Digital Leadership for the Construction Supply Chain

Project Partners: Leeds Beckett University, Horbury Group, Drylining & Plastering Training Forum, White Frog & Northumbria University

Project Dates: January 2020 to December 2022

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1. Project Summary

The project, supported by funded from the CITB, was a collaboration between Leeds Beckett University, Horbury Group Ltd, the Drylining & Plastering Training Forum (DLPTF), White Frog, and Northumbria University. It aimed to help business leaders develop skills and mindsets to drive digital transformation. It is recognised that the nature of the construction industry hinders the widespread diffusion of innovation. Factors such as the industry's fragmentation, demand structures, procurement, risk sharing, and discontinuities in relationships are barriers to innovation. Therefore, a supply-chain perspective is essential to boost the diffusion of digital innovation in the construction industry.

The project delivered free digital leadership training to senior leaders and professionals in construction supply chains. The project delivery team developed training content that focused on four key issues: understanding the business case for digitalisation; digital leadership; the digital environment and; managing digitalisation-induced organisational change. 106 industry business leaders and professionals participated in the training with a focus on developing digital leadership skills. The training was delivered via online webinars and a dedicated e-learning platform.

2. Introduction

The construction industry is acknowledged to be slow at adopting digital technologies compared to many other industries. It is recognised that the nature of the construction industry hinders the widespread diffusion of innovation. Factors such as the disintegration of the industry, demand structures, pricing, procurement, risk sharing, and discontinuities in relationships are acknowledged as potential roadblocks to innovation adoption. This project considered that unless there is a supply chain buy-in, it is likely that the diffusion of digital innovation in the construction industry will continue to lag other industries. As such, a supply chain perspective sh if the industry is to successfully innovate. Initiatives that have sought to provide solutions for change in the industry have advocated for greater involvement of the supply chain and such have shown to be promising in influencing change. For example, partnering, supply chain integration, and collaborative business models have been demonstrated to spur performance improvement in the construction industry. The need for top management support to influence innovation is also widely acknowledged in the relevant literature. Therefore this project focused on providing senior business leaders and managers with appropriate skills to take a leading role in influencing the digitalisation of their businesses and supply chains.

3. Aim and Objectives

The project aimed to help business leaders develop skills and mindsets to drive digital transformation.

The following were the project objectives:

(1)   conduct an analysis of the factors impacting digital leadership in the construction industry;

(2)   Synthesis of the knowledge base for digital leadership practice suitable for the construction industry

(3)   develop training material for best-practice digital leadership;

(4)   deliver digital leadership training to leaders in participating contractors' supply chain organisations.

4. Budget and Finance Sources

The total project cost was £164,530.00. This included a £115,171.70 contribution from the Construction Industry Training Board and £49,360.30 as match funding from the project partners.

5. Training delivery approach

The project focused on giving people in leadership roles the skills, behaviours and competencies to implement digital solutions. Topical areas considered included: understanding the business case for digital adoption; demonstration using exemplar case studies of leadership influence in company-wide and supply chain-wide adoption of digital innovation; leading intra-organisational and intra-supply chain diffusion of digital innovation; developing and implementing strategies for digital technologies adoption; and emerging trends in digital technologies adoption.

The project was delivered through six work packages (WP) described below:

• **WP1- Stakeholder engagement:** This involved engagement with key stakeholders to identify and clarify the construction industry business leaders' training needs. It involved engaging with business leaders to map their existing digital leadership skills requirements and identify opportunities for digital innovation. This information was then used to tailor the training to cater for the required digital leadership skill set.

• **WP2- Development of digital leadership knowledge base:** This involved a review of literature on digital leadership and primary data collection through interviews with business leaders. The findings were used as part of the training material to demonstrate the requirements for effective digital leadership in construction organisations.

• **WP3- Development of digital leadership excellence training material:** This involved work to develop digital leadership skills training material for best practice digital leadership for the construction industry.

• **WP4- Digital Leadership training for Horbury Group's supply chain leaders:** This involved delivery of digital leadership skills training to personnel at Horbury Group. Phase one training was delivered through webinars and e-learning modules on a dedicated training platform.

- **WP5- Digital Leadership training for members of DLPTF:** This phase two digital leadership training program focussed on business leaders of member organisations of the DLPTF and the wider construction industry. The training was again delivered through webinars and e-learning modules on a dedicated training platform.
- **WP6- Future focus- Digital Leadership skills for the construction industry:** This work focused on identifying opportunities for promoting digital leadership in the wider construction industry beyond the funded period. We also repackaged the training content, in a suitable format, as an online resource for construction industry leaders.

6. Results

The following were the key deliverables for the project:

- **Training framework:** As part of the project outputs a training framework was developed. The training focused on helping leaders understand how they can help organisations navigate through the digital transformation process.
- **Training material:** Having developed the training framework, the project team developed four training modules reflecting the 'why' (business case for digitalisation), 'what' (digitalisation), 'who' (digital leadership) and 'how/when' (managing digital transformation) of digital leadership. The content was developed as both e-learning and webinar content.
- **Training of business leaders and professionals:** The training was conducted in cohorts with each cohort having access to training over a period of three months. A full training program for each cohort involved attending an introductory webinar and four others representing the four learning modules. The project team managed to deliver training to five cohorts with a total of 106 business leaders and professionals from over 50 organisations. The organisations represented ranged in size and included miro, SME and large organisations. Table 1 shows the targeted and actual numbers.

Table 1: Number of participants

Targeted number of participants	Actual number of participants	Difference
70	106	+36

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- **Module Content:** The project team developed four modules that can be delivered in a webinar format or as asynchronous e-learning content. The four modules are:
  - Module 1: Digital transformation - understanding the business case;
  - Module 2: Digital leadership;
  - Module 3: Digital transformation – understanding the digital environment;
  - Module 4: Digital transformation: strategy & implementation.

- **Research Output:** The research undertaken as part of the effort to provide the knowledge base for digital leadership training resulted in the publication of academic journal papers on digital leadership issues. This includes:
  - Zulu, S.L.; Saad, A.M.; Gledson, B. (2023) Individual Characteristics as Enablers of Construction Employees' Digital Literacy: An Exploration of Leaders' Opinions. *Sustainability* 15, 1531. https://doi.org/10.3390/su15021531
  - Zulu, S.L.; Saad, A.M.; and Gledson, B. (2023) Exploring leaders' perceptions of the business case for digitalisation in the construction industry. *Buildings.* 13, no. 3: 701. https://doi.org/10.3390/buildings13030701

An additional two papers, from the same research team, reporting on findings from the research have been submitted to journals for publication and are currently under review.

- Exploring Digital Leadership of Construction 4.0 Organisations
- A systematic literature review of the mediating factors of the relationship between digitalisation and construction productivity: A systematic review

A summary of these research outputs is presented in appendix 1.

- **Contribution to the digitalization research agenda:** The CITB project's theme was commensurate with the broad research agenda on digitalisation for the academic project partners from Leeds Beckett University and Northumbria University. Their involvement in this project, therefore, helped to continue developing their research impact in this area. On the other hand, it meant that the project benefited from existing research efforts by the academic partners. For example, the researchers contributed to other research publications (see example papers listed in appendix 2) reflecting content that contributed to informing the development of training content and delivery on digital leadership in the construction industry.

7. Review and Discussion

Overall, the project achieved its objective of providing digital leadership training to business leaders and professionals in the construction industry. It is worth noting that the training did not focus on the technical aspects of digitalisation, but rather on the soft issues, i.e. digital leadership and organisational change.

The project was affected by the COVID-19 pandemic which resulted in the suspension of the project for six months. Upon resumption of the project activities, it was apparent that the original project design was not suitable for the post-pandemic era. Therefore changes had to be made to the method of delivery of the training. While this was the case, the project team managed to exceed the targeted number of training participants.

The nature of the construction industry as reflected in the range of sizes of construction organisations presented a challenge to the Project Team, in that the level of knowledge and capabilities to digitalization can be significantly different depending on organisational size. As such, in some cases, it seemed that the one-size-fits-all approach was not appropriate.

However, the Project Team, ensured that they contextualized the content to suit each cohort taking into consideration the profile of the participants attending the training course.

The project team expects that they will continue engaging with the wider construction industry in the digital leadership space, including involvement in similar funded projects, organisation of webinars and engagement in research on digitalisation and digital leadership.

8. Conclusion

As demonstrated above, the project team met the original objective of the project by delivering training on digital leadership to over 100 business leaders and professionals in the construction industry. The COVID-19 pandemic impacted the delivery of the project. However, the Project Team responded to this challenge by implementing changes in the project approach to suit the post-covid era. The project partners are grateful to the CITB for providing the funding to enable this project to achieve its objective.

Appendix 1: Research Summaries

Research Outputs

27 CONSTRUCTION LEADERS INVOLVED

Study 1

Leadership of Construction 4.0 Organisations.

Study 2

Individual characteristics as indicators of digital literacy.

Study 3

Extending digital advocates' ability to develop a compelling business case for digitalisation.

Study 4

Systematic review of the mediators between digitalisation and productivity

Study 1: Leadership of Construction 4.0 Organisations

To address a broad research question asking what digital leadership involves, an interpretivist study was conducted. Purposively selected business leaders and company digital champions from Construction 4.0 organisations were surveyed using in-depth semi-structured interviews. This helped obtain deep insights and reflections on how construction leaders can impel digital transformations. Clear definitions of digital transformation and digital leadership are provided, and details of how digital maturity can be increased within organisations are revealed.

Gledson, B., Zulu, S., Ponton, H., and Saad, A.M. (Under Review) Exploring Digital Leadership of Construction 4.0 Organisations

Exploring Digital Leadership of Construction 4.0 Organisations

- HOW CAN ORGANISATIONS BUILD THE RIGHT SKILLS SO THAT DIGITAL STRATEGIES CAN BE EFFECTIVE?
- WHAT DIGITAL COMPETENCIES ARE NOW ESSENTIAL FOR CONSTRUCTION BUSINESSES?
- IN WHAT WAY DOES DIGITAL LEADERSHIP MEAN THINKING DIFFERENTLY ABOUT BUSINESS MODELS?
- WHAT BUSINESS OPPORTUNITIES DOES DIGITAL TRANSFORMATION ENABLE?
- HOW CAN BUSINESS LEADERS INCREASE KNOWLEDGE OF THE DIGITAL TOOLS AVAILABLE?
- HOW CAN BUSINESS LEADERS SUPPORT THE SUCCESSFUL INTRODUCTION OF DIGITAL SOLUTIONS?
- HOW CAN BUSINESS LEADERS EVALUATE THE BENEFITS OF A DIGITAL SOLUTION?

Implications: This paper explored how construction leaders can embed the skills to drive such transformation in their firms; what the essential digital skills for construction businesses now are, and how leaders can attempt to evaluate the value of digital technology for their business practices, are all crystallised. Some impacts of digital transformations on the construction workplace are also highlighted.

Study 2: Individual Characteristics as Enablers of Construction Employees' Digital Literacy

This project yielded another theoretical contribution by relating social behaviour to the readiness of employees to technological change. Semi-structured interviews with 19 industry leaders led to a conceptualisation towards indicating employees' digital literacy, an aspect deemed vitally critical and chiefly understudied in vast construction literature. Results suggest nineteen personality traits that exist to inform organisations on the likelihood of higher digital literacy among a firm's social system. Such timely study is among the very few to focus on encouraging construction firms to utilise the readily available social and psychological information as predictors of their employees' ability to cope and keep pace with technological change amidst the evolution of a digital era.

Zulu, S., Saad, A.M. and Gledson, B. 2023. Individual Characteristics as Enablers of Construction Employees' Digital Literacy: An Exploration of Leaders' Opinions. Sustainability. 15(2), p.1531

Indicators of digital literacy in construction firms
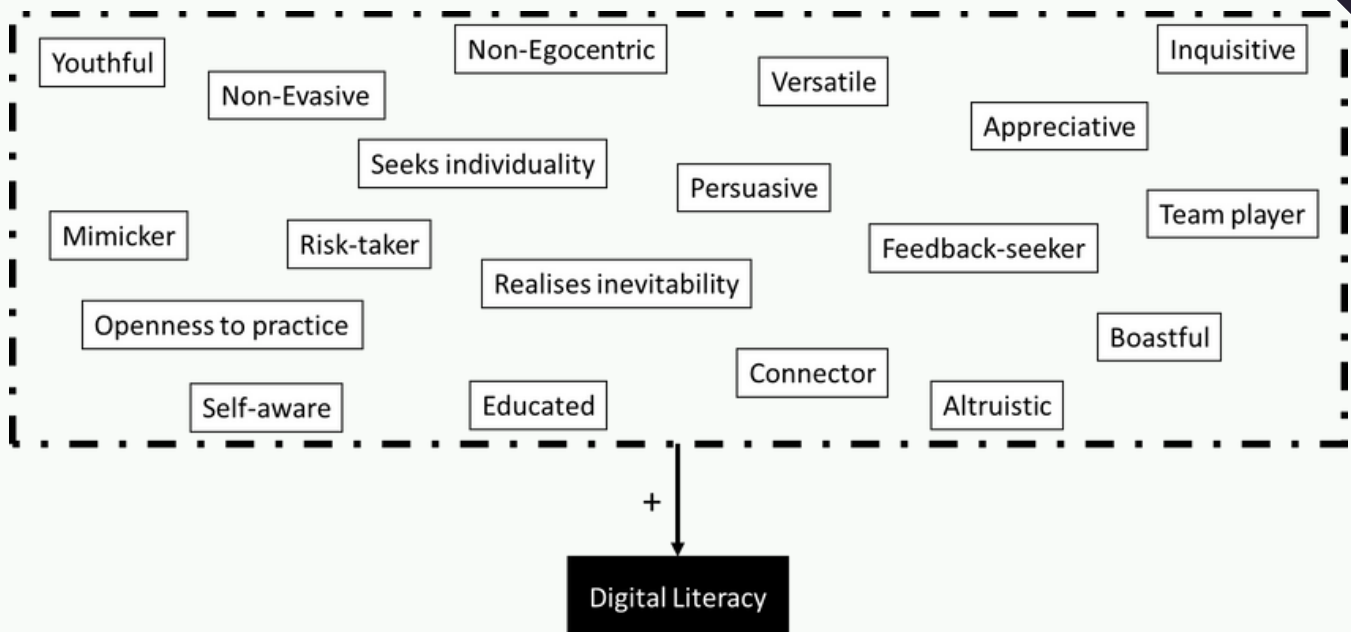
Implications: This paper is among the first to encourage construction research efforts towards the importance of studying social and psychological complexities. As such, it is of value to employers wishing to embed greater digitalisation in their firms, as well as leaders looking to assess employees' readiness, and policy makers looking to influence greater digital transformations.

Study 3: Leaders' perceptions of the business case for digitalisation in the construction industry

This qualitative exploration of 19 interviews with construction leaders aims to reveal the cues for a compelling business case behind the broader use of digitalisation in construction firms. Findings suggest that embracing these arguments would enable digital advocates to craft compelling justifications that may persuade decision-makers towards digitalisation. This output draws a guideline for those keen to adopt digitalisation but are lagging to influence their decision-makers due to the lack of persuasive business cases. Therefore, the findings comprise a set of justifications that can extend the purpose, legitimacy, and relative advantages of digitalisation in construction organisations, and as such, understanding the requirements that advocates require to advance their agendas and relational capabilities.

Zulu, S., Saad. A.M., and Gledson, B. (2023) Exploring Leaders' perceptions of the business case for digitalisation in the construction industry. Buildings. 13, no. 3: 701. https://doi.org/10.3390/buildings13030701

Developing a business case for digitalisation

READILY AVAILABLE POTENTIAL

HARMONISATION

CLEAR AND QUANTIFIABLE ADVANTAGES

ABILITY TO ATTRACT MORE WORK

RATIONALISATION

MANAGEABLE LEARNING CURVE

CLIENT SATISFACTION

OPTIMISE DISCIPLINES

Implications: This study draws a guideline for those keen to adopt digitalisation but do not proceed with innovation adoption decision-making due to the lack of persuasive business cases. Our findings comprise a set of arguments that can extend the purpose, legitimacy, and relative advantages of digitalisation in construction organisations, and as such, should be of interest to construction practitioners as well as researchers in understanding the requirements for advocates to advance their agendas and relational capabilities.
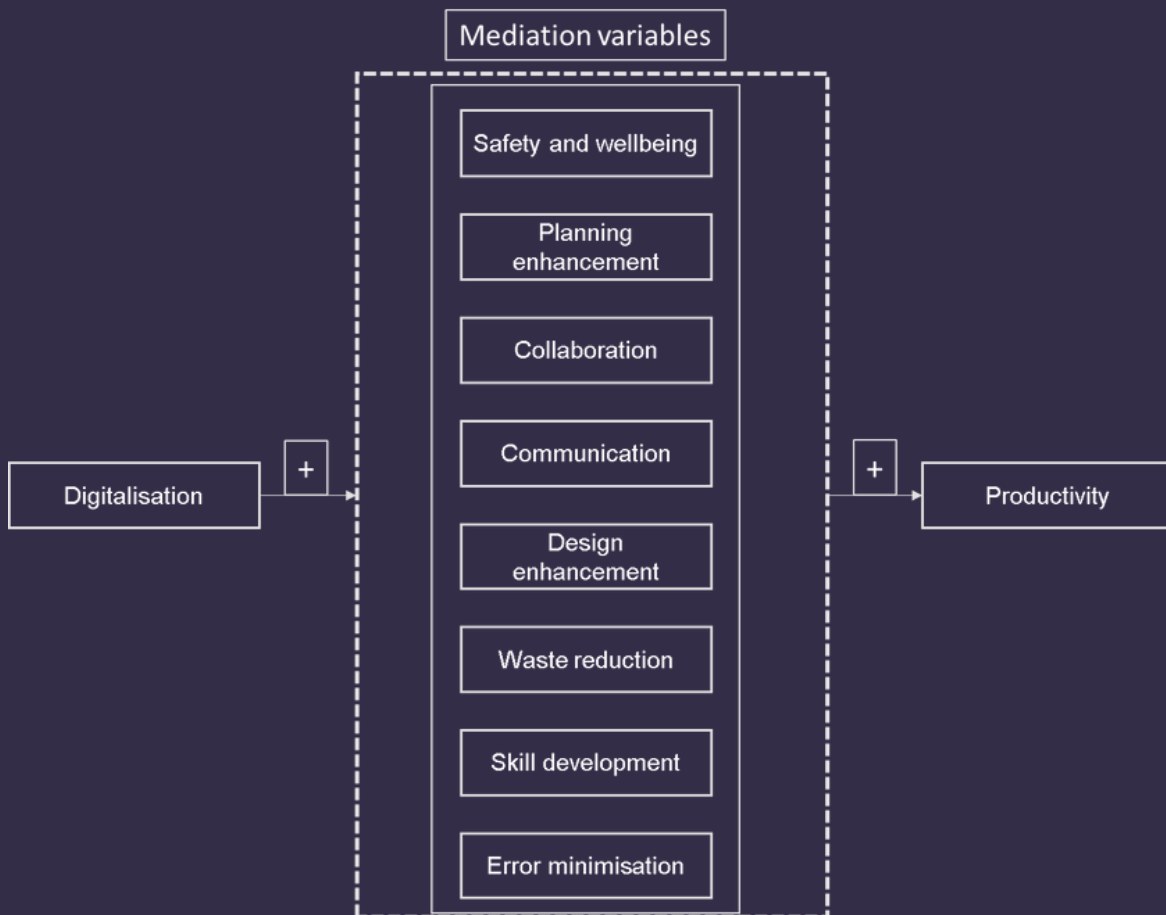
Study 4: Systematic review of the mediators between digitalisation and productivity

Despite the very low productivity rates achieved in the construction industry, studies on the association between technology adoption and productivity-related benefits and advantages are rare, and this may be a contributing factor to the indecision of construction firms to embrace digitalisation. A systematic literature review enables scholars to disseminate past research efforts in one scholarly resource in pursuit of new knowledge. Overall, sixty articles have been identified, screened, and included in this study. Productivity, in this context, is positively related to digitalisation by promoting more safety and well-being, planning enhancements, collaboration, waste reduction, employee upskilling, design enhancements, communication and knowledge transfer, and accuracy in information management.

Zulu, S., Saad. A.M., Omotayo, T. (Under Review) A systematic literature review of the mediating factors of the relationship between digitalisation and construction productivity: A systematic review.

Systematic review of the mediators

Mediation variables

- Safety and wellbeing
- Planning enhancement
- Collaboration
- Communication
- Design enhancement
- Waste reduction
- Skill development
- Error minimisation

Digitalisation + → [Mediation variables] → + → Productivity

i**mplications**: Through systematically reviewing literature, this study identifies, classifies, and critically analyses research efforts, aiming to shed light on the mediators of the relationship between digitalisation and productivity. The findings also reflect the popular use of qualitative methods when studying digitalisation in the construction context, a stance that may be a reflection of less diverse use of methodological approaches, and presents a call for more quantitative studies to explore the relationship between digitalisation and productivity. Future research is encouraged to use this extensive review as a foundation for comparable empirical investigations, considering areas of similar interest to accelerate the adoption of digitalisation.

Appendix 2: List of Relevant Papers

- Zulu, S., Saad. A. (2023) A sensemaking perspective of digitalisation in construction organisations. *Sustainability* 15, no. 3: 2344.. https://doi.org/10.3390/su15032344

- Gledson, B.J. (2022). Enhanced model of the innovation-decision process for modular-technological-process innovations in construction. *Construction Innovation: Information, Process, Management.* 22(4), pp.1085-1103. https://doi.org/10.1108/CI-02-2021-0021

- Tallet, E., Gledson, B., Rogage, K., Thompson, A., Wiggett, D. (2021) 'Digitally-Enabled Design Management'. Chapter 3 in: Shelbourne, M., Underwood, J (Eds) Driving Transformational Change in the Digital Built Environment. IGI Global. Pp 63-89.

- Zulu, S and Khosrowshahi, F (2021) A Taxonomy of Digital Leadership in the Construction Industry. *Construction Management & Economics. https://doi.org/10.1080/01446193.2021.1930080*

- Zulu, S. (2021) Barriers to Effective Digital Leadership Enactment in the Construction Industry. Proceedings, *the CIB International Conference on Smart Built Environment (ICSBE) 2021*, Leeds Beckett University/Heriot Watt University, 14th- 15th December 2021

- Gledson, B.J. and Phoenix, C. (2017) 'Exploring organisational attributes affecting the innovativeness of UK SMEs' Construction Innovation: Information, Process, Management, 17 (2), pp. 224-243. https://doi.org/10.1108/CI-11-2015-0065

- Gledson, B.J. and Greenwood, D. (2017), "The adoption of 4D BIM in the UK construction industry: an innovation diffusion approach ", Engineering, Construction and Architectural Management, 24 (6), pp. 950–967. https://doi.org/10.1108/ECAM-03-2016-0066