

Digital Leadership for the Built Environment



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Abstract While ‘soft skills’ are often viewed as add-ons in the digital journey, they are in fact critical in realizing the opportunities created by Industry 4.0 for the construction industry. This chapter focuses on a vital, but oft-neglected aspect of digitalization, namely digital leadership. By exploring understandings of digital leadership in the built environment, we show that digitalization demands that traditional views of leadership are broadened from an existing focus on senior figures in firms to embrace wider views of leadership across supply chains, projects and the industry as a whole. Skills in collaboration and a multi-cultural awareness are important components of this. This enhanced view of leadership is explored and practical examples of their application in firms, supply chains and projects in the construction industry are provided. The teaching case methodology is introduced as a suitable pedagogical approach to address this growing skills gap in the industry and summarise data gathered during recent sessions using this method. The data suggest some ‘dos and don’ts’ for digital leaders operating in the AEC industry and guidance on leading digitalization journeys across supply chains.

Keywords Digital leadership · Collaboration · Supply chains · Teaching cases · Skills gap

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1 Introduction

All too often, soft skills receive less focus in business than hard skills [1]. Digital transformation is no exception: the focus is often on the need to develop hard technical skills whilst ignoring those soft skills that are vital to achieving digital change. As a report from the Organisation for Economic Co-operation and Development (OECD) states: *‘To thrive in a digital workplace, workers need a broad mix of skills – strong cognitive and socio-emotional skills, as well as digital skills’* [2].

The phrase ‘soft skills’ was first used by the American military to describe any skill not employing the use of machinery. Today the term is used to refer to people skills, social skills and personal career attributes [3]. Hard skills, in contrast, are those that relate to an objective technical or administrative competence. Soft skills play a vital role in organizations’ and individuals’ achievements, and the growing presence of digital technologies in almost every aspect of professional lives is increasing their importance. One such vital soft skill is leadership. The significance of leadership as a key factor influencing the success (or otherwise) of organizations is apparent in the amount of management literature from the last 100 years relating to the subject. Traditional views of leaders are often borrowed from the military, and tend to see leaders as heroic figures born into such a role. This view is exemplified by Scottish philosopher, Thomas Carlyle’s Great Man theory [4]. Contemporaneous views of leadership adopt instead a belief that leadership is a capability that can be learnt. Command and control approaches to leadership which see leadership as an exercise of power or force, have given way to our understanding that successful leaders understand people’s motivations and enlist participation [5]. Contingency theories of leadership are influential in this shift as they posit that different leadership styles are appropriate in different contexts. The emotional impact and importance of leadership was emphasized in Goleman’s seminal publication highlighting six different observable approaches namely coercive, authoritative, affiliative, democratic, pacesetter and coaching leadership styles [6].

With the coming of Industry 4.0, a seventh leadership style—digital leadership—should perhaps be added to these approaches. The fourth industrial revolution is bringing us industries that are supported by digital technologies and automation that leverages the power of cyber-physical systems [7]. For any organization facing the threat of digital disruption—or considering disrupting a new market—competition is a key consideration. Digital leadership is a significant factor in successfully adopting technologies and developing digital innovations, and therefore in creating competitive advantage.

It is clear that digital leadership requires more than a command of technical skills. Common to the many definitions of digital leadership that abound is that digital leadership is the use and adoption of digital technologies and the ability to react on these opportunities [8]. It is clear that digital leadership requires different thinking about business strategy, models, teaming and people. This is because the process of

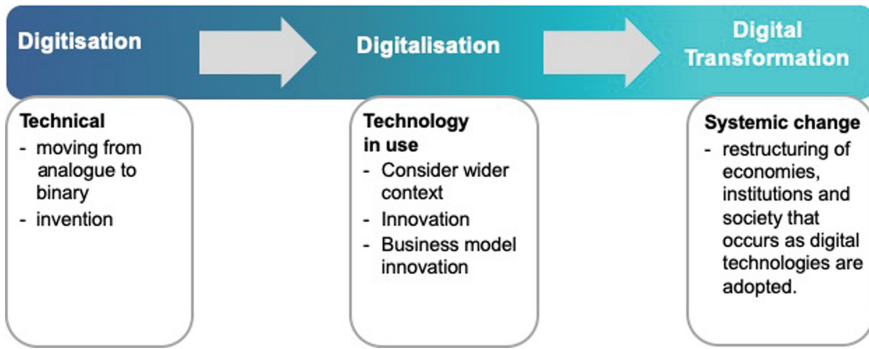


Fig. 1 Digital evolution: from digitisation to digital transformation. *Source* Digital Outlook

digitalization is a socio-technical one: successful digitalization involves not only the technical skills needed to use digital technologies, but also attends to the wider context of its use (Fig. 1). A lot of scholars have attended to this ‘duality of technology’ [9] where technological change brings organizational change and vice versa [10]. As shown in Fig.1, the purely technical process of digitization is widened to include people and process considerations as described by digitalization and widened further to include systemic change as described by digital transformation. Such is the importance of considering the wider changes that the recent observation has been made that ‘people are the real key to digital transformation’ [11].

In this chapter,¹ we first unpack the qualities of digital leadership. Practical cases are provided to illustrate an example of how digital leadership is apparent in the construction industry. The chapter concludes by discussing a novel pedagogical method we are using to address the digital leadership skills gap and by presenting an overview of leadership qualities that have been gathered from participants in sessions using this approach.

2 What is Digital Leadership?

For any organization facing the threat of digital disruption—or thinking about disrupting a new market—competition is a key consideration. The capability to adopt technologies and to develop digital innovations is an important competitive differentiator [12]. Research has long identified leadership as a key factor in order for organizations, teams and individuals to achieve exceptional performance. A range of research has shown that leadership is a significant factor in adopting

¹For brevity, we focus in depth on individual leaders in this chapter, but acknowledge that leadership positions can be taken by organizations, professions, policy bodies and governments and so on.

technologies and developing digital innovations, and therefore in creating competitive advantage (see for example [13]).

If we accept that digital leadership is an important source of competitive advantage for industries and organizations, this begs the question, what is different about digital, as opposed to traditional, leadership? The jury is out on this question [11]. Some argue that digital leadership is no different to traditional leadership, others that digital leadership demands a new set of behavioural traits. Whilst we acknowledge the importance of this distinction, we focus on the well-established model of transformational leadership to unpack what digital leadership actually is.

Our starting point is the knowledge that change is an implicit aspect of digital transformation. If change is such a dominant theme, it follows then that Bass's well-established model of transformational leaders is relevant [14, 15]. As Bass said: 'Transactional leaders work within the organizational culture as it exists; the transformational leader changes the organizational culture' [1985]. Transformational leaders will therefore drive the changes that organizations need to thrive in Industry 4.0. They exhibit Bass's key traits of idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. In other words, they build trust by leading by example, they inspire and motivate others, they place a great emphasis on creativity, and they attend to individual's personal growth. Below we will investigate those four areas in detail: idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. Looking at these areas, it is clear that all of these traits remain relevant to digital leadership.

2.1 Idealized Influence

Turning first to 'idealized influence', trust is critical to digital leadership. We want our leaders to lead by example and to practice the moral and ethical behaviours that are central to engendering trust [16]. This is particularly important as trust and collaboration are closely linked factors. Trust is crucial for innovative behaviours [17] and digitalization incorporates the introduction of novel process or outcomes. Collaboration is a vital element of digitalization: recent research finds that collaboration is a core trait of digitally mature organizations [11]. The combinatorial qualities and interdependence between digital technologies [18] demand that we adopt a broader view of leadership as extending beyond traditional organizational boundaries.

This broader view of leadership is particularly significant in the construction industry. It is an industry that has long struggled to achieve the collaborative behaviours called for [19–21]; this remains a major challenge for digital leadership in the industry. Digital leaders need to consider areas beyond the enterprise to include business ecosystems, which are vital to business success [22]. We can see that digital leadership extends beyond our traditional views of leaders as senior figures in boardrooms to include a broader set of project, program and supply chain managers as well as leading clients and policy makers.

Leading the Digital Ecosystem at Skanska UK²

Skanska, a multinational construction and development company based in Sweden was the 5th largest construction company in the world at the time of writing. Skanska's UK operation dated back to 1778 when London construction company Trollope & Colls was established. This became Skanska UK in 2000. In 2019 Skanska announced that they will become net zero by 2045 across their businesses and their supply chain. Their supply chain management departments contemplated how this sustainability vision could be supported by their supply chain (Fig. 2). It was clearly understood that the nature of the problem had shifted from simply meeting sustainability pledges into utilising digital technologies across their supply chain for efficiency.

Supply chains are compromised by lack of communication and trust throughout. Using idealized influence, Skanska was developing collaborative relations by making decisions based not just on price when appointing a supplier, but by procuring on best value through a tender list of partners capable of delivering, a due diligence process and a balanced scorecard. Selecting and connecting proactive businesses with similar visions of construction improvement were key activities of Skanska. By 2015, these preferred suppliers made only 45% of Skanska's spend and within 5 years, this was more than 80%. This stable ecosystem of like-minded businesses could form the basis of the digital innovation ecosystem that would supply Skanska's sustainability visions.

Skanska displayed digital leadership through idealized influence by meeting with their preferred suppliers formally every three months, to discuss various items, including digitalization. There, they asked them about *their digital strategy and what* Skanska could do to support them in their digitalization journeys. Apart from selecting, connecting their digital innovation ecosystem, they were creating a safe space for them to interact and to exchange ideas about digitalization.

Advanced data-driven analytics are becoming increasingly important in managing construction supply chains. First, this was achieved by digital applications and tools to create visibility on spending by using historical data on invoices, material-cost indexes, and other benchmarks to identify opportunities in sourcing. Second, this was led by moving from descriptive analytics to predictive analytics through tools such as "procure-to-pay" by using vast quantities of order and invoice data to create predictive order configurations and demand. Skanska was also using data analytics for performance benchmarking of their supply chain that could develop technological trust.

Since 2011, when the use of BIM (Chapter "[Building Information Modelling and Information Management](#)") was mandated by the UK

² This is an excerpt of a longer teaching case, [23].

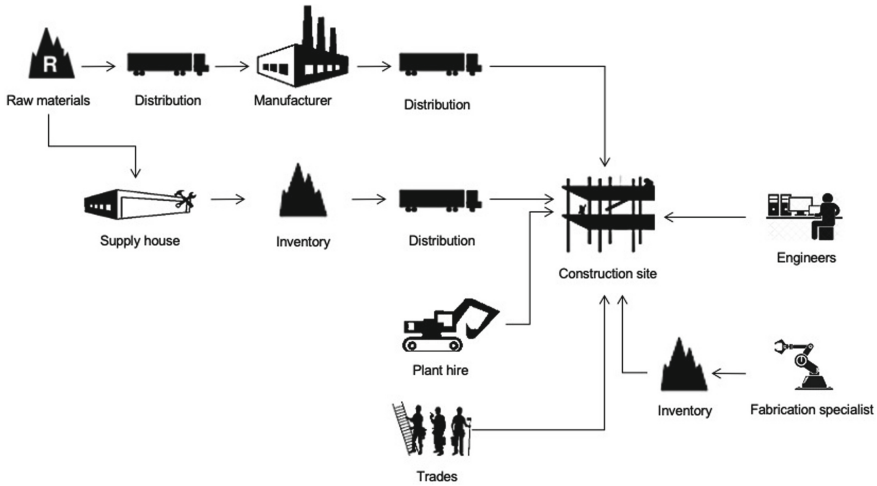


Fig. 2 Schematic representation of Skanska's supply chain of materials, services and sub-contractor. *Source* Digital Outlook

Government on centrally funded public sector projects by spring 2016, Skanska had developed capabilities of using construction data to build artificial intelligence-based predictive models for safety and risk that will be used beyond static compliance to develop insights and create a more responsible industry. Skanska, as an early adopter of digital and leading contractor in transportation and social infrastructure used BIM in its projects to comply with the mandate as well as also ensuring that their partners had these standards in place by assessing them at the pre-qualification stage. Skanska looked ahead to go beyond the mandated requirements for information management and looked into how to make the most of the opportunities that digitalization brings and shape its digital journey.

Skanska's business plan set out to consider (a) how integrated their supply chain was, (b) where they wanted to finish in the construction digitalisation race and (c) how they could improve when the only constant is change. To ensure that their supply chain could follow Skanska's digitalization and sustainability visions, they outlined 3 pillars to overcome resistance to change and support their supply chain on their individual digital journeys:

1. Developing a digital procurement strategy and creating a collaborative and integrated procurement process using simple framework agreements for long-term relations.
2. Creating a digital innovation ecosystem across Skanska's supply chain to advise the supply chain how to win framework agreements and develop their digital readiness while remaining true to their own digitalisation journeys.

3. Supporting the award-winning Supply Chain Sustainability School (SCSS), an online education platform, supported by Skanska among others, whose core mission is to upskill the industry through collaborative learning.

Skanska worked as an orchestrator of their digital innovation ecosystem to help their supply chain reach the 2045 sustainability pledge and inspired their supply chain's digital innovation investment decisions.

2.2 *Inspirational Motivation*

The need for leaders to inspire and motivate people, to provide a vision and purpose has long-been recognized as key to strong leadership. Arguably, it is becoming a more important (and challenging) aspect of digital leadership. As the pace of business increases rapidly, along with strategic uncertainty, so the need for leaders to provide people with a clear vision, sound strategy and foresight is growing. Digital leaders often have to demand change from people; this is challenging, and they often encounter pronounced resistance to change. Leaders encountering such resistance often embark on change management processes guided by the scale of the change (whether it is radical or incremental) and often using frameworks to guide the process (for example see [24]).

Of course, leadership has always involved making business and investment decisions. This holds true for digital leadership. In order to make informed decisions, digital leaders need a level of digital literacy, including a thorough knowledge of markets and trends. Digital literacy is a phrase first coined in 1997 [25] when it was described it as 'mastering ideas, not keystrokes'. While the term and its meaning has been widely-disputed since digital literacy is used here to mean having a thorough and up-to-date strategic knowledge and understanding of technical skills and trends. It is important so that leaders can value technology appropriately, always remembering that technology is a tool to solve a 'problem'. A critical aspect of realizing the value of digital technologies is business model change (Chapter '[New Business Models for Industrialized Construction](#)').

Digital Leadership at Thames Tideway³

Thames Tideway Tunnel supplements London's existing Victorian sewage network. Running 25 km through central and greater London, the tunnel spans from Acton in the west to Stratford in the east (Fig. 3). The tunnel will enhance the lives of many Londoners, as well as the natural ecosystems of the

³ This is an excerpt of a longer teaching case [26].

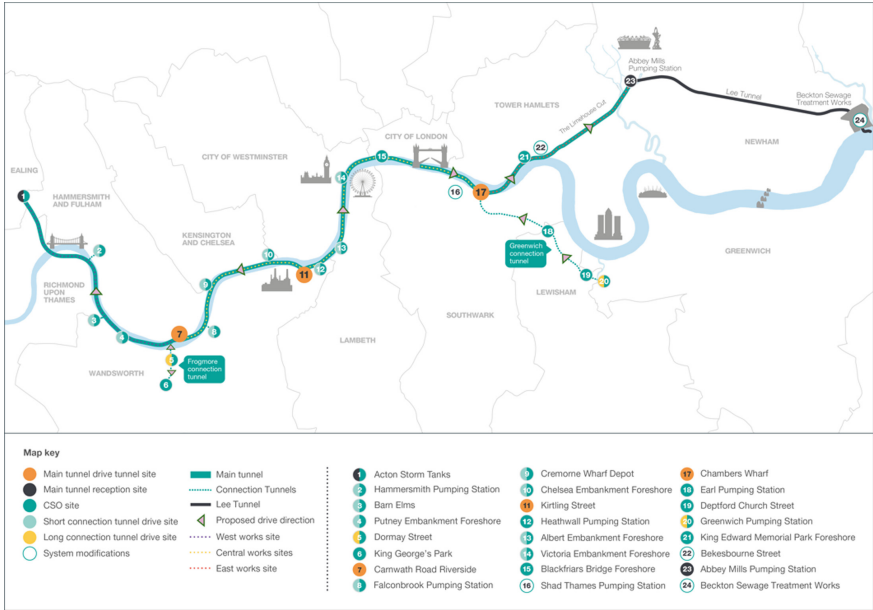


Fig. 3 The route of Thames Tideway tunnel. Source image courtesy of Thames Tideway

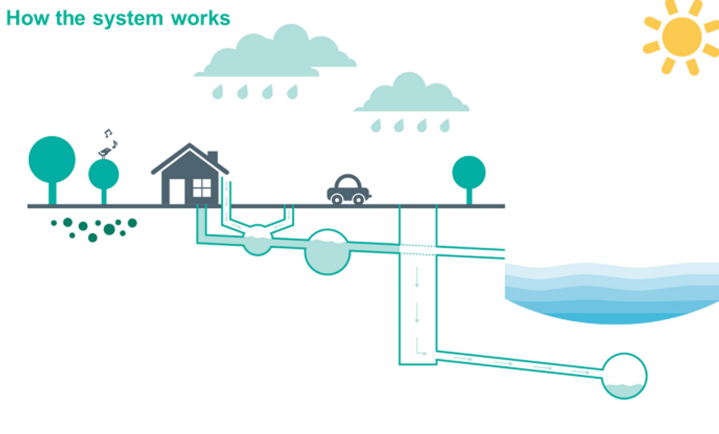


Fig. 4 How the tunnel will work. Source image courtesy of Thames Tideway

Thames itself by ensuring sewage is not pumped directly into the river (Fig. 4). Like many earlier infrastructure megaprojects, it played a significant role in the development of institutional policies and standards in the UK construction industry [27].

As is the case with many contemporary megaprojects, digital change is occurring rapidly during design and construction. In the five years since construction of Thames Tideway began, the potential of digital technologies to transform almost all aspects of professional and personal life has accelerated radically. For the leaders of Tideway, this change creates significant challenges and opportunities. On one hand, digital tools have enabled contractors to meet their contractual obligations to the client to supply digital records of the built asset upon handover. On the other hand, leaders at Tideway have had to develop a clear vision and lead a substantial change project—they have had to provide their workers with inspirational motivation. Any investment in digital innovation requires people working on the project to change in order to realise its value. With a diverse, physically distant and frequently changing (according to the project stage) workforce, this is an ongoing challenge for them.

For the leaders of Thames Tideway, providing ongoing inspirational motivation to their staff has been key to managing this ongoing digital change. Importantly they have had to develop a digital vision and strategy, which was done via a dedicated away day, communicate this to staff and establish a digital team responsible for driving this forward. Leadership have had to empower their staff, primarily by encouraging them to generate bottom-up digital innovations and to realise these by establishing a clear innovation investment process. They ‘lead by example’ by participating in training and using technology as required. They remain strongly focused on seeing technology as a tool and articulating its value to the business and individuals clearly. Finally, they recognize that one of the most powerful arguments in persuading individuals to use new technologies is to demonstrate how it allows individuals to do their jobs more effectively or efficiently.

2.3 Intellectual Stimulation

Innovation is a critical part of digital leadership. The creation, management and scale-up of digital innovations are necessary steps in realizing their value. Risk is an implicit and inevitable aspect of any innovation (digital or otherwise). Leadership support is critical in creating conditions for people to be innovative: they are key in creating the psychological safety that teams and individuals to take risks and be experimental [28, 29]. Leaders are responsible for stimulating creativity both up and down—innovation processes are both stimulated bottom-up and top-down. In going beyond traditional boundaries of the firm or supply chain to engage with other organizations—open innovation [30].

Innovation Through Experiment at Design Partnership⁴

Project Experiment is an exemplar BIM project invested in and supported by the leaders of Design Partnership⁵ in order to provide the firm with opportunities to innovate, learn and develop these capabilities. It was a fast project, completed in 8 weeks between September and December 2013. During this time, an interdisciplinary team modelled a 35-storey, 170 m tall building, based on the human form. Initially a member of the team was measured using a 3D laser scanner. The resulting data was used as the basis for modelling a building that incorporates architecture, structures, MEP and public health engineering. The design uses bodily systems to produce a building that takes the form of a human being.

Project Experiment was the idea of two BIM enthusiasts in Design Partnership. The concept gained senior leadership support and thus secured critical business investment. These project leaders also played a vital role. Not only did they secure senior leadership support, they also put together a small but enthusiastic team to work on the project. From the outset, the project leaders ensured that the team had shared ownership for the project. The initial concept was developed into a realizable project: turning the two project leaders' initial vision into a collectively owned and deliverable scheme. This challenging project, designing a model based on the human form, appealed to the engineers and designers involved. The team sought advice from scientists at Imperial College in London about human anatomy and mapped these into engineering systems, designing different components to correspond with bodily functions. For example, the public health engineers decided that the stomach would be a water system and the bladder would be grey water harvesting. In parallel, the team was addressing the technical aspects of the project: how such a complex, interdependent form was going to be modelled. They decided together to work on scanned data. In partnership with an external IT company they developed a 3D scan—produced by laser scanning the body of a member of the project team— and used this as the basis for ongoing modelling.

Although the primary purpose of the project was to innovate, the project leaders chose to use what they called an “old school methodology” to manage the project. Regular team meetings were held and collaboration and knowledge sharing encouraged. Several technical advances were made during this stage, often through collective problem solving carried out during design meetings. As the lead design explained: “There were instances on the project where we could have done it in an easier way. Take the structure: the way that we originally defined the structure was to trace the laser scan and join the

⁴ Based on data in [31].

⁵ Design Partnership is a pseudonym for a large, well-established multi-disciplinary construction operating in the construction industry worldwide.

dots: it is efficient but it's not very clever and it couldn't have coped with changes! Instead, we discovered that one of the team members had enough knowledge to define a parametric structure that would dynamically reform depending on a few variables. He could probably do that a lot quicker with his technical knowledge than to have done a manual process in the first place. From a design perspective that means it's a lot more flexible and copes with design changes easily".

After Project Experiment was completed and presented, significant resources were put into reflecting on the project. This was partly because of the nature of this project: it was experimental and funded as an exemplar project, therefore reflecting on and capturing the learning from the project was the central driver behind Design Partnership's and the team's investment in it. Through a series of internal seminars and events, and written accounts, the learning from Project Experiment is being diffused across Design Partnership. Externally, it is being presented at several conferences and written about in publications. It is also used to demonstrate Design Partnership's abilities in BIM to prospective clients and potential employees.

2.4 Individualized Consideration

Through individualized consideration, leaders can coach, facilitate, teach, mentor and encourage knowledge transfer and attend to their colleagues' development needs and potential. As digitalization is unbounded and spilled across disciplines [32], there is a crucial need for two-way communication and feedback. Such digital leaders need to transcend knowledge boundaries as boundary-spanners [33] and support knowledge transfer.

For digitalization, innovation champions are leaders centrally that lead their colleagues to support the social capital in their organizations. Rogers [34] had recognised innovation champion as organizational roles driving innovation. Digital innovation champions are digital leaders with individualized consideration who guide their teams to improve processes by ensuring implementation of digital and manages resistance to change.

Digitalization Champions at Alpha Design⁶

Alpha Design⁷ is an international design and engineering firm with a well-defined digital strategy. Alpha Design has a dedicated Research and Development (R&D) centre which develops digital solutions, software prototyping and research agendas. Alpha Design has a track record in facilitating communication and collaboration across disciplines and using online knowledge management systems to capture and share knowledge.

The UK offices of Alpha Design were impacted by the UK government mandate to use BIM in governmentally-regulated projects. In 2011, UK government required a fully collaborative BIM-based delivery process as a minimum for all government projects since 2016. Being proactive in leading digitalization in their business, Alpha Design utilized their internal network of digitalization champions who started to emerge since 2015. These digitalization champions spent the majority of their time leading teams in projects while promoting the strategic directions of Alpha Design to push digitalization.

By 2018, Alpha Design numbered circa 120 such digitalization champions across the UK. Through leadership, these digitalization champions communicated the vision of digitalization and new needs, developed digital solutions and supported change management when their colleagues were sceptical about novel digital initiatives. The digitalization champions were continuously educating and training their colleagues so as to upgrade the digital skills of the staff in a proactive way and selling the need for developing digital maturity.

The digitalization champions became involved in training and developing needs informally, as there was no formally identified digitalization champion role. Nevertheless, Alpha Design's knowledge management systems and internal networking platforms held an updated list of such digitalization champions, who were self-nominating themselves and where and how to find them across different branches of the firm. Anyone could be such a leader as long as they had the relevant digital knowledge and proactiveness to help their colleagues. Being proactive, they volunteered via their professional networks in Alpha Design to support their colleagues. Apart from training and education, the digitalization champions of Alpha Design were supporting with conflict management, mentoring, communication and knowledge sharing.

At the same time, these digitalization champions actively evolved together with the evolving digital innovations. Being continuously up to date, the digitalization champions showed a disconnect between their professional backgrounds and their informal roles. Digitalization champions with a background in engineering were called to undertake organisational roles by

⁶ Based on data in [35].

⁷ Alpha Design is a pseudonym for a large, international multi-disciplinary design and engineering firm.

leading their colleagues, whereas other had a background in social science and were leading digital transformation. Already crossing personal and professional boundaries made the digitalization champions being comfortable in different knowledge domains to be digital leaders.

With the increasing digital maturity in Alpha Design, more and more digitalization champions were self-nominated in the database. However, this also showed how ephemeral their roles were, as their colleagues were become better and better in their digital skills and did not require external support. In the future, and as digitalization becomes democratized in Alpha Design, digitalization champions will not be needed and will be transformed into another role to support the transformative visions of the firm by leveraging the social capital.

3 Developing Digital Leadership in Construction

It has long been the case that digital leadership is lacking in the construction industry [36]. It is a key variable factor in the industry's firm attempts to digitalize [31]. As a project-based industry, leadership is important not only in firms but in project, programmes, supply chains and ecologies [23, 37]. The recent report from an institutional perspective into the capabilities needed to digitalize the build environment for increased learning and adaptation through a process of continuous change [38]. We argue that the lack of digital leadership is a major barrier to the adoption of digital technologies. In an attempt to fill this gap, we have developed and applied a novel pedagogical approach, namely the teaching case method, in the construction industry.

Teaching cases are scenario-based accounts of managerial and organizational dilemmas. They are central to a teaching method developed by Harvard Business School over 100 years ago, and now widely used in leading business school around the world. In teaching case sessions, participants are provided with scenarios and asked to address various issues relating to them. Many world-leading firms are the subject of teaching cases, such as Google, IBM and IDEO. Teaching cases are particularly valuable for those already in business as participants bring their extensive experience to analysing and making decisions relating to complex business situations. All participants benefit greatly from the structured feedback that the facilitator and their peers can provide. Teaching cases often raise questions, rather than provide solutions.

Teaching cases are based on actual events and facts which are gleaned from interviews and other data sources, are necessarily fictionalized: 'While cases are true—they are not "the truth"... Any case is necessarily an abstraction, a distillation, and an oversimplification. And, all of these distortions are made in the service of the teaching purpose of the case' [39]. Cases always feature a 'main character' or

protagonist who is dealing with a number of managerial dilemmas or issues. These characters are usually drawn from the comments of a number of individuals.

Teaching cases are used for education and training for executives and students alike. The teaching sessions using the case teaching method run both face to face and online, typically with around 25 participants, so as all of them have the opportunity to voice their opinions and actively engage in learning. Sessions are highly interactive and use a flipped classroom approach, where the roles of the facilitator and participants are reversed from conventional classroom scenarios. Essentially the facilitator takes the role of the ‘guru on the side’ rather than the traditional role of the ‘sage on the stage’. The participants come prepared in the sessions by reading the cases and any supplemental material and preparing assigned questions.

During the live in-class facilitation, participants draw on the complex (sometimes contradictory or incomplete) information provided through the cases and their experiences to address queries and exercises set by the facilitator. Working with their peers, they develop evidence-based and defensible perspectives. Because the teaching cases can be versatile, the teaching sessions can be tailored to suit the participants’ backgrounds and requirements. Each session has specific learning objectives which are tightly defined before the session, and these are achieved through the facilitated discussion of the cases. Hence, the participants can grasp high-level concepts, such as leadership, strategy etc., through applied scenarios and essentially practice learning by doing in a safe environment where they can test their ideas and arguments. At the same time, due to the inductive teaching approach, the participants can develop soft skills such as presentation, debate, argumentation and critical thinking skills.

3.1 Developing Digital Leadership

Created with the support of the Supply Chain Sustainability School and the Construction Industry Training Board, we applied this pedagogical approach to work with Skanska and Tideway, developing teaching cases that were then delivered to a selection of executives, identified as current or future leaders. Developed around themes relating to digital leadership, the teaching cases focussed on leadership in Skanska’s supply chain and developing the value case for digital technologies at Tideway.

The cases were authored by Dr. Papadonikolaki (Skanska) and Dr. Morgan (Thames Tideway). As is normal with Teaching Cases, they are based on real events and behaviours but are fictionalized. A number of interviews (of approximately 45 min in duration) were carried out with key personnel to inform the

cases.⁸ Data collected in these interviews and other archival sources formed the basis of the cases. The teaching cases were then delivered to executives from both organizations and partners in six sessions held during September 2020. Fifty-one executives attended the online sessions in total.

Using collaborative software, participants completed a number of group exercises (as well as other participative exercises) for both teaching cases. We have summarized a selection of the information that these groups provided in relation to two key questions, namely: 1) what are some ‘do’s and don’ts’ for digital leaders in the AEC industry, and 2) how can firms’ support the digitalization journeys of their supply chains? This selection of our major findings represents initial analysis into the major points raised by this group of 51 executives.

What are some ‘dos and don’ts’ for digital leaders in the AEC industry?

Do:

1. Learn from industry-wide technologies advances and apply them to your own situation.
2. Create highly-collaborative internal teams that are supported by leadership.
3. Recognise, encourage and support ‘digital champions’ within your organization.
4. Understand and accept the limit of your own expertise and knowledge.
5. Lead by example.
6. Show a willingness to try new things. Support your staff in taking risks.
7. Encourage creative and innovative use of technologies.
8. Use your experience to identify the business issues that technology may help.
9. Remain focused on the need to see technology as a tool.
10. Clearly identify and articulate the benefits of technology in your organization.

Don’t:

1. Fail to consider the cost, time and resources taken to implement technologies in digital investment decisions. Results won’t be instantaneous.
2. Underestimate the magnitude of the change and training that will be required for implementation.
3. Fail to consider the intangible and long-term benefits of technology.
4. Underestimate the importance of ‘bottom-up’ initiatives in catalysing digital innovations. Bottom-up innovations require a clear process and support.
5. Consider digital leadership too late in projects.
6. Adopt a ‘solution looking for a problem’ approach to digitalization, but rather than start with the business problem.
7. Fail to own technological change: this creates significant problems for later buy-in.

⁸ 12 interviews were carried out with Skanska and its supply chain. 12 interviews were carried out with individuals from CVB (the joint venture responsible for delivering the Eastern Section of Thames Tideway) and Tideway. These interviews took place in March and April 2020.

8. Neglect your own levels of digital know-how. Without an appropriate level of digital literacy, you are unlikely to be able to make informed, strategic decisions.
9. Fail to build sufficient cohesion internally and along supply chain. To do this, you need to tackle the commercial and professional barriers that impede collaboration directly.
10. Fail to provide clear requirements and vision relating to digital change.

How can firms support the digitalization journeys of their supply chains?

1. Create a strategic supply chain list underpinned by a simple framework agreement, thus building long term relationship.
2. Support supply chains by offering forward workload projections. By providing this visibility of future work, more strategic investment decisions can be taken by the supply chain.
3. Develop a clear understanding of the capacity of your supply chain partners and a consistent digital procurement strategy.
4. Provide clear leadership and direction in your strategic requirements. As part of this talk, more about digitalization and define its short and long-term value clearly.
5. Co-create a digitalization strategy with your supply chain, don't just expect them to follow it. This represents an important cultural recognition that supply chain partners are vital.
6. Deploy consistent performance benchmarking and measurement, using a balanced scorecard approach or similar.
7. Create an 'ecosystem of innovation'. As part of this, share the risk of innovation with the supply chain.
8. Facilitate greater collaboration by providing the appropriate forums and working spaces to share ideas.
9. Considering using a third party to manage the supply chain and provide training across it. Encourage knowledge-sharing, provide regular workshops and e-learning facilities.
10. Look externally for sources of funding, innovation, and knowledge-sharing.

All of these points are summaries of the input that participants put into the sessions. All of them merit further investigation and exploration, and we continue to engage with industry partners to do so using the teaching case method. However, we believe that they represent a robust overview of different aspects of digital leadership and represent a good starting point for unpacking digital leadership in the AEC industry.

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