A thematic analysis of the organisational influences on digitalisation in construction firms

Abstract

Purpose: Due to the practical complexity and fragmented nature of the construction industry, digitalisation, like other innovations, is not easily achieved. This study aimed to explore organisational influences on digitalisation within construction firms.

Method: The study utilises structured open-ended questions as a data collection tool for a qualitative investigation. The qualitative approach enabled participants to express their inputs and maximise the diversity of data, offering new insights and discussions that are distinct from previous works.

Findings: Construction professionals from twenty-two organisations provided their perspectives on digital transformation and their organisations. Under four constructs- structure, culture, leadership, and internal processes, findings uncovered sixteen determinants critical to digitalisation in construction firms. The study offers a offers a theoretical perspective supported by empirical data to explore the complex dynamics and internal interactions of organisational influence on the uptake of digitalisation in the construction industry.

Originality: This paper offers arguments from a theoretical lens by applying the organisational influence model and capturing the variables under each construct in an exploratory manner to highlight the reasoning behind the low digital uptake in construction firms. This research aids academia and practice on the pressure points responsible for enhancing, or undermining, digital uptake in construction firms at an organisational level.

Keywords: Digitalisation, construction, organisational influence, leadership

Introduction

The construction industry is not failing to keep up to its reputation as a contributor to waste (Zhang et al., 2022), carbon emissions (Yang et al., 2022), cost overruns (Sepasgozar et al., 2022), and delays (Sanni-Anibire et al., 2020). These are only some of what are, arguably, placing the industry at the end of the list compared to other sectors in terms of efficiency, effectiveness, and innovation (Ernstsen et al., 2021). Nikmehr et al. (2021) discuss the adoption of digital technologies in handling the critical issues lurking within the construction industry. Digitalisation is described as associated with "limitless potential" in addressing construction's main challenges (Bhattacharya and Momaya, 2021, p.1338). Hence, if digitalisation is the answer to a better construction sector, what is limiting a wider uptake?

Digitalisation is being recognised beyond its technical stance from a tool to more of a business case (Turk, 2021). Digitalisation is being directly linked within construction literature as a root cause of myriad advantages such as performance enhancement (Lee and Lee, 2021), cost reductions (Nikmehr et al., 2021), and extensive data analysis (Huang et al., 2021). Such technologies, tentatively, provide early adopters with the competent characteristics to enhance their business and operational processes (Sopiyah et al., 2020). The list of technologies that are emerging in the digital era, in the construction context, includes Building Information Modelling (BIM) (Huang et al., 2021), Big data (McNamara and Sepasgozar, 2021), and augmented reality (Rohani et al., 2014). All of which are solutions that transforms the traditional processes to a more digitalised stance that achieves value.

The benefits of digitalisation are being recognised across the introduction of modern digital innovations such as automation (Bademosi and Issa, 2021), machine learning (Huang et al., 2021), blockchain (Lu et al., 2021), digital twin (Lee and Lee, 2021), and robotics (Manzoor et al., 2021). However, challenges yet exist to influence wider

uptake and adoption (Zulu and Khosrowshahi, 2021), particularly among small and medium enterprises (Eller et al., 2020). These challenges have been argued to be both technological and non-technological (Almeida et al., 2020). This paper, therefore, aims to highlight the reasoning behind the low digital uptake within construction organisations despite the associated benefits. The key assumption acting as the departure point of this study is that challenges extend beyond technicalities to include non-technical internal organisational interactions that are of equal significance in delimiting an effective transformation.

Literature review

Digitalisation among construction organisations, despite emerging, is yet under adopted. Reasons behind this, questionably, are relevant to the organisational influence undermining digitalisation (Ernstsen et al., 2021). Such a low adoption phenomenon does not particularly relate to digitalisation in the construction industry, as the sector has a track record of resisting change and rejecting innovations (Muñoz-La Rivera et al., 2021). To address this, there is a need to capture the elements that influence wider digital adoption in both theory and practice. Many elements do contribute to the low digitalisation rates among construction organisations. A significant portion of these, however, are said to exist from within organisations rather than externally (Zulu and Khosrowshahi, 2021). Our knowledge on the relationship between organisational influence and digitalisation is limited and discreet in literature, which underpins the necessity of this study.

Despite that digitalisation in construction may have been accelerated due to the pandemic (Mazurchenko and Zelenka, 2022), the adoption rates are yet far from satisfactory. Literature implies a linkage between the low digitalisation rate in

construction firms and organisations' influence; however, research focusing on aggregating this knowledge is lagging. Current efforts have identified organisational influences like the need to upskill and digitally train staff (Mazurchenko et al., 2020), drive financial incentives (Ninan et al., 2022), and prioritise feedback (Shojaei et al., 2022). However, the organisational influence on the adoption of innovation remains a complex interaction, and the understanding of it is limited across the construction context (Lin and Yi, 2022). Hereby, an empirical investigation is deemed necessary to shed light on the relationship between the organisational influence of construction firms on their digitalisation (Na et al., 2022). This paper questions, in essence, the critical variables that shape the organisational influence and are undermining wider digital uptake.

Organisational influence has been described as the company's orientation to drive employees' behaviour towards aligning with the organisation's main goals (Maseko, 2017). Encouraging positive and discouraging negative cultures is a practical approach to sustaining a positive organisational influence within a firm (Owoyemi and Ekwoaba, 2014). Organisational influence is the generic name of the influence exerted, intentionally or unintentionally, on a single individual or multiple individuals that, in turn, produce an outcome (Moncef and Philipp, 2021). Key aspects shaping such influence are emphasized to be relevant to the leadership of the organisation (Griffioen et al., 2018; Bloch, 2021), the organisational culture (Varma, 2019; Na et al., 2022), the structure of the organisation (Nugus, 2019), and the internal processes (Egan and Tweedie, 2018).

Kimberly and Cook (2008) indicates comparable four constructs to those reflected by literature, detailing and steering the overall organisational influence and these are organisational structure, organisational culture, leadership, and internal processes.

The relationships among the four constructs may help describe the key impacts of the organisational influence on digital transformation in construction organisations (see *Figure 1*).

Insert>> **Figure 1**: Proposed generic conceptual model

The first construct is the organisational structure, which has been defined as the hierarchal design of roles and responsibilities that directly influence the mechanisms that control an organisation's key activities and resources (Olson et al., 1995). Such construct has been linked, in prior studies, to its influence on the adoption of innovation in the construction context (Li et al., 2019). The second construct is organisational culture, which has been defined as the encouragement, support, and implementation of creative means that foster an effective work environment and achieve a supportive culture (Jackson, 2006). Where achieving a supportive culture and climate has proven as a critical influence on innovation-adoption's success (Gambatese and Hallowell, 2011). The third construct is leadership, which has been defined as the organisational power to dictate and mobilise the key practices and performance (MacKillop, 2018). A construct that has been described as one of the most influential factors influencing digitalisation in construction (Zulu and Khosrowshahi, 2021). Finally, the fourth construct is the organisation's internal processes, which is defined as a sphere of an organisation and a key indicator of an organisational performance (Elg et al., 2021).

Methodology

This paper adopts a qualitative approach to collect and analyse relevant data. The authors choice is orchestrated by the discreetness of literature in identifying and capturing such variables, a selection that is supported by Glenn et al. (2022), a study that encourages the utilisation of qualitative methods to study organisational influence

in the construction sector. Participants, with experiences varying between 1 and 10 years, have been approached for inputs. Such population has been described by Jacobsson and Linderoth (2021, p.759) as "ambassadors for digitalisation in construction firms". Perspectives were surveyed to detail the organisational influence from a non-bias position in which participants were encouraged to freely, and flexibly, reflect on their leaders' practices.

Due to the exploratory nature of this study, the tool chosen is an open-ended questionnaire. Such a tool has been described as effective in capturing qualitative data at the respondent's convenience, eliminating any constraints to explain their perspective freely, and adding another layer of absolute anonymity (Sizoo et al., 2020). Open-ended questionnaires are qualitative data collection methods that encourage communication and boost interpretations (Agustianingsih and Mahmudi, 2019). A qualitative questionnaire is described as commonly used in practice than other qualitative means of data collection (Zhou et al., 2017). Therefore, a qualitative approach through open-ended questions is chosen in this exploratory study as the sole and primary data collection tool.

The study focused on approaching UK-based construction organisations. This resulted in capturing 22 construction professionals' detailed perspectives from different firms; the participants involved are detailed in **Error! Reference source not found.**. In addition, participants were requested to contribute at the convenience of time, access, site, and preparedness (Whitehead and Lopez, 2016), which is a convenience sampling approach. One of the critical arguments is validating the reliability of the sample number in a qualitative approach (Patton, 1982). A consensus exist that data saturation is an effective indicator for the reliability of a qualitative method (O'Reilly and Parker, 2013). The participants' number in which such data

saturation could be achieved has been argued to exceed 12 participants (Galvin, 2015). Thus, data is both diverse and reliable to generate a compelling exploratory study.

Insert>> **Table 1**: Participants' roles and their years of experience

Data analysis

One of the practical and popular approaches when analysing qualitative data is thematic analysis (Braun et al., 2022). Since participants reflected their perspective on their organisations' digitalisation, the selected tool attained first-hand inputs that encouraged the inductive approach of a thematic analysis (Nowell et al., 2017). Moreover, the use of the four constructs model implies the existence of deductive reasoning (Bergdahl and Berterö, 2015), as the constructs are dictated by the deductive approach to fit in the theoretical framework, while the emergent themes are inductively identified (Thompson, 2022). Thus, the interaction between both inductive and deductive reasonings implies the abductive nature of this study (Johnson and Krems, 2001). The analysis stage acknowledged and adopted the systematic thematic approach described by Braun (2021), which dedicates an organised and adequate manner when thematically analysing qualitative data, starting from familiarising the data and ending with reporting the main themes and sub-themes (see **Figure 2**), and sample questions on each constructs have been carefully worded to capture participants' views on the same context (see **Figure 3**). Hence, a thematic analysis with an abductive reasoning approach supports the exploratory stance of this paper.

Insert>> **Figure 2**: Data analysis process as adapted from Braun (2021)

Insert>> **Figure 3**: Sample questions to capture views relevant to the constructs

Organisational structure

Top management's digital experience

Participants pointed the importance of top management to be directly involved in the digitalisation uptake, otherwise, they would less sense its value and recognise its benefits; "*because management are not everyday users of that particular technology, the technique is never fully understood at management level and inevitably goes ignored*" Participant 4 (P4). This approach is said to change a current stance of which the top management is bounded by their own experiences, limiting any potential to foster change; "*they only have narrow experiences and are not good at looking outside their own experience*" P20. Organisations with less support from their top management reflected a lower digital uptake from those having experienced individuals holding the higher positions; "*lack of foresight from directors*" P15. Such lack of knowledge is influencing the decision-making to adopt digitalisation by higher management; "*in terms of cost, the difficulties of the managers to decide how much and where to invest the money could delay the adoption of high standard technologies*" P19. To investigate this, the need for experience and training seems to be a typical response from employees' perspective on their top management's knowledge level; "*not enough training for senior employees*" P17. Such training would require time, an aspect that is being described as a challenge by its own means; "*the adoption of new technologies*

requires time for the team to be trained and this slows down the workflow" P22. Associated with time, the learning curve associated with digitalisation is described as limiting top managements' assertion of digitalisation; "*too many projects, therefore no time for learning*" P17.

Centralised decision-making

An organisational structure that fosters innovation comprises a decentralised nature of decision-making. This means that decisions, ideas, and employees' perspectives are welcomed and considered rather than limited to a centralised stance where decisions are final from a single point of issuance; "*freedom for the employee and trust from the managers*" P12. Organisations that are structured to support a decentralised stance are proving more effective in their approach towards digitalisation; "*we are leaders to ourselves*" P16. This phenomenon may be effective due to its ability to identify, nurture, and utilise personal motives and skills; "*individual experts are highly innovative within their specialist domain*" P14, "*in terms of co-development projects, the organisation is free and flexible to allow members to develop their ideas and strategies without being bound by fixed goals*" P18. A centralised approach, therefore, bounds decisions to top management and regular decision-makers, while a decentralised approach means that all individuals within the firm can influence critical decisions.

Organisations promoting individual incentives and embracing everyone's opinion to influence key decisions is an effective digital transformation strategy; "w*e are leaders to ourselves, there are no official or traditional leaders in our team*" P13. In contrast, firms that are limiting decisions to top management are reflecting lower digital uptake and hence, this highlights a negative impact of centralised decision-making compared

to a decentralised approach of the organisation's structure; "*innovation encouraged within reason, current policy and procedures very much engrained*" P9, "*staff therefore can be somewhat muted when thinking of suggesting new innovations*" P7. However, despite that decentralisation can achieve better digital uptake, such an approach needs to be systematic and regulated, otherwise may influence transformation; "*the organisation has an informalised approach, so sometimes being so flexible and giving each member of the team the power to organise and distribute the workflow so autonomously makes it difficult for all of us to be in the same path and the same level of knowledge*" P22. Moreover, P4 underlines the need for a guideline to ensure effective decentralisation; "*everyone is entitled to an opinion and very rarely do we all agree, generally, it is the lack of support and guidance from senior staff that leads to this unrest*". Thus, centralisation in the decision-making process towards digitalisation has a negative influence on an organisation's digital uptake.

Hierarchical nature

Another perceived influence from the organisation's structure on the effective digital transformation is the hierarchy of the firm. Participants are reflecting that the more complex the firm is, the harder an innovation decision is transmitted to influence an effective digital transformation; "*it must move through the ranks and process approval stays some time*" P10. Ensuring a hierarchy that fosters innovative change is a complex process, especially when previously proven effective with traditional ways of practice; "*as a company that has grown rapidly in recent times, they don't have the hierarchy in place and often cling onto old analogue ways*" P3. Therefore, a complex hierarchy means less coordination; "*difficulty of coordination across disciplines impose limits on the innovation as a whole*" P14, negatively influencing digital uptake; "*we*

currently facing a huge gap between the old employees and the new hired employees and the new leadership" P11, and this is relatively due to how innovations are transmitted from top management to lower management "*successful cascading of innovation depends on competent middle management, which is sorely lacking at our organisation*" P20. Hence, the hierarchy of a firm could be logically described as a variable within the organisational structure construct of the organisational influence on the digital uptake among construction firms.

Organisation's size

The size of the organisation is being described as another variable relevant to the organisational structure construct. The logic flows to identify smaller organisations as more resistant towards enhancing their digital uptake compared to bigger firms. P5 refers that this could be due to costs needed; "*small, difficult to justify large capital investment, even with returns as the capital requirements are a significant % of cashflow*". Whereas P18 justified this to the time needed which may not be available in smaller organisations; "*the company is too small, directors are too busy to consider how the company can innovate*". P6, on the other hand, reflects that smaller organisations would struggle in the learning curve associated with digitalisation; "*low number of employees resulting in immediate training/uptake of new technology*", which aligns with P8 on the need for training, which may not be within the capabilities of smaller organisations "*the structure would mean retraining of existing staff which would be costly for a small team*". Hence, inputs from the participants do form ground to identify a relation between the organisation's size and it's potential to digitally innovate in the construction context.

Organisational culture

Collaborative culture

Achieving a collaborative culture within construction organisations is described as innovative-friendly when promoting digitalisation. Collaboration is associated with better communication and knowledge exchange, "*organisational culture promotes digital innovations at my company due to the positivity that is applied from all. They promote a strong teamwork ethos which is embedded within the site teams. This culture is applied business wide. Due to the positive culture, it empowers staff to believe that no idea is a bad idea*" P7. There is not a single point of responsibility from a specific role to drive a collaborative environment. This, in fact, is shared among everyone involved; "*a collaborative approach is used to promote innovation - leaders and employees are both responsible for bringing new ideas to the table*" P20. In contrast, participants from less digitally driven organisations reflected collaboration as lacking; "*lack in collaboration between stakeholder and other staff, as well as fear from the new ideas*" P12. The same participant added "*the company missing collaboration between the team as well as behaviour issues between the department, for example, Jealousy and interfering with the decisions of others*". Hereby, achieving a collaborative culture has a positive influence on an organisation's digital uptake.

Constructive culture

Another type of organisational culture is a constructive culture that welcomes suggestions and feedback. P8 reflects their organisation's direction by stating "*decision makers listen to suggestions and the requirements of staff of all levels to be able to do their job*". Similarly, P7 highlights the role their leaders play to ensure their organisation's culture is constructive; "*leaders are always open to listening to suggestions of new technologies*". Such a culture is hereby said to be driven by

leaders, who acquire specific characteristics to nurture a constructive culture; "*open minded and open to suggestions, blended working arrangements*" P8. Therefore, it is logical to state that seeking suggestions from employees and encouraging feedback are shaping a constructive culture that is promoted by leaders towards achieving an effective digital transformation.

Connected culture

Connectiveness among peers is said to drive innovation within organisations and achieving a connected culture could hereby enhance a firm's digital uptake. Organisations fostering digitalisation are being reflected as achieving a connected culture; "*using system such as ERP to improve and connect all departments together such as finance, HR, salary, etc.*" P12. A connected culture is said to be due to the interaction between peers, where knowledge and ideas are exchanged; "*I work for a small company, so it is a close-knit environment. Open discussions happen where employees share ideas on where the company can improve, innovate etc.*" P17. In contrast, an approach that would limit communication between peers would mean a more fragmented culture; "*the same office being split into teams can slow innovation with lack of communication between teams*" P2. Hence, it is logical to link a connected organisational culture to an enhanced digital uptake; "*we work on par with each other and therefore freely exchange ideas*" P15, and to link a less connected, or fragmented organisational culture to less digital uptake; "*as a satellite office we often struggle to remotely connect back into the head office*" P3. Therefore, a connected culture positively influences the firm's digital uptake.

Innovative culture

Participants from organisations that adopted digitalisation reflect the characteristics of an innovative culture like the consideration of relatively new and uncommon concepts; "*we are truly open-minded and open to any sort of things, even if they seem bizarre at first*" P16. Moreover, an innovative culture is associated with a level of competition among peers, such competition is said to enhance the level of innovation; "*the organisation being split into teams under different directors lends itself to natural competition between teams*" P2. Such a culture provides flexibility for stakeholders to innovate and promote their innovations within the firm; "*most of our staff are inventive in nature, so we usually invent and promote our things ourselves without any difficulties*" P15. In contrast, a less innovative culture is achieved upon limiting innovators; "*once it's discussed with the team, this creative and innovative thought will be talked out of them in order to keep standard work processes in place*" P7. Such impact on undermining an innovative culture is hereby described as limiting communication; "*suggested ideas are rarely taken forward*" P18.

Dynamic culture

A dynamic culture could be achieved by focusing on driving individuals away from their regular practices, which usually resists improvements; "*this is countered by those who prefer to stay in the 'comfort zone'*" P4. The same participant further illustrates "*I'd say that if your organisation has a young, dynamic culture, full of forward-thinking attitudes, the rate of digital innovation will be increased*". The young nature of an organisation has been mentioned by several participants as a demographic influence that can drive a dynamic culture. P8 discusses that younger staff are "*more receptive to adopting technologies and sometimes even drive the suggestion of adoption of new technologies*", where older staff are said to "*only work a certain way and are not as computer literate as younger staff members meaning cross-member working is difficult*

with new technologies". It is hereby interesting how a younger staff has a critical influence on ensuring less old manifested norms exist within a firm. Such a young demography is being described by participants as "*forward thinking*" P4, where a young team is linked to accelerating digital uptake; "*the team is quite young, and this makes things easier*" P21. Similarly, older staff may be undermining digital innovations; "*less interested in adopting newer technologies where existing technology has worked for them in the past*" P2.

Training culture

Participants underpin discussions on achieving an effective training culture. Such a culture is said to be associated with "*continues training on different aspects that promote innovation*" P20. Participants from construction organisations that have less digital uptake have highlighted the absence of such a culture in their firms; "*training is not very well structured*" P21. Other participants reflected challenges of achieving a training culture such as achieving a "*balance between carrying out the daily tasks and the learnt of new skills*" P22. The challenge of spending time has been emphasised by multiple participants, making the time associated with the learning curve necessary for an effective digital transformation a critical challenge undermining a training culture within construction firms; "*less time to train staff in new technology inside general working hours*" P2, "*high volume of daily tasks make investing time in specifying and customising solutions and training users is difficult*" P5. Time to learn, therefore, emerges as a critical determinant impacting a digital training culture within construction organisations.

Leadership

Transformational leaders

Transformational leaders are said to drive change; "*people with knowledge on things such as Revit and BIM are situated at the bottom of the structure so lead from above stop influence from bottom*" P19. Such a leader type is keen to ensure adequate investment in innovations; "*always looking for opportunities to invest in innovation by researching and applying the best options in the construction market*" P21. The influence of a transformational leader can be sensed compared to traditionally oriented leaders; "*as the management was changed lately the new company leaders came with a new methodology which greatly promotes the digital innovation*" P11. The transformational role expands from being at the adoption stage only to being supportive as well at the implementation stage; "*the top management was a great support in helping us understand the new system*" P11. This role has been described as a proactive role which flows from interest in the innovation, adoption, and implementation; "*manager keeps abreast of new trends and is a key proactive in their implementation*" P22.

Cautious leaders

A driver of becoming more cautious is linked to the perceived effectiveness of existing norms; "*as existing technologies work for them and that's all they are interested in*" P2. Their caution is hereby shaped by the ability of existing approaches to meet their needs, which subsides the necessity to adopt new less experimented technologies; "*reluctance to invest in integrating new and untested technology*" P5. Moreover, cautious leaders lead to approaches that impact a change mindset described by P8 as "*a 'why change now' attitude*", which hinders their search of new ways to develop; "*directors not actively looking for ways to digitally innovate*" P9. A cautious leader may feed the belief to avoid taking risks, but in fact, it may be an approach that limits progression; "*they are unable to adjust to the requirements of today's business world*"

P21. P15 describes this caution to be nurtured, logically, by the associated investment needed; "*there is a reluctance and caution to invest in new software and costly annual subscriptions*".

Strategic leaders

Organisations who have strategic leaders show more digital uptake. P12 describes their leaders to "*encourages creativity and innovation*", and this is said to drive more staff involvement; "*confident enough to invite upwards feedback and involve users in early planning*" P5. Being strategic means that a leader would be open to change and embrace effective strategies that would achieve better digital uptake. Such strategies, however, are to be placed to capture everyone's input; "*ideas from staff are limited with really only leaders contributing*" P14, avoid conventional strategies when fostering innovation; "*old school and work on a reward basis. Do this task, get a reward. Don't do this task, get penalised*" P6, and support a strategy that boosts employees' motivation; "imposition is not an efficient way to roll out new digital technology" P17. A strategic leader hereby would work on achieving better relationships with their employees with regards to an innovation, through a strategy that will allow a convenient engagement; "*make the employee satisfied*" P10.

Outcome-oriented leaders

Outcome-oriented leaders are those who focus on result, which drives their innovation-adoption to sustain this direction; "*they are forward thinking leaders who are determined to optimise processes to maximise productivity*" P3. Such leaders hereby look at innovations from an improvement lens; "*it's in their interest to do so from a future proofing perspective*" P6. Nevertheless, the same type would eventually question innovations if those are perceived to limit outcomes; "*digital innovation will*

be adopted if saves time, cost and is of good quality. You will be encouraged by your immediate head/s to adopt this technology and share it among the rest" P10. Therefore, outcome-oriented leaders are those who have captured the value of digitalisation in construction, and as such, are positively influencing digital uptake in their organisations.

Internal processes

Operation processes

One of the benefits associated with digital uptake is the improvements in operational processes within construction organisations; "*There had been a recent move to build GIS based substations and to upgrade existing substation infrastructure automate switching processes. These changes are taking place only because they are necessary to facilitate the population and it successfully completes the task at hand*" P10. Digital uptake is enhanced to sustain effective operational processes at multiple dimensions "*using video calling etc we are saving time rather than travelling all the time*" P3. The key aspect from participants' perspective on the internal processes enhancement is the achievement of better performance in their operations; "*every task is monitored so the best performance can be reached. Thanks to that, there is space for each member to allocate time and organise its schedule to adopt new technologies*" P22. Similarly, it can be considered the main drive behind digital transformation; "*we invest in innovative digital software to support this collaborative way of working*" P4.

Business processes

Another influence of digitalisation on an organisation's internal processes is its support towards the firm's business processes. Digital uptake may enhance the business processes by better aligning with demand; "*it is usually driven by the clients requesting*

we use a certain technology" P7. Moreover, digitalisation may enhance demand's experience which is a key aspect any business process thrives to achieve; "*understanding of customer expectations through visualising final products before completion*" P6. Digital uptake is directly linked to improving business process particularly in better approaching demand; "*any technology that assists in getting projects delivered or assists in winning bids will be adopted*" P2. Therefore, digital uptake positively influences an organisation's business processes in approaching and penetrating demand's market.

Discussion

Our findings indicate the critical relations between multiple variables detailing the organisational influence on the digital uptake in construction firms. Findings from our collected inputs suggest an organisation's structure critical relation to its digital uptake in the construction context. It is vital to have digitally supportive personnel in higher management positions; otherwise, innovation adoption approaches may easily be hindered (Çetin et al., 2021). Moreover, the lack of proper knowledge, i.e. research and development, to recognise the benefits and values of innovation would deter higher management investment decisions (Graser et al., 2021). To approach this, data aids the direction for which better involvement of higher management in digital practices can help them recognise the associated values, and in return, favours the decisions towards more digitalisation, and shapes an experience other than their own (Li and Shen, 2021). Training in higher management is a complex process, and the learning curve associated is not readily accepted; however, a practical approach would be acknowledged and deemed effective (Schaefer et al., 2019). Hence, to facilitate digitalisation at an organisational level, organisations must be equipped with

innovation-friendly higher management that would cascade an innovative and digital mindset across the hierarchy.

Developing a hierarchy that fosters digitalisation ensures that it achieves coordination, is not complex, and is not halting innovative decisions. Dakhil et al. (2019) discuss that despite the importance of the organisational hierarchy, organisations are yet to recognise how a hierarchy facilitates digitalisation. This has directly reflected the need for a structure that would not limit the flow of ideas and innovation decisions among all stakeholders. A centralised decision-making structure undermines digital uptake in construction firms compared to a decentralised structure, which aligns with Nagy et al. (2021) on the need to transform organisational hierarchies to foster decentralised decision-making that facilitates the adoption of innovation, communication of ideas, and new concepts. In addition to these influences, our findings suggest that larger organisations achieve better digital uptake than smaller firms. This is indicated by Rogers (2003) on the ability of larger firms to achieve an early adopter stance compared to smaller firms. Time and money in smaller firms have more value due to the business fragility compared to more prominent organisations with more flexibility in digital trial initiatives, which emphasises the influence of the organisation's size on the adoption of innovation (Al-Qirim, 2007). Hence, it is logical to state that how an organisation is structured in terms of who fills higher positions, the formation of an innovation-friendly hierarchy, the achievement of a decentralised decision-making flow, and the size of the organisation are all influences on a firm's digital uptake (see *Figure 4*).

Insert>> **Figure 4**: Determinants and relationships of the organisational influence constructs

This paper supports the assertion of Kimberly and Cook (2008) on the influence of organisational culture on its digital uptake. The results of this qualitative exploratory investigation reiterate the need to create a digitally supportive organisational culture in construction firms. Collaborative (Sujan et al., 2020), constructive (Jensen, 2014), connected (Folkestad and Gonzalez, 2010), innovative (van Marrewijk, 2007), dynamic (Menghwar and Daood, 2018), and training cultures (Colli et al., 2019), are all essential cultures that can co-exist in an organisation interchangeably to drive better digital adoption. Developing these cultures can help set up an environment that enables cultural change and fosters digitalisation. Our findings showed that the existence of comparable cultures was limited to organisations that had substantiated more digital uptake than firms that lagged in accepting digitisation. Thus, these organisational culture types positively influence construction firms' digital uptake, and those influences are presented in *Figure 4*.

Participants reflected various leadership types that influenced the digital uptake in their organisations. Respondents from digitally mature firms identified their leaders as transformational, a leadership style that encourages incentives and sustains effective relationships; it is where leaders are keen and supportive of change and transformation (Zulu and Khosrowshahi, 2021). In contrast, respondents from less digitally mature construction firms identified their leaders as cautious, a leadership style that negatively influences digital uptake. Cautious leaders are mindful in their approaches, and despite their acknowledgement of the need to change, caution

shapes their decisions to adopt digital technologies (Zulu and Khosrowshahi, 2021). The findings of this study suggest a direct relationship between leadership and digital uptake. For example, organisations with strategic leaders are proving a more favourable attitude towards digitalisation than other construction firms. The same aligns with Hambrick and Mason (1984) on the influence of strategic leaders on the organisational outcome, where strategic leaders have the potential to drive innovation. Therefore, the findings of this paper address the call to better understand the influence of strategic leaders on innovation adoption (Kurzhals et al., 2020). Furthermore, another type of leadership is the outcome-oriented style, which was implied by participants as proportional to their organisation's digital uptake. Per se, this is a type where leaders are driven by the outcome of the innovation rather than the innovation itself. Such style is said to investigate capability and results through their broadened nature of seeking knowledge, which leads to adopting practical innovations (Sutling et al., 2014). Hence, various leadership styles may exist to influence an organisation's digital uptake, and these are detailed in *Figure 4*.

The final construct adopted in this study from the organisation's influence on the adoption of digital technologies is the internal processes. Such an influence is vital when studying innovation at an organisational level (Anzola-Román et al., 2018). Participants' inputs highlight the relationship between the previous constructs on the internal processes within their organisations. For example, participants from low digital uptake firms had less support from their leaders, reflecting a scarcity of effective organisational cultures, and reporting a weak organisational structure, which had minimum to null use of digitalisation. Therefore, the relation between an organisation's structure, culture, and leadership can be described as having a direct influence on the performance of internal processes influenced by the greater use of digitalisation

(Ghosh et al., 2021). As a result, internal process performance could be the representation and measurement of an effective digital transformation. This has been touched upon by earlier studies, emphasising the positive influence of better digitalisation on enhancing the operational processes in construction (Wernicke et al., 2021). Similarly, more use of digitalisation leads to improving business processes in firms which, moreover, could form a mean of measurement of the effectiveness of an innovation (Bellalouna, 2021). Hence, internal processes can logically be placed in a position that is indirectly influenced by the structure, culture, and leadership of an organisation and directly influenced by the digital uptake promoted, or undermined, by the three mentioned constructs (see *Figure 4*).

Conclusion

This paper aimed to explore the variables that detail the organisational influence on the digital uptake of construction firms. Our findings argue the existence of critical influences exerted by how an organisation is structured, the type of culture, and leadership style on the digital uptake, which in return influences the internal processes of an organisation and determines its competitive standing. Moreover, this paper provides a novel contribution in isolation of the popular direction of existing research by highlighting the relationships between the primary constructs and the influence of each variable on a firm's digital uptake from an employee perspective rather than that of higher management and decision-making positions.

Literature has proposed that shaping a digitally effective construction organisation is necessary for better digital uptake among construction firms. How an organisation is structured, the leadership styles adopted, and the cultures formed are all key considerations that impacts digitalisation in construction firms. Based on the above,

this paper supports this proposition and fortifies the need for a clear guideline to drive organisations in the practical direction when seeking a digital transformation. Analysis of the participants inputs confirmed the relative validity of the generic conceptual model and the relationships between the four constructs and an organisational digital uptake.

The premise that an organisation unintentionally influences its internal processes by undermining digitalisation, limiting the associated values, places an overly critical responsibility and emphasis on decision-makers to shape an innovation-friendly organisation. This paper, hereby, act as an exploratory guide for future research to utilise other methods of research, such as quantitative assessments, to underpin the identified variables and their determinants. Future studies can focus on leaders' perspectives rather than only employees' inputs, which would then be aligned with the outcomes of this work on whether the perception of the organisational influence is unified across multiple viewpoints, or it is heterogeneous in essence. Moreover, despite the developed framework is intended to align with the UK context, future research is highly encouraged to apply the same in other geographical contexts which would extend our knowledge on the regional differences of organisational interactions.

The limitations of this study could be argued to be the small sample size of real-life data. However, and due to the intention of this paper to act as an exploratory departure point that encourages future studies to detail the complex nature of organisational influence on digitalisation, this data set, undoubtedly, is fortified for extension through better validation of the complex interactions that occur at an organisational level. The captured variables, hereby, are yet conceptual and tentative and would benefit from other means of empirical underpinning, qualifying as enough ground to call

researchers seeking comparable future investigations to treat these variables with caution.

Data Availability Statement

The data generated during the study are available upon request from the corresponding author.

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A thematic analysis of the organisational influences on digitalisation in construction firms

Table 1: Participants' roles and their years of experience

| Participants	< 1 year	1 to 2 years	3 to 5 years	6 to 10 years	over 10 years	Total
Quantity Surveyor				2		**2**
Architectural Technologist	1		1			**2**
Technical Officer				1		**1**
Operations manager		1				**1**
Project Technician			1			**1**
Assistant Quantity Surveyor		1				**1**
Senior Planner	1					**1**
BIM Technician		1				**1**
Interior Designer/Project Manager				1		**1**
Builder					1	**1**
Project architect			1			**1**
Consultant		1				**1**
Proprietor					1	**1**
Cost Assistant Manger	1					**1**
Quantity Surveyor	1					**1**
Design & Technology role					1	**1**
Surveyor			1			**1**
Designer		1				**1**
Architect				1		**1**
Draughtsman		1				**1**
Total	**4**	**6**	**4**	**5**	**3**	**22**
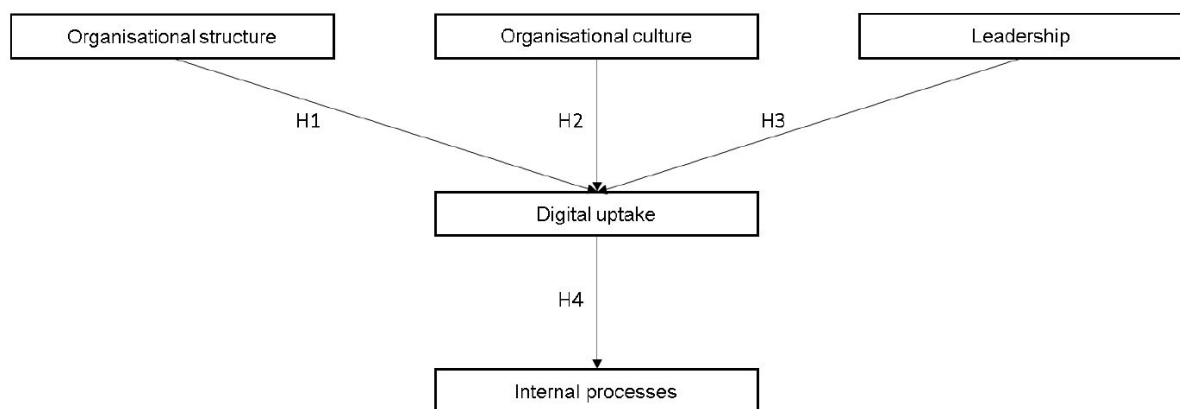
Figure 1: Proposed generic conceptual model
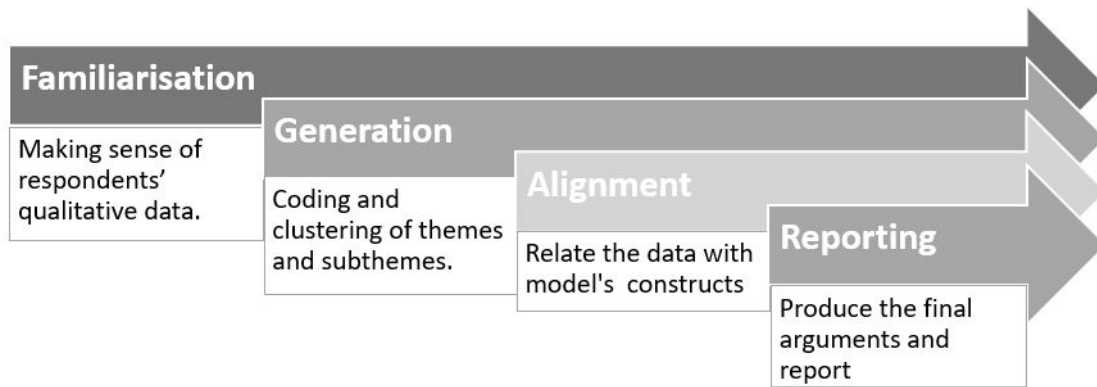
Insert>> **Figure 2**: Data analysis process as adapted from Braun (2021)

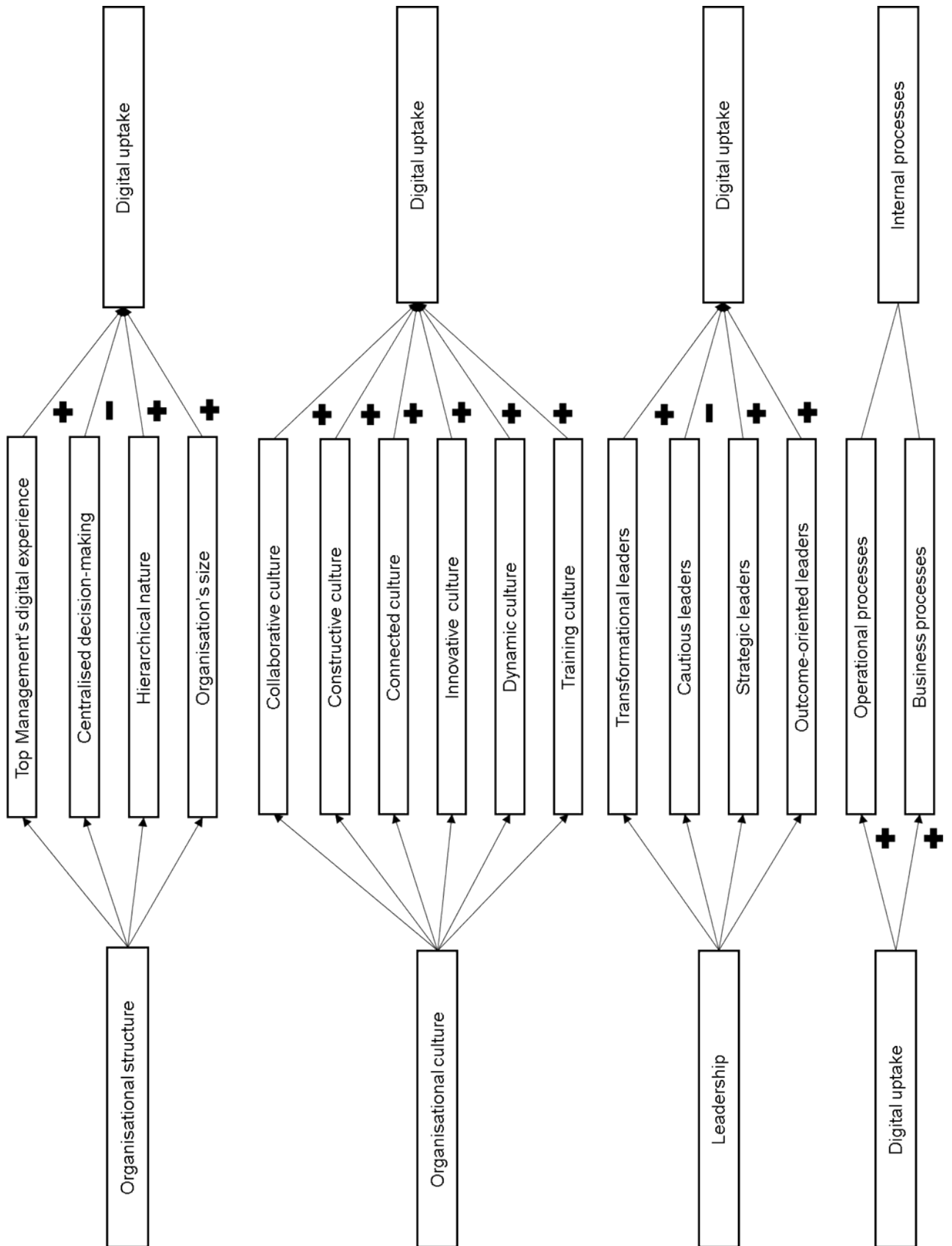*Figure 3*: Sample questions to capture views relevant to the constructs

Figure 4: Determinants and relationships of the organisational influence constructs