction sector has been slow to adopt digitisation in its processes, making it difficult to assess whether this affordance may be well received and the current capabilities of digitisation to achieve this effectively. The purpose of this paper is to investigate the interest in remote working among construction sector personnel and to examine the factors affecting remote working through digitisation affordances.
Design/Method/Approach: Based on a case study of one of the largest contractor firms in the United Kingdom, an online questionnaire survey was used to collect responses from 125 construction professionals. SPSS was used to do basic statistical analysis on the results.
Findings: The findings show that there is a general appetite for remote working on a flexible basis where a mix of "on-site" and "off-site" arrangement was deemed practical. This could potentially unlock significant time and cost savings as well as productivity gains. The main factors affecting remote working were the availability of interconnected systems allowing efficient communication and digital infrastructure that enable automated processes. The research is limited to a large contractor company and may not be appropriate for small and medium-sized companies. The findings may benefit organisations to evaluate the practical needs of ensuring effective remote working in the construction industry and unlocking efficiencies.
Originality: The paper adds value to understanding the affordances and constraints of digitisation for remote working from the perspective of construction professionals.

Keywords: construction management, automation, project management, technology, working practices, virtual work, project teams

INTRODUCTION

The COVID-19 epidemic has pushed the global workforce to adapt to a new style of working, with many individuals shifting to remote working and relying largely on digital infrastructure to ensure business can continue as usual (Gamil, 2020). Organisations who were unable to adjust to this new method of working faltered and many were forced to close. This has resulted in job losses, liquidation, or significant cuts (Raoufi & Fayek, 2020). According to a recent study, the majority of people feel that remote working is more likely to persist after the crisis than to revert to former traditional work practices (McKinsey & Company, 2020). This is consistent with the trend toward a more service-based economy, which places greater focus on "human capital" as individual workers and the way they work (Quinn, 2018). Remote working, also known as flexible working, is becoming the new norm in many countries affected by the Covid-19

pandemic. Building Information Modelling (BIM), cloud computing, drones, and sensors are only a few examples of digital infrastructure that help the construction industry respond to a limited-movement working environment in order to maintain and improve project quality and productivity (Gamil, 2020). In addition to productivity and cost savings, these technologies have the ability to afford flexible working conditions (Troup & Rose, 2012), which can potentially address issues of labour shortages, cost overruns, and delays (Bigagli, et al., 2020). However, the construction sector has been slow to adopt digitisation in its processes (Schober & Hoff, 2016). The paper aims to investigate the interest in remote working among construction sector personnel and examine the factors affecting remote working through digitisation affordances.

The structure of the paper consists of a review of the capabilities of digital technology such as robotics and BIM in construction, which are fundamental for enabling remote working. The study then explores the affordance theory as a lens to understand the factors influencing remote working as an affordance of digital technology. To achieve this, the research conducts a quantitative survey with construction professionals to determine their preferences, challenges and current capabilities for remote working, as detailed in the research methods section. Finally, the results and its implications are discussed, as well as future directions to remote working.

LITERATURE REVIEW

Remote working and digital technology

The use of digital technologies has provided multiple benefits to the construction industry including better visualization, efficient data sharing, waste minimisation, increased productivity, and improvements in construction safety and sustainability (Manzoor, Othman & Pomares, 2021). The advantages of digital technologies are well recognised, most notably in the use of BIM to support project stakeholders in decision-making through functions such as 3D visualisation, clash detection and constructability analysis (Gholizadeh et al., 2018). While the benefits are clear, the industry has been slow to adopt BIM more widely over the last 20 years, with only the last two years seeing a 73% adoption rate among construction professionals, up from 13% in 2011 (Statistica Research Department, 2022). This could be attributed to the building industry's challenges with skills, government policies, culture, and costs related to digital technology (Manzoor, Othman & Pomares, 2021). More recently, the use of digital technology has greatly boosted the capacity for remote working across a wide range of industries. Remote working has been linked to many positive effects such as work flexibility, improved safety, increased efficiency, and travel convenience. This has played an important role in helping organisations retain skilled employees who would benefit from the flexibility to work remotely (Grant, et al., 2019), as well as reducing the risk of interruption due to a circumstance such as the COVID-19 pandemic (Gamil, 2020). As a result, the use of digital technology in remote working is intertwined and offers several advantages in terms of increased flexibility, safety, efficiency, and mobility.

Flexibility

Troup and Rose (2012) discovered that the ability to work flexibly provided people with the highest levels of satisfaction in terms of childcare delivery, as well as improved career satisfaction because of the flexibility that remote working provides (Troup & Rose, 2012). This is ideal for the construction industry, since it necessitates a high degree of flexibility and can

never be entirely off-site (Balfour Beatty, 2018). The adoption and advancement of technology have helped the construction industry become more versatile, as well as address long-standing issues such as inefficiencies, safety and labour shortage (Farmer, 2016). Sutherland & Janene-Nelson (2020) point out that a shift in mindset to treating work as something that is done rather than a place where people go could lead to improved productivity as it focuses on generation of outputs as a result of working, rather than merely filling up the time intended for work. The use of digitisation tools that have become commonplace to us, such as mobile phones, tablets and laptops, allows this to happen without difficulty at any time and location, providing a more open vision of work that caters to varied workers' needs.

Safety

The advent of digital technology has made working flexibly possible while simultaneously addressing long-standing issues of inefficiencies, safety and labour shortage (Farmer, 2016). With the construction industry being the third most dangerous industry in the UK, safety a top priority (Steed, 2020). Aside from the personal toll that these injuries and accidents will take, there is also an economic and efficiency expense, which is estimated at £1.2 billion between 2018 and 2019, with 2.1 million working days missed as a result of occupational injuries and illness (Health and Safety Executive, 2020). The ability to work remotely will mean safer construction sites as only those who need to complete work on-site will be there, putting fewer people at risk of injury. Robotics can be a solution to significantly improve safety on construction projects as well as address inefficiencies, low productivity and the critical shortage of skilled labour supply (Prince Waterhouse Coopers, 2018). Inefficiencies and human errors can be reduced by replacing dangerous and monotonous tasks with robotics (Steed, 2020). A more recent benefit of digital technology is seen in the COVID-19 pandemic, which allowed automatic temperature checks using thermal cameras to detect signs of cold and flu, and using drones to monitor progress on site (Raoufi & Fayek, 2021). This permitted work on-site to continue in a relatively safe manner during the pandemic.

Efficiency

Robotics and automation technology has also helped to improve efficiency (World Economic Forum, 2018). In addition to ensuring better safety in the workplace, robotics may also help to tackle the issue of skilled labour shortage allowing people to concentrate on skilled tasks thereby increasing efficiency and effectiveness across the construction phase (World Economic Forum, 2018). According to a study published by the Midwest Economic Policy Institute in 2018, nearly 50 percent of all existing building activities could be automated, and efficient automation of all operations in the construction industry will maximize efficiency, lower costs, and improve quality. By 2025, machines will perform more job activities than humans, compared to 71 percent currently. As a result, future job demand will change as the sector requires specialized labour to run and deploy machines, potentially resulting in the creation of 133 million new jobs (Schwab, 2018). Automation will allow project teams to be more efficient with their resources and focus on critical higher-order activities, and freeing up capacity across projects (Maresova et al., 2018). For example, Building Information Technology (BIM) offers the benefit of automatic clash detection, which helps in identifying early on where two or more elements of the building such as plumbing, wall and the like interfere with one another. As BIM enables the building design to be graphically modelled and simulated in advance, potential problems on site can be

minimised by ensuring all elements fit precisely together before actual assembly (United-BIM, 2021).

Mobility

Employees whose work is knowledge based rather than physical based are able to enjoy greater mobility by facilitating work through information and communication technologies from various remote places outside the office during the day. This allows people to avoid traveling at peak hours and may lessen the impact of peak periods by varying people's departure timings. On this basis, demand management strategies and peak avoidance incentives may be implemented to encourage employees' temporal and spatial flexibility (Stiles & Smart, 2021). Remote working could also help minimise carbon emissions by reducing the amount of time people spend commuting (Bloom et al., 2015). This may have significant implications for the building industry, as transportation is a significant element of the construction process (Giesekam et al., 2014). People who operate remotely have the option of only traveling when absolutely necessary, allowing them to be more deliberate about their travel decisions. This permits disparities in travel behaviour that cater to various individual needs and suitability (Brough, Freedman & Phillips, 2021). As a result of the decreased need for travel and enhanced mobility, there are fewer distractions and less stress associated with travel (Milakis et al., 2015).

Remote working is possible with the right technologies and expertise, and it opens up a whole new world of possibilities. Technological developments have enabled new ways of working across various fields that is no longer limited by geography, work times and employment contracts (Donnelly & Johns, 2021). For example, in the medical field, virtual receptions are set up using technology like Yo Telecom which allows management of calls and access to databases from home (Remote working solutions for your practice, 2020). In other cases, the integration of IT innovations such as Slack (workplace communication tool), Zoom (videoconferencing), and Trello (project management) has enabled organisations to retain a level of security and control over employees in order to assure productivity (Carroll & Conboy, 2020). Remote monitoring of employee performance can be accomplished by the use of technology, such as keystroke control, computer time accounting, global positioning system (GPS) surveillance, or telephone call tracking (Hartner-Tiefenthaler, et al., 2021). As a result, technology-driven work practises such as remote working may successfully enable processes such as assuring coherence in work practises, developing a community of practise around a technology or method, managing collective action, and conducting appraisals (Carroll & Conboy, 2020). In the construction sector, there has been increased interest in automation with the use of robots and virtual reality (VR) for remote operating (Adami et al, 2022). 3D laser scanning and digital photogrammetry, for example, have made building registration significantly more precise, decreased mistakes, and reduced fieldwork compared to traditional methods. Current industry changes, as well as new standards arising globally, have raised the demand for building information modelling (BIM) models as the end product of these surveys (Gustavo Rocha, & Luís Mateus, 2021). Despite this, many professionals find the transition to adopting these technologies challenging (Gustavo Rocha, & Luís Mateus, 2021) and there has been little research on the impact this has had for remote working in the construction field (Rabida, 2020).

In this study, opportunities for remote working in the construction industry are explored, as well as the implications for digitisation requirements. To achieve this, it is important to understand the

affordances and constrains of technology as an enabler of remote working, and the perspectives of those who work in the sector (Lerch & Gotsch, 2015). The research would also delve at the factors that impact successful remote working, and recommendations for current and future digitisation needs for construction projects.

Affordance Theory

The 'Affordance Theory' is a valuable lens for examining the action opportunities that emerge between users and technology (Blewett & Hugo, 2016). Gibson (1977) defines affordances as the action possibilities of a perceived surface existing in an environment. This concept has been used in various areas such as 3-D Virtual Environments (Dalgarno & Lee, 2012), online social networks (Veletsianos & Kimmons, 2013), and scaffolded-social learning network (Zywica et al., 2011). Technological affordances have been widely discussed in education research, but little has been explored of this theory in the context of remote working in construction. When discussing technological affordances, focus is always placed on understanding the relationship between humans and technology (Majchrzak & Markus, 2012). They are the direct consequences of human-computer interactions, which may vary depending on the perception of different actors, irrespective of the object's intended design (Leonardi, 2013). Since the technology is not limited to physical location, this feature often allows people to work outside of the boundaries of a certain location (remote working). This technological affordance, however, is contingent on the availability of the necessary resources and skills, such as an Internet connection, a computer device, and the user's abilities to use the technology. As a result, while remote working can be a technological affordance, it is not always the case since it is influenced by a variety of factors other than technology. The study examines these factors in the construction industry using the Affordance Theory as a premise.

RESEARCH METHODS

A quantitative research method was adopted in one of the UK's largest tier 1 contractor companies. The organisation was chosen because their position at the forefront of the industry was deemed advantageous for establishing new trends, with any common themes more likely to be replicated by other companies in the sector (Bazley, 2009). An online survey was used to gather information on how construction professionals perceive and experience digitisation for remote working. A total of 125 responses were received, indicating a representative view of the organisation, as calculations indicated that 96 responses with a margin of error of 10% and a confidence level of 95% would suffice as shown in Table 1.

$$Necessary\ sample\ size = \frac{(Z\text{-}score)^2\ x\ StdDev\ x\ (1-StdDev)}{(margin\ of\ error)^2}$$

Table 1: Information for calculating necessary sample size

All participants were construction professionals involved in project delivery. According to Zdonek, Podgórska, and Hysa (2017), when working remotely, the highest competency is expected of those responsible for performing particular project tasks, as well as managers responsible for overseeing the implementation process and supporting the workgroup. The study's focus is on construction project employees. Respondents were divided into two groups

based on their position in the contractor firm: managers and non-managers. Respondents classed as managers worked as engineers, architects, quantity surveyors, and project managers, and held some management responsibility on site. Whereas respondents classed as non-managers worked in supporting roles to managers on site. A total of 51% (63 respondents) were managers, while the remaining 49% (62 respondents) were non-managers.

Each question was analysed using the SPSS software to accurately calculate percentages, frequencies, standard deviations (Std. Deviation) and Cronbach's alpha to infer significance, validity and reliability of the results (SPSS Inc., 2004; Valli, 2017). According to Wan et al (2014), a standard deviation (SD) of 0.5 shows a reliable response, indicating that the responses received did not differ significantly between respondents. Given that the standard deviation measured less than 2 for each question, this demonstrates the data's reliability (Wan et al., 2014). Standard deviation has been historically used to assess uncertainty by measuring how much variation exists from the average mean (Lumen, 2021). When deciding whether results agree with a theoretical prediction, the standard deviation of those results is significantly important, where a higher standard deviation suggests a lower reliability (Lumen, 2021).

The questionnaire inquired about respondents' remote working practises, their willingness to work remotely, their perceptions of remote work in the construction sector, the problems associated with remote work, the availability of digital infrastructure, and remote working capabilities. The variables assigned to each of the categories were derived from the literature. It took around ten minutes to complete the questionnaire. A Google survey was used to distribute the questions. The link was sent to the firm's director, who extended the invitation to participate in the research to all employees.

Cronbach's alpha was used to measure the internal consistency of the results, and a value of 0.82 was achieved, which indicates strong reliability. Previous reports suggest that a Cronbach's alpha score of between 0.70 and 0.95 is considered acceptable (Nunnally & Bernstein, 1994; Bland & Altman, 1997; Tavakol & Dennick, 2011).

RESULTS AND FINDINGS

Preference for remote working

The findings indicated that 42% of respondents had never worked remotely, while 34% had worked remotely on occasion. Only 24% of the workforce works remotely at least once per week. Although the majority of respondents lacked prior experience working remotely, 82.4% (SD 1.671) expressed a desire to work remotely on a consistent basis each week, albeit over a varying number of days. 70% of respondents indicated that they would prefer to work remotely between 2-3 days. Only 4% of respondents expressed the desire not to work remotely at all. This reflects a major disparity between how workers typically work and how they want to work in the future. The discovery is not surprising given the literature's evidence of the construction industry's lack of digitisation and digital infrastructure (Raoufi & Fayek, 2021). It's unclear if the COVID-19 lockout triggered the desire to alter working habits or if it was simply a catalyst for change. It is presumed that the pressures to keep the business running might have revealed and demonstrated advantages of remote working that were previously unknown.

The ability to work remotely only part of the week emerged as a major element in remote working in the construction industry. Figure 1 shows the results on respondents' opinions and perceptions on remote working. The fact that the majority of respondents choose to work remotely more frequently, but not all of the time, supports the need for more flexibility while still recognising that the construction industry will never be fully off-site (Quinn, 2018). Flexible remote working is likely to be the best solution for a rapidly evolving market, and there is potential to benefit from recently recorded improvements in family satisfaction while retaining an on-site presence to sustain long-established and effective construction practices (Troup & Rose, 2012). An effective combination of agile remote working and well-coordinated on-site operations has the potential to save time and resources for both the industry and its employees.

Figure 1 Perceptions of remote working in the construction industry

As shown in Figure 1, 79.2 % (SD 1.020) of respondents agreed that working remotely allowed them to save time travelling, focus on tasks, and increase productivity. It also shows 84% of respondents (SD 0.705) believe that working remotely will cause them to miss seeing their co-workers, which made it difficult for 48% of respondents (SD 1.041) to complete their work. The ability to meet colleagues in person seems to have an effect on work success. This may be linked to the industry's high levels of job-related stress, depression, and anxiety, which strong social interaction and comradery can tend to alleviate, while also making work more enjoyable with easier access to resources and "water-cooler" talks (ONS, 2018). Almost all respondents accepted that travelling less would lower emissions and that operating remotely would save money (SD 0.951). Clearly, there are untapped cost and environmental gains to be achieved by a transition to a smarter way of working.

79.2% of respondents believe that working remotely promotes work-life balance. They also did not anticipate a detrimental impact on the border between home and work, evidenced by 41.6% disagreeing on the potential for remote working to blur the boundaries too much, while the remaining 30.4% felt impartial. These data imply that remote working is widely accepted among construction professionals in the UK. However, further research is needed to validate this beyond the employees' perceptions. The findings contradict that of the United States where construction professionals expressed reluctance to work remotely because they found communication in a virtual environment difficult, and the inability to physically inspect job sites to ensure work was proceeding according to plan and specification was a hindrance (Overturff, 2021). Other research showed that work-life balance was affected by the blurred boundary between work and home life as a result of the continuous use of mobile technologies at home, enabling individuals to be easily reached even after working hours (Boswell & Olson-Buchanan, 2007; Moore, 2017; Felstead & Henseke, 2017). Digitisation has undeniably led to the enhancement of value by linking processes throughout the supply chain (Hoff & Schober, 2016). This is shared by 85.6% (SD 0.727) of respondents who agree that digitisation has made information more accessible and 75.2% of respondents (SD 0.830) said they were more productive. The benefit was most apparent in the cloud storage for accessing building plans, which could be downloaded, checked, and made immediately accessible online for feedback and comments from development teams and designers. It not only increases access and flow of information but also improves coordination between teams, resulting in a significant reduction in query response time.

Challenges of remote working

Figure 2 shows varied responses when it came to rating the greatest challenges encountered when working remotely. Collaboration with colleagues was ranked the most difficult challenge by 53% of respondents and was in the top three challenges in 73% of respondents.

The second biggest obstacle was poor ergonomics of home arrangement, which was chosen by 20.6% of respondents as their biggest challenge and 25.4% as their second biggest challenge, putting it in the top four by 84.8% of those surveyed. General distraction from those in the home came in third place, with 47.6% of respondents naming it as one of the top three obstacles. This study did not elaborate on what the term 'other' could mean, leaving interpretation to the respondent; also, there was no option for the respondent to elaborate on this by entering in a choice. This could be a study problem that future research should address in greater depth in order to better understand remote working challenges. However, because 'Other' was ranked the lowest, it reinforces the inference that respondents' main challenges in remote working are as specified in the options provided.

Figure 2 Challenges of remote working

As shown by Figure 2, environment affordances of working and living spaces have an effect on remote working capabilities since work settings and workstation ergonomics become unregulated when working remotely. However, environment-related challenges were not always the most pressing issue for all participants. This can be connected to particular home situations, with individuals working from home with children having a completely different experience than those without children. Similarly, remote working was less difficult for those who had a suitable workspace at home. Thus, the ability to operate remotely was reliant on the provision of digital technology and an environment that "affords" remote working.

Digital Infrastructure

Figure 3 illustrates the majority of projects have basic amenities such as high internet speed (73.6%; SD 0.787) and broadband networking (88%; SD 0.605). Despite this, 37.6% (SD 0.984) of respondents said their current project does not have BIM or that they are unaware of it. The potential for interconnectivity in the building lifecycle is reduced by a lack of application of BIM, stifling performance at all levels (Leonardi, 2020). True digitisation occurs when all systems are linked together to allow for a smooth transfer and sharing of data, allowing users to design, predict, and track real-time data (Schober et al., 2016). BIM software such as Revit and Naviswork allows some form of automation and this has been shown to boost worker productivity by enabling construction professionals to focus on more critical tasks, allowing them to save time and resources (Maresova et al., 2018). Just 38.4% of respondents (SD 1.212) said they had an automated process, with 61.6% saying they didn't have or weren't sure of any.

Figure 3 Digital infrastructure currently used

Similarly, robotics continues to be underutilised on building sites, with just 4% of respondents reporting to have used it (SD 1.382). Portable technology however, is widely used within the industry according to 79.2% of respondents (SD 0.741). Tablets, helmet cams, and electronic

sign-in sheets are some examples of portable technologies often used in modern construction (Gamil & Alhagar, 2020). Nevertheless, their capacity is limited by a lack of digital access, as information is not updated immediately, causing delays or errors (Raoufi & Fayek, 2021). The capacity and capability of portable technology on building projects could be increased by connecting it to successful control systems such as BIM (Leonardi, 2020). If successful, this will save much more money and time because real-time data updating and analysis allow for faster detection, interpretation, and avoidance of problems or delays. These findings show that, although portable technology is used, it is not often used to its full potential.

Remote working capabilities

As seen in Figure 4, most respondents (85.6%, SD 0.713) believe their project has enough technologies for successful remote working. However, 46.4% (SD 1.095) agree that more investment is needed to improve its effectiveness. Although the exact limitations of remote working are unknown, it appears that enough capability exists to enable flexible working. Working remotely, according to 62% of respondents, allows people to work on multiple tasks at the same time (SD 1.038). This greatly improves the ability to direct talents precisely where they are needed, regardless of location (Maresova et al., 2018). Given the lack of skilled labour in the sector, this opens up a lot of possibilities for bringing in experts from all over the world, which will further increase flexibility and quality. In fact, the general consensus of responses accepts that remote working would improve efficiency by speeding up processes, with 43.2% of respondents agreeing (SD 1.112).

Figure 4 Opinion on remote working capabilities

Despite the positive outlook, the study estimates that they will not be as efficient as they believe since the data indicates that they are not fully prepared with digital infrastructure aimed to increase productivity. Sophisticated digital infrastructures are not extensively used in building, and many individuals are unaware of their existence. As shown in Figure 3, robots and automated processes are the least used digital infrastructures, with nearly two-fifths of respondents reporting that they do not use BIM. This explains why most respondents in Figure 2 ranked collaboration as the most significant issue. Collaboration could be significantly improved with the full use of BIM tools.

DISCUSSION

Affordance perspective to remote working

The affordance theory offers a prism by which one can understand how technology delivers functional and social affordances to the building industry, allowing work to continue efficiently without regional constraints (Leonardi, 2013). The findings show that people are pleased that technology has allowed them to make remote-working possible and even increase work-life balance. The positive perception is likely to have increased as a result of the changes in working patterns brought on by COVID-19, making people realise that remote working is not only possible, but can also provide tangible advantages such as minimized traveling, more flexible working opportunities, and considerable cost savings for companies (Gamil, 2020). Many technological affordances make it easy to complete tasks and connect with teams when working remotely by facilitating communication and collaboration activities such as virtual team stand-ups, formal meetings, and after-work socials (Majchrzak & Markus, 2012). In most instances, technologies such as computer systems, cloud computing, wireless internet, and the like will

keep things running smoothly. However, these affordances have positive and negative effects (Cai et al., 2020). Despite technological affordances, the study discovered that remote working presents challenges for collaboration in the construction sector. This can be attributed to a change in communication and coordination methods, with issues such as communication frequencies, flows and etiquette being reflexively adjusted to take advantage of the technological affordances (Waizenegger et al., 2020). Environment affordances of working and living spaces have an effect on remote working capabilities as work settings and workstation ergonomics become unregulated when working remotely (Waizenegger et al., 2020). Thus, the ability to operate remotely was reliant on the provision of digital technology and an environment that "affords" remote working.

Factors affecting remote working

At present, remote working capabilities cannot completely replace work on site because "affordance" is constrained by factors of digital competencies, environmental conditions, and digital infrastructure. The lack of digital infrastructure and integrated systems is a major stumbling block to effective remote working. Few respondents said they used BIM on their projects, but a startling number did not. Additionally, certain projects were unaware of or lacked fast internet, wireless networking, portable technologies, or automated systems, all of which have an impact on performance, workload, and efficiency (Bigagli, et al., 2020). While digitisation does not necessarily involve the use of BIM, it entails the use of interconnected systems at any stage of the supply chain (Hoff & Schober, 2016). The infrastructure control layer, of which BIM is a large part, is a core aspect of the construction industry's digital success (Bigagli, et al., 2020). This control layer enables the interconnection of all processes, resulting in cost and energy savings as well as improved project completion time, quality, and safety (The Boston Consulting Group, 2016). However, BIM seems to be underutilised as a digital infrastructure in the industry right now, which means that effective technologies and innovations like the ability to operate remotely and flexibly aren't as effective as they should be (The Boston Consulting Group, 2016). Improving this infrastructure and encouraging wider practice of remote working would enable people to operate more flexibly, efficiently, and cost-effectively while also helping to overcome the industry's skills shortages. A change in mindset from seeing work as a destination to seeing it as a task can open up possibilities for productivity that support both the industry and its employees (Sutherland & Janene-Nelson, 2020).

Future directions to remote working

Many industries have been disrupted as a result of the rapid implementation of digital technology, including collaboration opportunities in teams and organizations. Given how much collaborative work is needed in the construction industry, the fact that collaboration was identified as one of the main challenges in remote working is cause for concern. The findings show that online collaboration capabilities are still limited with the current infrastructure. As a result, future studies should focus on how virtual teams negotiate new communication norms. Successful control systems, such as BIM, may help boost this capability, but are not commonly used yet (Mäkinen, 2017). Thus, research into the use and potential of digital collaboration tools, as well as their effects on connectivity, information exchange, and decision-making, is needed. In addition, further research on the policies and incentives for future modifications of work practices is needed to drive change. While digitisation tools offer clear benefits of facilitating remote working, there are still many aspects of work in which digitisation simply cannot substitute working on site. The future research should investigate the impact of distinct affordances of various technology on remote working. It should also analyse any differences

between various construction professionals in terms of remote working capabilities through technological affordances.

CONCLUSIONS

The study sought to investigate the interest in remote working among construction professionals and to examine the factors affecting remote working. Using the affordance theory as a prism, the study discovered that remote working capabilities were not exclusively reliant on affordances of digitisation, but also subject to a paradigm shift in the approach to work.There was widespread support for digitisation in the construction industry and a clear expectation that it would facilitate remote working, leading to efficiency gains. However, the results reveal that there is a common need for flexibility in working, where a combination of "on-site" and "off-site" arrangements considered more practical. This may result in considerable time and cost savings, as well as increased efficiency. The effectiveness of remote working was linked to interaction with co-workers, with the absence of such contact increasing work-related stress, depression, and anxiety. Strong social ties and amity were established as a result of access to support and "water cooler talks" with co-workers, which mitigated this impact. As a result, the availability of interconnected systems that allow for efficient communication and digital technology that allow automated processes became the key factors impacting remote working. It can be concluded that while digitisation provides technological affordances that enable remote working, it must be supported by environmental and social factors of work. There is a need to review and regulate these factors to prevent issues like isolation and distractions in the home while working remotely. It is important to realise that affording remote working goes beyond digitisation. While technology has empowered human labour and reshaped society since the invention of machines, the effects of technology can be felt in society in the way we communicate with one another, exploit one another, or know one another. People can easily work from anywhere with the use of email, tablets, and other portable devices. However, it simultaneously encourages people to work while on the go, at home, on vacation, and at their leisure. This can both enhance time-value by shortening the amount of time to complete a task, but also lengthen work hours by encouraging people to work more. The proliferation of technology has been argued to foster a society that is constantly “switched on”, and more research is needed to assess its impact on employees (Grant, et al., 2019). The findings may benefit organisations to evaluate the practical needs of ensuring effective remote working in the construction industry and unlocking efficiencies. This work is significant for understanding the practical implications of using digital technology as a means to enable remote working and re-contextualises the idea of technological affordance as a functional benefit. The research is limited to a large contractor company; thus, the findings may not be appropriate for small and medium-sized companies, which may face different challenges. Furthermore, the survey did not include demographic information of the respondents. Due to a lack of information about respondents' background, this study was unable to conduct an advanced statistical analysis to determine how digital technology affects remote working differently across professions. The originality of this paper's contributions addresses a research gap in which there was uncertainty about the technology affordances among construction personnel. Recent study concluded that remote working in the construction industry had a positive impact on productivity when the work was digitised (Ogunnusi, M., et al 2021), but acknowledged that working from home had challenges. Nonetheless, the study did not go into detail about the difficulties encountered when working remotely. As a result, this paper expands on the findings of previous research by explaining them using affordance theory.

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