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A Sensemaking Perspective of Digitalisation in Construction Organisations

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Abstract: Different researchers have examined construction innovation from diverse perspectives and with varied conclusions, but what has commonly transpired is that the construction industry is a complex and ever-changing environment that tends to have a selective perspective on innovation. Recently, digitalisation has offered critical enhancements in construction organisations' internal processes. However, the uptake of these innovations is far from satisfactory. To integrate theory with practice, sensemaking theories provide an opportunity to help us understand and explain the social phenomenon behind achieving a common meaning across social systems. In the quest to support research efforts through understanding and explaining the enablers of digital transformation, this paper aims to qualitatively apply the sensemaking perspective to digitalisation in construction organisations. To this end, an empirical qualitative approach was adopted using a questionnaire survey of 59 construction professionals, from different firms in the United Kingdom, providing a perspective on how sense is being developed by their organisations to foster digitalisation and achieve an effective digital transformation. Results suggest that a variety of aspects contribute to the indecision of construction firms towards digitalisation, informing research of the pressure points deemed critical at both leadership and employee levels. The findings point to the complexity of construction organisations and the non-linear nature of embracing new ideas. Future research is encouraged to assess the empirically captured cues presented in this paper through other means of investigation towards a more robust sensemaking perspective in the construction industry.

Keywords: sensemaking; digitalisation; construction innovation

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1. Introduction

The construction industry is one of the largest industries at a global level, attaining a spent budget of tens of trillions of dollars annually [1]. However, the industry's productivity growth in the last 20 years did not exceed 1% [2], pinpointing a severe lag compared to other industries [3]. Research investigating the reasons behind the industry's slow growth identified a significant resistance to change and innovation [4]. Despite the governmental support for innovative approaches like the digitalisation of processes to enhance efficiency, the industry reflects a low response rate towards change [5]. Digitalisation, in its broader context, is being recognised as a transformative force toward critical performance enhancements [6], better use of data [7], and vital cost reductions [8]. Hence, there is a link between the low rate of growth and the low rate of digitalisation.

More digitalisation in construction would mean more automation [9], robotics [10], digital twin [6], and machine learning [7]; innovations that are generated due to the embedment of traditional construction processes with technological advancements [11]. In the United Kingdom, Ninan et al. [12] investigated the narratives of innovation in construction, inferring the role of innovators' narration in driving an effective transformation. Sensemaking has been utilised interchangeably in construction to achieve a common meaning among UK contractors towards capturing value [13]. The utilisation of the sensemaking perspective in the construction context is increasingly gaining popularity due to its ability to capture meanings from observations and understand changing environments [14].

Relating sensemaking to digitalisation in construction would mean establishing different considerations among heterogeneous actors in a complex sector [15]. Hence, sensemaking is assumed to be one of the means that can aid our knowledge of how digitalisation could be promoted among construction firms.

This paper responds to the growing need for comparative studies that can aid research efforts on sensemaking in general [13], sensemaking in construction [1], and sensemaking towards more digitalisation [5]. Maitlis and Christianson [16], nevertheless, encourage research to focus on the sensemaking perspective to particularly influence organisational processes. In a digitalisation context, Linderoth [5] and Çıdık and Boyd [17] emphasise the need for research to capture the strategies that can contribute to effective sensemaking when adopting technology in construction. Hence, it seems rational to state that this study is timely and can extend research efforts aiming at making sense of an important feature in what is believed to be a challenging industry.

2. Literature Review

2.1. Sensemaking Perspective

Sensemaking has been described as the development of an understanding, where individuals gain comprehension of uncertain, new, and changing events [16]. Key actors are logically required to utilise accessible and reachable information to understand reality and prepare for uncertainty [18]. Weick [19], a social psychologist, who is recognised as an influential actor in sensemaking research, suggests that sensemaking is not the unravelling of a confident situation, but rather the shaping of a situation to deal with uncertainty, making it interpreted differently by each actor. Weick [19] defines sensemaking as a process in which actions are influenced by the understanding of the stakeholders involved in the changing environment around them. Literature supports the association of sensemaking prospects with uncertainty as a cause that drives coherence and awareness [18]. However, uncertainty and the lack of information are two distinct aspects, where uncertainty is fed by the lack of a clear direction and guidance to interpret available information. Based on this, actions that would influence a positive organisational change would mean that actors should justify this change and underpin this justification across the overall system. Justifying sensemaking, indeed, requires effective communication where sensemaking would be captured by the receiving end [20]. Rolling out sensemaking can be done through narratives and conversations [21]. Communication is essential in sensemaking as it is the stage where the formation of meaning may be at risk of being destroyed [16]. However, occasionally, sensemaking may require destroying an old manifestation in order to roll out another [22]. Therefore, sensemaking orchestrates a process in which organisations identify change through understanding the meaning behind existing information towards an interpretation that can aid their adjustment to a new reality. Subsequently, such a process is argued to drive stakeholders' behaviour to envision a common future.

2.2. Sensemaking and Digitalisation

First and foremost, it is vital to distinguish between the term 'digitisation' and 'digitalisation'. The former term presents a generic use of technology to enhance specific tasks, i.e., the conversion of documents from hard copies to soft copies that are easily communicated electronically, while the latter presents a more advanced utilisation of technologies to capture a value, i.e., the strategy in which a company seeks digital change to embrace a transformation [23]. Terminologically, digitalisation can be referred to as an organisation's drive to realise values associated with digital means that are argued to improve key processes [24,25]. In this sense, digitalisation is shifting from being a luxurious addition into an essential requirement for organisational survival amidst changing environments [26]. However, despite being identified as practical in addressing the construction industry's contemporary challenges [8,27], digitalisation in construction organisations has been argued to be slow and insufficient [28,29]. Zulu and Khosrowshahi [30] explored digitalisation in

construction organisations and inferred the need for studies to look beyond the innovation itself to a more organisation-oriented stance of research.

Technological adoption across sectors is rationally associated with a learning curve and requires a unique sensemaking approach for a satisfactory transformation. The reason why sensemaking is crucial may be linked to its influence on the effective adoption of technology and innovation. For instance, Robert and Ola [31] underpin this importance by underlining a linkage between the failure of a technological adoption with the lack of a sensemaking strategy. The literature points out the existence of a coalition between the use of innovation and sensemaking strategies, where the latter encourages the former [32]. Sensemaking, therefore, extends the ability to facilitate the adoption of innovation [33], encouraging academics to study sensemaking across multiple disciplines like organisational dischronisation [34], leadership [35], design thinking [36], and information creation [37]. Hence, capturing the perspective behind achieving effective sensemaking in a workplace is deemed critical for academic research in the construction context [22], driving further purpose and need for this paper.

2.3. Digitalisation in Construction

Digitalisation is proving key for the construction industry due to values like enhanced efficiency [38], cost reduction [39], and most importantly, a significant increase in productivity [40]. Notably, the higher use of digitalisation in construction processes has been described as an enabler of collaboration and informed decisions among construction trades [41]. In the UK construction industry, digitalisation carries particular importance due to supporting a transformation from historical conventional methods the industry has been reliant on, which is the main cause for the lag in construction productivity [42]. Recently, such a lag in productivity has led to UK construction being linked to the housing crises [43], fueled by the inability of the sector to meet the increasing demand [44]. To approach this, scholars argue that non-technical attributes exist and are as important as the technical ones when studying digitalisation in the UK construction industry [29,30,45], which chiefly aligns with the sensemaking perspectives championed in this paper. Therefore, embracing digitalisation would allow the industry to exploit the associated advantages and deliver better outcomes.

2.4. Theoretical Underpinning

In general, organisational research-related studies adopt sensemaking as an approach to understanding leaders within an organisation in terms of their ability to share a common meaning and envision a common future [46], varying in terms of roles such as human resources [47]. Recent studies, however, have little focus on capturing employees' sensemaking perspective [48]. Despite the large quantity of literature on construction and innovation in general, very limited studies relate sensemaking with digital technologies. Construction literature focuses on strategic action fields [13], critical success factors [49,50], construction safety [51], and construction cost [52]. Very little research, nevertheless, focuses on linking sensemaking with digitalisation in the construction context (see Table 1). We can, therefore, deduce the potential of a sensemaking approach in extending our understanding of what contributes an influence within an organisation towards digitalisation.

The closest study to this research is the work by Klos and Spieth [53], capturing managers' sensemaking perspective on their activities toward changing technological aspects. This paper, however, captures a counterpart perspective of the employees on their organisations' sensemaking, offering the construction context a view on sensemaking from a new viewpoint, and thus, providing new insights to the existing body of knowledge by adopting, arguably, a less biased approach. Here, for the first time, a sensemaking approach of construction professionals' perspective on their organisations' digital uptake is adopted and examined in detail.

Table 1. Selected articles utilising sensemaking perspective in the construction context.

Source	Genre
Çıdık and Boyd [17]	Coordinating design in construction
Fellows and Liu [54]	The reasoning of decisions in construction
Addis [14]	Tacit knowledge management in construction
Gacasan et al. [55]	Project management in construction
Volker [56]	Procurement of architectural services
Fellows and Liu [13]	Strategic action fields
Linderoth [5]	Information and communication technology
Qin and Green [49]	Micro-practices and project organisation

Studies in the construction context vary in their objectives, with different genres covering a range of disciplines within the sector. However, what commonly emerges is the use of sensemaking to interpret and explain social behaviour. For instance, Çıdık and Boyd (2020) utilise the same interaction with team members to enrich a state of purposefulness, and Fellows and Liu (2018) infer that decisions are determined by the meaning actors capture from contexts. Moreover, Addis (2016) combines sensemaking with performance management measures to enable effective knowledge management, and Gacasan et al. (2016) deduce that sensemaking skills are vital for the effective management of projects. Sensemaking is also used to detail decisions [56], facilitate knowledge [13], and pinpoint the behaviour of specific roles (Qin and Green, 2022). Thus, it is logical that the selection to investigate digitalisation in this paper aligns with the past use of sensemaking, where this theoretical standing would help simplify and explain the complexities associated with the dynamics of the adoption of new concepts within construction organisations.

Linderoth [5] emphasises the need for research to contribute, through a sensemaking perspective, to the amplification of how technologies are addressing contemporary challenges in the construction industry. Leaders are expected to be well-informed of the rules of going digital. Attaining these rules would mean going through an extensive learning curve themselves initially, then arguably even to a more complex task, where they must simplify these rules to drive employees' adoption, accelerated by effective communication, motivation, and engagement [54]. Sensemaking would support creating a philosophical ground for the change in reluctancy of the construction industry, particularly in the adoption of new concepts such as digital technologies. It is not about creating a 'right' rule book, it is rather facilitating the birth of a reference that would direct the team to the necessary focus points for restructuring their mindset. The main question of this paper, thus, is how can construction organisations influence more digitalisation by allowing the emergence and flow of meaning.

3. Materials and Methods

Through utilising a qualitative questionnaire survey as a tool for data collection, the methodology of this paper can be described as an empirical qualitative approach. A questionnaire survey has been described as a tool that encourages communication and reasoning [57]. Qualitatively collecting data is beneficial when research focuses on revealing new information and has no prior clear understanding of the topic through detailed theoretical constructs [58]. The chosen methodology is justified by the exploratory nature of this study in investigating a new and contemporary trend without relying on past theoretical constructs. The use of a questionnaire as a qualitative, data collection tool has been promoted as effective by Braun [59], who noted its suitability when exploring "perceptions and their understandings about the research topic" and "for researching sensitive topics". In addition to the stated benefits of using a qualitative questionnaire in this paper, Toerien [60] stresses on the ability of such a research tool to capture more qualitative data faster than other instruments. Moreover, the use of open-ended questions in the questionnaire enabled an unstructured flow of responses, which provided insights into participants' experiences naturally [61]. Hence, it is clear that a qualitative questionnaire

method notably aligns with the objectives of this study, allowing a deeper understanding of the participants' perspectives.

The study adopted the sensemaking perspective to help understand and explain reality in the construction context without following a specific model. Hereby, this means that an inductive approach is present, as described by Nowell [62], in coding data without fitting it with a previously developed theoretical framework, instead, the sensemaking of digitalisation was shaped by the inputs of the respondents. This aligns with the inductive reasoning guidelines by Gioia [63], who infers that "it is imperative that we remain open to new concept development and new theory development". Hence, the phenomenological process can be said to best relate to this stance of capturing how participants perceive the world [64]. This stance takes interest in the participants' psychological processes and perceptions based on memories and thoughts [65].

In addition, the nature of the data collected is qualitative as text inputs by the participants, dictating that hermeneutics would be an approach under the phenomenological stance that interprets data to generate an understanding [66]. Such a combination has been described as effective when capturing the participants' 'everyday world' [67]. The choices of the data collection tool, methodology, and stance allowed a wider lens when examining this paper's social phenomenon. Questions were relevant to the participant's experiences and observations of their organisational practices (see Appendix A). All participants are employees in construction firms, a condition that can be argued to sustain a less biased collection of data compared to targeting leaders and top managers to self-assess their actions and perceptions of the organisation's digitalisation. Finally, a thematic analysis procedure has been followed to study the respondents' inputs, the paper adopted the procedure underlined by Braun [68] to sustain a systematic nature and ensure robust analysis criteria. The procedure includes the familiarisation of first-hand data, pinpointing emerging codes, shaping themes, classifying data under each theme, and reporting them.

This paper comprises inputs from 59 construction professionals working in different construction firms in the United Kingdom. Such a sample size can be argued to represent the whole construction industry due to the sampling approach that focused on purposiveness and convenience [69]. A convenience method means that participants were selected based on accessibility, location, and availability while ensuring that such a population comprises multiple in roles within a sector, making them representatives of a larger population [70]. Participants varied in roles and years of experience, providing a diversity of views and opinions on their organisation's digitalisation direction. In spite of the sample size being relatively low for comparable studies, it is worth noting that the number of participants has no critical bearing in qualitative research [59]. In contrast, it is otherwise enough to collect insights from those living the phenomenon to determine the reliability of qualitative methodologies [71]. Table 2 summarises the roles, years of experience, and company's number of employees. Most of the participants have over 10 years of experience, and most of the firms are considered big with over 500 employees.

Table 2. Respondents' characteristics.

Count of Experience	Firm Size					
Profession	**<10**	**11–50**	**51–250**	**251–500**	**500+**	**Grand Total**
1 year	2		2		2	6
Assistant Commercial Manager					1	1
Assistant Quantity Surveyor	1					1
Consultant	1					1
Design and Technology role			1			1
Kitchen and Wardrobe Designer			1			1
Research Finance Administrator					1	1
1–2 years	3	1	1	1	1	7
Architectural Technician	1					1

Table 2. *Cont.*

Count of Experience	Firm Size					
Profession	**<10**	**11–50**	**51–250**	**251–500**	**500+**	**Grand Total**
CAD Technician	1					1
Designer				1		1
Operations Manager	1					1
Quantity Surveyor			1			1
Trainee Quantity Surveyor		1				1
Trainee Surveyor					1	1
3–5 years	2	4	5	2	2	15
Architectural Technologist		1	3			4
Contracts and Commercial Assistant					1	1
Cost Assistant Manger			1			1
Interior Designer	1					1
Project Quantity Surveyor		1				1
Project Specification Manager					1	1
Project Technician		1				1
Quantity Surveyor	1			1		2
Quantity Surveyor				1		1
Surveyor			1			1
Town Planner		1				1
6–10 years	1	3	2		5	11
Assistant Quantity Surveyor					1	1
Contract Admin.					1	1
Graduate Engineer					1	1
Interior Designer/Project Manager	1					1
MEP Quantity Surveyor			1			1
Project Architect			1			1
Quantity Surveyor					2	2
Senior Planner		1				1
Technical Officer		1				1
Trainee Quantity Surveyor		1				1
10+ years	4	2	3	4	7	20
Architect				1		1
Assistant Quantity Surveyor					1	1
BIM Technician				1		1
Builder	1					1
Business Unit Director					1	1
Commercial Manager		1				1
Contract Engineer					1	1
Director	1					1
Draughtsman					1	1
Head of Commercial			1			1
Installation Manager.			1			1
MEP Engineer		1				1
MEP Project Manager					1	1
Project manager					1	1
Project Quantity Surveyor			1			1
Proprietor	1					1
Quantity Surveyor	1					1
Senior CAD Technician					1	1
Senior Quantity Surveyor				1		1
Service Lead (Business and Development)				1		1
Grand Total	12	10	13	7	17	59

4. Results

The analysis of the qualitative data aligned with the sensemaking interpretations yielded a range of arguments that approaches the research question motivating this paper. Themes that transpired detail a variety of arguments to represent the flow and context of digitalisation in construction organisations. This section, therefore, thematically presents subheadings that emerged from the analysis of data and are sequentially stated as (a) why change?; (b) stuck in the past; (c) too busy; (d) reactive or proactive?; (e) time waits for no one; (f) fragmentation or communication?; (g) culture is all; (h) leaders' sensemaking; (i) help me understand; and finally, (j) if you were in a leader's shoes.

4.1. Resistance to Change

Participants' responses uncovered the existence of a 'why change' mindset. Several statements from respondents demonstrated this way of thinking when dealing with innovation, "using traditional methods of doing the job means sometimes a 'why change' attitude can be adopted", Participant 8 (P8). This mindset is not new in innovation research, and it is said to deprive an organisation of extracting value from innovations [72]. Understanding the causes of this manifested phenomenon would enable more comprehension of the effective sensemaking strategies towards more digitalisation. This is another example of statements demonstrating a 'why change' mindset is the alignment of norms with the organisation's capabilities, "once the task can be completed with the available resources there is no need to change the method", P10. These capabilities extend from being resource oriented to also being financially oriented, "I'd also say there is a reluctance and caution to invest in new software and costly annual subscriptions", P18. In addition, another reason that feeds into the 'why change' mindset and undermines digitalisation in an organisation is not sensing the changing environment, by having an insufficient motive to change, "Not actively looking to digitally innovate current workflow to increase efficiency/performance", P9. Moreover, change has also been linked to clients as enablers of digitalisation, in contrast to common belief, offering another interesting determinant of change, "if new technologies are adopted, it is usually driven by the clients requesting we use a certain technology rather than staff members/leaders successfully initiating the adoption", P8. Hence, a 'why change' mindset is comparable with the existing resources and financial capabilities of an organisation, and the lack of motive to be well-informed with the changing environment, which is also said to be influenced by members of the same social system, exerting effort to undermine change due to the lack of a shared and common meaning of digital reality.

4.2. Alignment with Past Experience

Another similar theme that emerges from analysing participants' inputs is the reluctance to change due to the incompatibility of the innovation with best practice, "Resistant to change which would disrupt the 'business as usual'", P9. This lack of motive to search for effective change, arguably, can be influenced by different members of the social system;,"There are those in our team who are excited by digital innovation, however, this is countered by those who prefer to stay in the 'comfort zone'", P4. Respondents had a very interesting exposure to the phenomenon in which the past dominates the future, "More senior staff generally are older and less interested in adopting newer technologies where existing technology has worked for them in the past", P2. The perceived effectiveness of past practices and methods, "They are slow to adopt new technologies unless it is put under their nose as existing technologies work for them and that's all they are interested in", P2. It is, however, unclear how the effectiveness of the past is driving reluctance for future change. To answer this, it may be reasonable to measure the extent to which past experiences were associated with perceived success and growth, "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. Hence, achieving sensemaking towards digitisation in construction organisations may require the alignment of past experiences with future activities in the sense that a common success rate could be achieved by the latter over the former.

4.3. Workloads Influence Adoption

An additional theme that emerged informs us on another sensemaking variable of digital technologies in construction organisations is described as the extra work and change associated with innovations. Participants perceive their workplace as congested with workloads, meaning that any new idea would not fit into a schedule with overwhelming tasks, "Business already very busy, implementing new technology is time-consuming and overlooked for this reason", P13. This has been stated to exist at an employee level, "High volume of daily tasks make investing time in specifying and customising solutions and training users is difficult", P5, and at the management level, "Directors are too busy to consider how the company can innovate", P18. We can notice an uninformed perception that the adoption of digital technologies is associated with a very long learning curve and significant workloads to their busy schedules, which is, feasibly, not always the case. Hence, there is a need to replace a perception manifested to deter new ideas and innovations by substantiating the effectiveness of digitalisation in minimising workloads and saving time rather than the other way around.

4.4. Reactivity and Proactivity

A supportive variable to the sensemaking of digital adoption among construction organisations is the effectiveness of these innovations in improving key processes. Participants reflected on the reactive nature of their construction organisations in considering digital technologies to address a sudden disruption, "Digital innovation isn't high on the agenda. It tends to be reactive, i.e., before the pandemic, company employees did not have laptops", P18. Such an approach underpins an emerging stance, in which if the technology works then it is accepted, meaning that if decision-makers accepted the specific connotation behind the adoption of the digital technology, the sense behind its adoption would justify embracing this innovation, "Any technology that assists in getting projects delivered or assists in winning bids will be adopted", P2; "fully open to all practical innovations and easily implementing new technology if it is useful and functional for our purposes", P16; and "The MD is heavily involved and keen to find new ways to increase efficiency", P3. It is logical to state that the adoption is directly linked with the outcome, if an innovation influences an outcome as perceived by decision-makers, the justification of their social system would be simplified and linked to a clear and sensed result.

4.5. Time Determining Adoption

Participants' views supported the emergence of time as a critical theme within this study. Interestingly, saving time is driving digital adoption, "Digital innovation will be adopted if it saves time", P10. Upon trialling digital technologies, saving time emerged as a key aspect that enhanced respondents' digital experience, "using Teams/Zoom has saved on time out of the office traveling", P18, and "Using video calling we are saving time rather than traveling all the time", P3. In contrast, time was also a cause for limited adoption, "The speed in which we work also means less time to train staff in new technology inside general working hours", P2. Time is hereby split into two dimensions, a driver, and an inhibitor, requiring a sensemaking approach that ensures time is the former and not the latter. The rationalisation of digitalisation across the firm may aid more engagement leading to less time for adoption, "decision-making processes can be time-consuming based on full contribution of team", P14. Hence, it is logical to state that time is a double-edged sword, as saving time is perceived to be at the expense of spending time learning, which qualifies to be a cue in the sensemaking perspective of construction professionals.

4.6. Fragmentation in Construction

Since communication is key for the effective sensemaking of innovations in changing environments, a fragmented organisation limits the establishment of rational meaning. Participants from fragmented organisations proved to have less digital uptake compared to those more connected, "we are currently facing a huge gap between the old employees and

the newly hired employees and the new leadership", P11. Sensemaking requires effective communication, a function that may not be achievable in a fragmented environment, "Discussions take place, but suggested ideas are rarely taken forward", P18. Being at a distance from those required to drive sensemaking is hereby a critical phenomenon halting effective communication, "As a satellite office, we often struggle to remotely connect back into the head office", P3, and "office being split into teams can slow innovation with lack of communication between teams", P2. In contrast, organisations that are fostering more connectivity reflect better digital uptake, "Increasingly we are encouraged to use shared networks, cloud systems, and collaborative 3D models for many of our day-to-day activities", P4. Hence, albeit logical, it is worth mentioning the influence of better connectivity on construction organisations' sensemaking ability toward more digitalisation.

4.7. Culture Determining Adoption

Achieving a sensemaking culture rises to act as a theme by itself. Leaders, solely, may not achieve a sensemaking perspective on digitalisation unless this is supported by employees. Sharing the same view means that employees are expected, to a certain level, to contribute to understanding and driving digitalisation, "Ideas from staff are limited with really only leaders contributing", P14. Achieving a culture hereby means both leaders and employees gain the same understanding of the direction necessary for a firm's survival, hence, action is required from both sides. Leaders are encouraged to ensure that all employees are being heard, "Organisational culture promotes digital innovations at my company due to the positivity that is applied from all. They promote a strong teamwork ethos that 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. Participants agree that a culture that supports more involvement from employees to aid their leaders is as important as the vice versa situation, "Culture of 'this is how it is done' takes precedent over encouraging innovation", P9. Hence, a culture that ensures both leaders and employees have a similar understanding of the meaning behind digitalisation would result in achieving an effective digital transformation.

4.8. Leaders' Sensemaking

There is a consensus in the employees' perspective on their leaders' sensemaking role when aiming to rationalise a common digital meaning for their organisational change. Initially, it is critical to state that in the theory of sensemaking, leaders should be aware and well informed on the innovation prior to sense giving the necessity to change to their social system. The same has been acknowledged by the participants, "Leaders establish values, culture, tolerance for change, and employee motivation", P1. Moreover, a change in leaders is seen as an opportunity to change the level of digitalisation, "As the management was changed lately the new company leaders came with a new methodology which greatly promotes the digital innovation", P11, underpinning the vital role of leaders in facilitating digital adoption. Leaders' sensemaking role, however, is being stated as complex and problematic, "It is increasingly difficult for leaders with the current era of digital transformation. As well as, leaders are experiencing ongoing pressure and confusion with how best to maintain long-term vision and focus necessary to help their business evolve", P25. Leaders' sensemaking is hereby directly linked to their ability to enhance their own understanding of digital technologies before influencing the social system, "They only have narrow experiences and are not good at looking outside their own experience", P20. A well-informed leader would result in effective sensemaking to influence their employees to embrace innovations, "Only once the line managers have a thorough understanding of the product will it be implemented by the wider team. Working this way means that the wider team have the supervision and guidance they require from their line manager. This reduces confusion caused by the implementation of new processes", P4. Hence, null sensemaking is expected in the presence of ill-informed and inexperienced leaders who are subjectively undermining wider digital uptake.

After making sufficient sense of the meaning behind a digital transformation, a well-informed leader is now required to cascade this to their social system and rationalise a common meaning. Participants sharing their perspectives on this stage detailed multiple challenges that are deemed interesting for consideration, "Getting 40+ members of staff to agree on a suitable new method or process is always tricky in our organisation. Everyone is entitled to an opinion and very rarely do we all agree. Often when a new process is implemented, we lose a few staff members", P4. To start with, P10 describes the lengthy process when submitting a digitally related request to their leaders, "Requests must be made for any digital innovation to be used. It must move through the ranks and process approval stays some time", P10. Delaying a process may be a cause to limit an individual's drive towards innovation compared to dealing directly with employees' envisioned future, "If you have a good innovative idea, you can forward it on immediately to the relevant person–no questions asked", P7. This is linked to the role of middle managers to ensure such a flow and smooth communication between employees and higher management, "Successful cascading of innovation depends on competent middle management", P10. Hence, after the leadership self-awareness phase in an effective sensemaking approach to enhance digital uptake in construction organisations, leaders are required to share and rationalise a common sensemaking meaning of these technologies without undermining processes that would facilitate the acceptance of innovation.

4.9. The Role of the Social System

Sharing common sense is an integral function for leaders to attain amid their efforts to rationalise a common perspective. Participants from higher digital uptake firms had more support from their leaders to understand and make sense of innovations compared to those with low digital uptake, "top management was a great support in helping us understand the new system", P11. The process in which leaders drive effective communication results in building more interest at different levels in a firm, "anything regarding digital innovation or innovation, in general, is a shared discussion between the company directors and employees", P18. However, achieving this task of rationalising sense on why enhancing the digital uptake is necessary and effective is described to be problematic and would require leaders to learn the technology beforehand, "Learn the fundamentals of the software themselves in order to gain an appreciation of the time and effort required", P47. Participants had a shared view on the influence of their leaders on the firm's digital uptake, "Lack of clear guidance and understanding of what is required", P19, which is urging leaders to adopt before driving adoption, "Use the technology themselves and set an example for the rest of the business", P43. It is hereby apparent that the inability of leaders to share sense and lead their employees to acknowledge a common meaning is a root cause limiting wider digitalisation. Multiple factors feed into this cause such as leaders' wrong assumption about their employees, "Sometimes a 'best practice' guide is issued, but when staff fails to use it problems occur. Sometimes senior management assume all staff know how to use", P4; unawareness of how to roll out a digitalisation, "difficulties of the managers to decide how much and where to invest the money could delay the adoption of high standard technologies", P22; and the inability of leaders to effectively develop common outcome-oriented sensemaking, "Critically, the argument for improved performance needs to be justified before adoption", P9. Hence, helping employees make sense of why digital uptake should be enhanced is not only linked to employees' characteristics but rather to everyone belonging to the social system.

4.10. If You Were in a Leader's Shoe

Participants have been encouraged to provide insights on the strategies they perceive as effective so that better sensemaking of digitalisation is achieved. Such an interesting approach led to capturing a variety of viewpoints that participants believe leaders should apply. Inputs have been related to three main subthemes of processes, people, and money (see Table 3).

Table 3. Participants inputs on their perceived actions as a leader.

Dimension	Participants' Inputs
Processes	"Make data the centre of decision-making" P26 "Compile a central library of resources and standards for the new software" P47 "Visualising final products before completion" P6 "Hire a credited individual to lead the way and to bring in new clients/work with their knowledge and contacts" P27 "More digital interaction with clients in-between face to face meetings" P23 "Need to form a small VR team which has strong leadership backing and to champion their work at the highest levels of the organization, helping them spread the word, engage teams worldwide and encourage others to get on board or risk being left behind" P30
People	"Invest time in training with relevant people" P32 "Listen to the lowest levels of staff. Accept that they get it wrong and that they can make changes if things don't work as well as they'd hoped" P33 "Invest in staff who have the knowledge to help drive the 'digital" P34 "Resource–in line with the above, an IT specialist would be useful in accelerating our digital transformation" P35 "People often don't find out about what's being introduced until it's happened, there are often than many teething problems" P38 "Engage with the employees on how to implement the technology successfully into the company working practices" P40 "Provide follow up training reviews" P43 "Bring in people with relevant experience and ideas" P45 "Enable more mandatory gatherings between the users" P46 "Employ more people in productivity roles where their efforts can be spread across improvements in large numbers of people" P49 "Start training the employees of the company on modern systems once obtained, and consider it as part of their daily activities, so that a regular time is allocated" P54
Money	"Investment in hardware and software" P28 "Cost–put money aside for adopting the latest digital trends" P35 "Prepare to spend capital in the short term for increased efficiency in the long" P57 "Investing and taking a risk in new technologies which may either lead to increased productivity or have become a financial hit not worth taking" P8

5. Discussion

The discussion of the emerged themes with the sensemaking interpretations yielded a further set of arguments that represent the flow of meaning of digitalisation in construction organisations. This section, therefore, presents the discussion subheadings that align with the above themes of data and are sequentially stated as (a) meanings of change, (b) formation of a favourable decision, (c) driving proactivity, (d) the learning curves, (e) communicating sensemaking, and finally, (f) the responsibilities of a leader.

Encouraging participants to provide their perspectives of their organisations' sensemaking strategies towards digitalisation led to a consistent direction of linking the innovation with its associated values. To underpin the meaning of change from a sensemaking perspective, understanding what is change needed for is of utmost importance [73]. Initially, the effectiveness of the norms adopted weakness the need for change, indeed, which is a reasonable statement as to why would actors adopt new ways if best practice is already effective. In that sense, breaking old norms through reflecting on how can digitalisation be superior to traditional practice is a direction that is being adopted to interpret the need for innovation in a workplace [74]. However, before shedding light on how digitalisation's capability can better replace conventional activities, an innovation must prove to fit into the firms' resources and financial abilities [75]. The structuring of meaning for change, in the complex nature of the construction's environment, would require interactions between those involved [54]. Such an interaction to foster change could be aided by the observation from members within the firm, towards linking the introduction of digitalisation with a project's outcome, which would underpin a common meaning of purposefulness among all [55]. Sensemaking, would indeed, exist within this process of rationalising digital value [56]. Cues, hereby, would be the effectiveness of old norms as a negative influence on

digitalisation, in contrast to the positive influence of the alignment of digitalisation with the organisation's capability.

One of the critical subjects to argue is the formation of a decision towards innovation in a complex sector like the construction industry. In construction sensemaking, the decision is encouraged to be formed before adopting a practice and not after, as the prior adoption of norms would create a commitment to the decisions that in return would halt any favourable reception of new information [13]. Not surprisingly, the decision is influenced by the level of uncertainty, which may be nurtured by the decision-makers themselves. In construction, an event that is associated with uncertainty drives a strong need for sensemaking to sustain assurance [55]. A decision that would foster innovation over best practice would hereby require a combination of the values offered by the innovation with an effective sensemaking approach [14]. The sensemaking approach that would support this decision is the actual goal adopted by the decision-makers, shifting from a profit-centred paradigm towards a growth one [54]. The findings of this paper reflected that a change in the driver would lead to a change in the sensemaking perspective. In contrast, the failure of an organisation to pinpoint a meaning through an effective sensemaking strategy would mean that resistance would prevail over a favourable decision, where survival instincts and inertia will define the overall practices [76].

The inputs of this study underpinned the reactive nature of construction organisations. One of the emerging reactions by the participants' firms was the use of digital technologies to replace restricted commuting, which in return, encouraged a positive attitude towards this application [5]. It is logical to say that an effective sensemaking approach would be equipped with a solution to a lurking problem [32] so that the reactive nature of the construction organisations can be exploited towards more proactivity. This sensemaking approach is said to be shifting to what is considered unnecessary, through urgency, towards a more proactive attitude [14]. Linderoth [5] describes these approaches to have different outcomes, one of which an agreeable stance would be formed subject to the technology addressing recurrent problems, or a resistive stance due to the technology complicating the norms and regular tasks. It is common sense to state that the proactivity could be driven by sensemaking, nevertheless, an interpretive consensus is needed in the environment rather than being driven individually [77].

One of the challenges that is described by this study as key in limiting better digitalisation in construction organisations is the learning curve associated with the adoption of new practices. Having more information and experience is inversely linked with the level of risk perception associated with the adoption of unfamiliar practices [54]. Sensemaking in this context would be enriched by the learning curve through the interactions with both the technology and other peers attending the same process [56]. The process of sensemaking fed by learning is said to be initiated by training that would enable wider exposure for learners as well as receiving advice, both aspects of which could shape successful sensemaking [55]. Such training would minimise their requirement for supervision, a phenomenon that can aid their confidence in innovation [20], which is necessary for the formation of a dominant logic [54]. In this sense, organisations should thrive to achieve this logic by reaching a position where employees require no or minimum support and can be described as independent [31]. Hence, reasoning sensemaking towards digitalisation is associated with a learning curve that is necessary for both those fostering the innovation and the recipients.

The key aspect to ensuring alignment between the leadership style and the sensemaking strategy is communication. The way sensemaking is communicated determines how effective an approach would be [20]. Results suggest that the fragmentation of the organisation's levels, where minimum communication can be sensed, had a lower favour towards digitalisation than those with a more robust structure that facilitates communication. The same aligns with Çıdık and Boyd [17], on the need for organisations' tasks to be centred beyond their regular outputs into managing the interactions with the firm. Supporting a stance of effective communication, between the leaders and employees [5], could be described as creating an internal communication channel of interactions that

should be nurtured and preserved. The process, moreover, is reflected by participants that more interaction and shared networks with their peers yielded a more favourable outcome that supported digitalisation in their organisations. This aligns with Volker [56], on the effectiveness of communication between peers to feed into the sensemaking process. Such interaction helps in developing what has been described as a 'group mind' that supports a stance of sensemaking when negotiations and discussions occur among peers of comparable levels [13]. To better understand the influence of this interaction, Sergeeva, and Green [32] explain that this phenomenon creates a shift in paradigm from personal sensemaking, which is developed at an individual level, to collective sensemaking, which is developed at a group level. Hence, forming a stance where a group is supported to interact collaboratively would lead to a more favourable sensemaking perspective towards digitalisation [17].

Undoubtedly, enough evidence exists to pinpoint the role that leaders should play to ensure the sensemaking of digitalisation is effectively achieved. A sensemaking strategy that would drive the acceptance, awareness, and implementation of unfamiliar events across organisations is said to be aided by reasoning initiated top-down in a firm's hierarchy [13]. The reasoning is storytelling, 'what is the story' [19], which could be detailing the importance of an innovation supported by the leader's personal experience [32]. Upon achieving a performative narration that emphasises the areas an innovation can aid and simplify work, a leader can then achieve a shared sense of purpose and meaning. However, such a sense is not permanent, and its continuity is subject to the employee's confidence throughout the unfolding of the actions associated with the new event [17]. The leader's responsibility is hereby to capture the effective factors that would determine actions in changing situations. In this sense, someone may argue the necessity of a technique to aid leaders in identifying these factors, or cues, that would reinforce the sensemaking approach. Gacasan et al. [55] discuss the effectiveness of collecting feedback as a practical method to gather quality information on employees' concerns and interpretations, emerging as a key cue in sensemaking. The respondents' inputs analysed in this study reflected a variety of exposure to leaders' practices, some of which were successful to an extent, and others were not. Leaders that seemed to reflect an arguable success rate in fostering digitalisation in their organisations showed an alignment between their sensemaking and their sense of urgency.

6. Conclusions

The premise of this study was that construction organisations capture the advantages associated with digitalisation by driving an effective flow of meaning across their social systems through a sensemaking perspective. We infer that a variety of aspects contribute to the indecision of construction firms towards digitalisation, where this paper stands to inform the research of arguments at both leadership and employee levels that can help the direction of interpreting and explaining the complex nature of innovation adoption in construction firms. The findings point to the non-linear nature of embracing new ideas among construction personnel, reiterating the difficulty of achieving effective change and the responsibility of multiple roles to foster and envision a common meaning of digitalisation. Our investigation captured first-hand data from eligible participants that lived the reality rather than only perceiving it, offering a less biased approach compared to previous research efforts. Based on our discussions, it is logical to state that sensemaking in construction firms is cumulative and complex, where a variety of cues exist to shape how meaning is transmitted, and accepted, by members within a construction organisation. Moreover, it is also reasonable to state that digitalisation in construction is due to the interaction with other industries; however, the flow of meaning across the construction social systems is where the merit lurks.

Our results suggest that the reluctance to change is linked to the decision maker's perception of their organisation's capability, in terms of resources and finance, influencing the consideration of a digital initiative. However, this has emerged as a tentative perception rather than an absolute reality, whereas the behaviour that is influenced by this perception is limiting

a motive for change, and thus, nurturing reluctance toward digitalisation by conflicting reality with perception. Firms that lack this self-perception are proving a more favourable decision towards digitalisation compared to organisations that, groundlessly, perceive their capabilities as a constraint. On another note, there is a consensus that the success achieved in the past influence the practices of the future. Findings suggest that the paradox of past growth and glory is manifested to drive less sensemaking of the need to change usual business, proving a critical misinterpretation of the changing and evolving environment surrounding the industry, and minimising the logic behind necessitating digitalisation.

Furthermore, our findings indicate that employees cannot drive digitalisation solely; instead, support is required from top management, leaders, and colleagues. Nevertheless, employees have critical inputs in shaping leaders' strategies, which emphasise the effectiveness of regular feedback. Leader support would foremost require a motive, or appetite, as it is illogical to expect that innovation would be fostered naturally without action from influential actors from the same firm. Sensemaking flow to sustain a meaningful stance in which digitalisation can supersede best practices through communication and sources of information. Without leaders experiencing digitalisation themselves, achieving a common meaning among their employees may not be possible. Moreover, leaders not involved personally in the process, relying on employees' self-development, means that potential exposure to inaccurate and unreliable information exists to drive the benefits away from what an organisation expects from digitalisation.

Despite that sensemaking, in general, is not industry-specific, sensemaking in construction is not a widely studied area, in fact, limited studies exist to aid our understanding of the effective sensemaking strategies that can drive innovation and change. This paper can be argued to support the philosophy that construction, as an industry, has unique features compared to other sectors, revealing that an investigation on digitalisation in the construction setting would yield different results from other empirical settings. Hereby, our knowledge of how stakeholders' attitudes and intentions develop towards innovations in a complex and problematic industry like construction is discreet. This has elevated our motive to craft a sensemaking study that would encourage future research in the same direction. More research is certainly needed to aggregate our understanding into sensemaking towards construction innovations, aiding research efforts to explain the very resistant and fragmented nature of the construction sector. Future studies may consider other methodologies to study the reception of meaning among construction social systems, in particular, the use of predictive analysis using Artificial Intelligence and Big Data, which are areas deemed popular and effective. Moreover, studies may focus on investigating the intensity and influence of the learning curves associated with digitalisation, driving the development of an educational module that can foster more sense of the necessity and effectiveness of change.

Multiple limitations exist to guide the readers to treat the results of this paper with caution. Firstly, the use of a qualitative questionnaire may have delimited the authors from the in-depth insights gained by the traditionally used methods to observe and analyze data, i.e., standard interviews and social interactions. Moreover, it is reasonable that results may not be generalisable to other sectors other than construction. Finally, technological change has historically proven to be an evolving phenomenon, a stance that may influence the findings of this study and the sensemaking theory relevant to innovation adoption.

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Appendix A

Table A1. Questions used in this research.

	Question
1.	How many employees are there in your organisation?
2.	What is your organisation's annual Turnover?
3.	How many years have you been in the current job?
4.	How many years have you worked in the Architecture, Construction, Engineering (AEC) industry?
5.	What course are you doing?
6.	How prepared, in your view, are leaders in your organisation to navigate the organisation through the digital world?
7.	What is your current job role/title?
8.	How would you describe leadership approach by leaders in your organisation in respect of driving digital transformation?
9.	How would you describe leadership effectiveness in driving digital transformation in your organisation?
10.	If you were to have a sit-down with the leadership in your organisation, what would you tell them are the top three things they need to do to accelerate digital transformation in your organisation?
11.	What is the most recent game-changing digital technology adopted in your organisation?
12.	What are the main leadership-related barriers to accelerating digital transformation in your organisation?

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