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Exploring the barriers to innovation adoption in the UK construction industry

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Abstract

The UK construction industry is an important aspect of the UK economy; however, it is struggling to keep pace with wider economic growth and if it does not change it will not be able to keep up with demand. There is a gap between academia and practice, and little understanding of how to successfully innovate within the industry. Following a workshop with 25 construction industry professionals on the barriers to innovation in the construction industry, key themes were developed through thematic analysis including regulation, fragmentation and constant change.

Keywords: inclusive design, case study, construction industry, innovation adoption

1. Introduction

The construction industry is a substantive and varied sector and is one of the largest sectors of the UK economy. Not only does the construction industry create physical assets, but it also changes the way we as people experience and interact with the environment around us. Construction includes not only the creation of homes and buildings such as hospitals, schools, offices, and shops but also the creation and maintenance of roads, railways, ports, tunnels, sewers, and water mains - it fundamentally underpins the effectiveness and workings of the economy. More than three-quarters of the nation's stock of economic assets result from construction (CIOB, 2020). The construction industry is a core part of the UK economy, according to an analysis by Oxford Economics, for every £1 spent on UK construction, £2.92 of value is created for the whole economy (CBI, 2020). Construction has remained a relatively stable element of the UK economy in comparison to other similar industries, e.g., manufacturing, underlining "*its enduring importance within the economy and indeed society*" (CIOB, 2020; Bank of England, 2016). The construction industry can be characterised by an unreliable and low rate of profitability and a high rate of unpredictability in terms of projects being completed to time, budget and the necessary standards of quality (Egan, 1998, Wolstenholme et al., 2009; Farmer, 2016). The industry in the UK is highly risk averse, partially due to its economic vulnerability. According to Farmer (2016), the construction industry is often seen as an example of market failure, due to the high levels of self-employment, its "introverted nature" and its highly fragmented structure (both horizontally and vertically). The Department for Business, Innovation and Skills (2013) reported that the UK construction sector has a high degree of fragmentation relative to other sectors in the UK and other construction sectors internationally. There is a long-standing problem of low profitability in the UK construction industry (Farmer, 2016). The average profitability across all industries in the UK is 17.9%, while during 2018, the largest 100 construction contractors had an average margin of only 2.6% (CBI, 2020). The construction industry has the highest insolvency rates across the British economy at 16.5% (ONS, 2021a). The high volatility of the industry has a large impact on industry confidence, which is

only exacerbated by project delays or cancellations. According to Farmer (2016), the construction industry will only change when its clients change or the government change regulation.
One cluster of technology-based processes, amongst others, that has been widely adopted by the industry is Building Information Modelling (BIM). The UK government have mandated BIM on all centrally procured projects since 2016 (UK Construction Online, 2018); and this has significantly increased the use of BIM in the construction industry. The 2020 National Building Specification (NBS) Survey found 71% of the respondents to the survey who have adopted BIM agreed that it can help them be more productive (NBS, 2020a), yet there has been no noticeable improvement in productivity within the construction industry since 2016. Farmer (2016) states that for BIM to be fully effective and function as intended, it needs to sit at the heart of a project with multi-party liaison; the full benefits of "big data" are being prevented by the lack of the necessary collaborative work environment. Technology alone is not, and will not, be enough to address the issues faced by the construction industry, but Egan (1998) advocates for its use as a tool to help support the necessary cultural and process improvements.
The construction industry is slow on the uptake of new technology and as a result, the implementation of new technologies in the construction industry has a very high failure rate. Sailer et al. (2019) reported that many of the industry-focused studies into digital transformation found that most organisations failed in their initiatives to exploit digital technologies, with reported failure rates of 60%–85%. Similarly, approximately only 6% of proposed robotic technologies in concrete building construction research are actually implemented (Gharbia et al., 2019), a number indicative of the wider problem with technology uptake in construction. The construction sector is the second least digitised sector according to Agarwal et al. (2016), only more digitised than the "agriculture and hunting" sector. As an industry, construction will rarely invest in new technology if the value is not clearly demonstratable (Heinzel et al., 2017); however, even when the long-term benefits are significant there is a low adoption rate of new digital technologies (Agarwal et al., 2016).

Research questions

This research project attempted to address the following questions:

1. What are the current perceived barriers to innovating in the UK construction industry?
2. How does this compare to those found in literature?

2. Methodology

There is very little existing research on the barriers to innovation adoption in the UK construction industry. This study aimed to explore the perceived barriers and gather stories from some of those who work and innovate in the UK construction industry, to identify areas of interest to be investigated further and direct future research. A workshop was chosen as the method of data collection due to this being an explorative study and well-suited to a "collaborative"-style workshop methodology as defined by Ørngreen and Levinsen (2017, p.73): "*whereby researchers and participants work together, but with the researchers in control*". According to Ørngreen and Levinsen (2017, p.78), when it comes to immature research areas, workshops can "*aid in exploring the domain in question, enabling […] researchers to identify areas of interest*". Reflexive thematic analysis, as described by Braun and Clarke (2022), was then chosen to analyse the workshop data as it acknowledges researcher subjectivity, and it would be wrong to ignore the impact of the researcher on a collaborative research workshop. Given the exploratory nature of the study, grounded theory was chosen for the coding rationale as it allows for the data to generate theory (Chun Tie et al., 2019) and Atlas.ti was used to visualise and store the coded data. The workshop had 25 participants with data recorded via an audio transcript and the completed participant worksheets (individual and group).
The workshop was 90 minutes long and consisted of 2 main sections, involving a period of individual work, group work and discussion. Participants (quoted as P0XX) were allowed to choose their groups for the group work and there were 5 groups (quoted as Group X) with 3 - 6 participants per group. Participants were asked to complete a consent form and provide demographic information immediately before the start of the workshop. Section 1 of the workshop focused on the perceived demands of the

construction industry, while section 2 of the workshop aimed to gather experiences of innovation in the construction industry. Participants were initially asked to ideate individually, before coming together as a small group to discuss their ideas. The groups were then asked to present their ideas and all the workshop participants discussed the presented themes. This structure was chosen to enable the ideas of all the participants to be captured and give quieter participants a space to voice their ideas. The demographic questionnaires and worksheet are available from https://bit.ly/3ODznAe.

The workshop participants were all students on the University of Cambridge Construction Engineering Management course, they were all industry professionals with "*significant experience in the industry*" (an entry requirement to the course) - only one of the participants had less than 5 years of experience in the construction industry. The students were a mixture of UK nationals and international students; however, of the 25 participants, one had no experience within the UK construction industry and their contribution was removed from the data sample before analysis. Table 1 shows the key demographics of the sample. The sample is heavily male-dominated but is comparable to the UK construction industry where women contribute 15.8% of the workforce (ONS, 2023). The sample skewed young and with higher levels of formal education when compared to the UK construction industry (ONS, 2021b).

Table 1. Frequency table of demographic data for a sample size of 24

Variable	Value	% of participants
Gender	Male	83.3
	Female	16.7
Industry Experience (years)	<10	33.3
	10 - 15	20.8
	15 - 20	25.0
	20+	20.8

3. Results

Key themes were developed through the thematic analysis of the transcript and worksheets. These were:

Transiency, Change and Inertia: The theme of transiency, change and inertia was raised many times in the workshop presenting a duality in the industry with everything always changing and inertia/difficulty bringing about change in the industry.

Fragmentation and Adversary Relationships: The construction industry is highly fragmented, leading to high levels of disconnect in the industry. The many different fragmented groups are often interfaced by contracts, enabling an adversary environment.

Communication: Good communication is important for the smooth running of any project, including construction projects. The high levels of fragmentation in the construction industry give rise to many communication challenges and opportunities for multiple understandings of information on a project.

Human Factors and Demands: The construction industry has an ageing and male-dominated workforce, and places many demands on those in it, in particular when it comes to the health and well-being of its workers. The industry is a high-stress one that is physically demanding and has long work hours. The hours and requirement to travel to site can negatively impact work/life balance and well-being, causing burn-out by making individuals miss out on everyday activities such as taking their children to school. Those within the industry are also under a lot of pressure from clients, and working in an environment fraught with tension, due to the nature of adversary relationships. Workers are also impacted by the wider pressures on the industry, resulting in a lack of job security and low wages.

Physical Environment Factors: Construction sites are dangerous and challenging environments, which due to their nature are constantly changing. They are often dirty, noisy, wet, outdoor, and busy with large plant and machinery. Due to the dangerous environment, the construction industry has had a poor safety record for many years and PPE is now mandated. Construction worksites can be in a wide variety of locations: sometimes in busy inner-city locations and sometimes in isolated, difficult-to-access places requiring workers to travel or relocate to the worksite.

Process/Work Factors: Construction is a prototype industry where no two projects are the same and trial and error is not possible. Construction programmes are often under a lot of pressure and delays to project tasks can have quickly snowballing costs and programme impacts as teams and machinery become unavailable and are contracted to work on other projects. Construction projects can have a lot of complexity be it technical, programme or regulative; those in the industry rely heavily on established methods and standards to manage this complexity.
Design Process: Currently, the design and rollout of innovation in the construction industry are often left to motivated individuals without sufficient support or strategy for innovation. There is little evidence or success stories of innovation research being converted into application, making it harder to garner the required support for innovation during the design process and remove some of the risk associated with innovation in the construction industry. Stakeholders and end users are not engaged early enough in the design process, resulting in design clashes and misaligned strategies and solutions.
Resource Factors: Workers are an important resource in the construction industry, as is knowledge and experience which is sometimes more highly valued than evidence-based results. There can be a lot of technical complexity on construction projects and data that needs to flow around the project; however, those in the industry also expressed having trouble accessing the necessary resources and information required for the industry to function efficiently. Unrealistically short timeframes are common in the construction industry due to the "financial and contractual race-to-the-bottom" with construction companies doing their best to win tenders. This results in programme challenges as a default and construction programmes being easily impacted by small delays or events. When combined with "the learning curve" associated with innovations, those in the industry often feel as though there just is not enough time to do anything new.
Economic Factors: The profit margins in the construction industry are low with restricted cash flow. Those in the industry expressed difficulties with making the case for investment as it can be difficult to make return-on-investment calculations and prove the savings made from mistakes that were prevented.
Regulative: Construction is highly regulated through legislation, standards and procedures. This has led to an improved safety record but also more barriers to change and innovation in the industry, as there is a lot of reluctance to do anything that is not supported by regulation which can be slow to change.

4. Discussion

The majority of the themes that were synthesised through the reflexive thematic analysis were also seen and mentioned in the available literature. There is very little existing academic literature on the state of the UK construction industry and the adoption of innovation in the construction industry, with a large proportion of the literature existing as grey papers published by those within the industry or as government reports but without the rigour of academic "white" literature. A downside of this is that bias, political motivation or agendas are more likely to be present in the literature, affecting what appear as the most important issues or themes when only literature is considered.
Three of the key themes developed through the reflexive thematic analysis of the workshop data, "transiency, change and inertia", "fragmentation and adversary relationships" and "regulation" are presented and discussed in more detail below, including how they relate to the available literature.

4.1. Transiency, change and inertia

There is a big resistance to change in the construction industry, as well as a feeling of constant change. Change as a theme, in its different forms of existing and not existing, frequently came up among the workshop participants when the demands of the construction industry were discussed and the challenges those demands placed on the adoption of innovation within the construction industry.

4.1.1. A state of constant change

The workshop participants described a feeling in the construction industry of transiency and everything always changing, be this through each project being different, workplaces constantly changing, a non-guaranteed work forecast, lack of job security, frequent team change, forming and dissolving and the

use of temporary accommodation and offices (see Table 2). There can also be a sense of uncertainty in the industry with changing client expectations and a lack of consistency in what is expected. Overall, those in the industry can be left without a sense of stability and not feel like they have the mental capacity to take on new innovations or additional planned change.

Table 2. Selection of participant quotes regarding a constant state of change

P005	"Unstable & changing workplace"
P008	"Job uncertainty"
P016	"Temporary accommodation/ setups", "Regular team forming/dissolving"
P019	"Transient projects/ clients/ contractors"
P021	"Transiency", "Lack of consistent approaches between projects"
P022	"Constantly changing teams"
P024	"Constant change"
Group 3	"Transiency - changing locations, changing teams, projects"

4.1.2. Reluctance to change

There is a reluctance amongst those in the industry to change: there is a social expectation, culture, and pressure to use old existing processes as well as a "comfort zone" attitude from those in the industry which provides resistance to any proposed innovation (Table 3: P003). This resistance to change is visible through the lack of adoption of innovation by entire teams, reduced utility (through late/no adoption) and the slow adoption of innovations that have been proven in other industries. Fear of change amongst some in the workforce was described (Table 3: P017), something which has come up in some casual conversations with those in the industry but does not appear much in the literature surrounding innovation in the construction industry, and which would be interesting to investigate further.
Participant P007 describes how experience and repetition are often more highly valued than the possible new "evidence-based" methods, thereby favouring methods that are established in the construction industry and enabling reliance on "old processes" (Table 3: P009). As any innovation will involve a learning curve, it will initially be more effort to use than the older existing method, something participant P016 gave as a reason to explain the unsuccessful rollout of an example innovation.

Table 3. Selection of participant quotes regarding a reluctance to change

P003	"'Comfort zone' attitude of the industry players"
P007	"Lack of openness from senior managers to change", "experience and repetition valued more highly than evidence-based results"
P009	"People want to use old processes"
P010	"Little to no cooperation", "Very slow to adopting technology/processes that have been developed and proven in other industries"
P016	"…they're really resistant because it is more effort…"
P017	"People's mindset (afraid of change)"
P023	"Inertia for change"
P024	"Inertia", "Slow to make decisions"

4.1.3. Need for change

In his 2016 report for the UK Government, Farmer describes the need for the construction industry to change. This was echoed by the workshop participants; however, whereas Farmer discussed the need to change largely coming from a need to meet output demands with a decreasing workforce, the workshop participants discussed regulatory changes as a motivator for the construction industry to change. The participants discussed how the construction industry needs to change as the world around it changes, regulation changes (Table 4) and to better manage risks (Table 4: Group 2). The current pace of change in the construction industry is not enough to keep up with regulatory change, there is a lack of innovations being adopted and construction has been left behind by other comparable industries.

Table 4. Selection of participant quotes on the need for change

P006	"Commercial & Environmental pressure"
P019	"High Carbon/ polluting"
P022	"Regulatory Changes"
Group 2	"Risks [are] not reduced but transferred"

4.1.4. Adapting and responding to change

The construction industry has been facing increasing calls to modernise since the 1998 publication of "Rethinking Construction" by The Construction Task Force to tackle the severe problems faced by the industry, more commonly known as "the Egan Report". Since then, the UK economy has grown significantly, almost doubling, while the productivity of the construction industry has shown no noticeable improvement. Previous calls to arms (e.g. the Egan, Wolstenholme reports) have been mostly not acted upon and despite the persisting problems, it is unlikely that clients will simply stop using the industry (Farmer, 2016). The deep-seated market failure and problems in the UK construction industry have been known for many years, but the industry appears to have a collective reluctance or inability to actually address the issues (Farmer, 2016). This was echoed in the workshop, with an overall reluctance to change in practice and a lack of openness from management within the industry to change (see Tables 2 + 4). The pace of intentional change in the industry is slow compared to regulation and other industries, with those in the construction industry feeling as though they do not have enough time to learn/adopt innovations (Table 5: P001, P015) and without the early adopter crowd (Table 5: P003) that are necessary to advocate for innovation.

While there are systems in place to communicate change on a construction site and through a project, the industry struggles to communicate new ways of working and to transfer lessons learnt/new methods from one project to another (Table 5: P016, P022). Changes to the scope and design requested by the owner, inaccurate design specifications or problems procuring materials or services are all communicated through change orders: an agreement to revise the original terms of a construction contract between a project owner and contractor (Nobles, 2023); however, there is no equivalent for changes of method that are not contractually determined. Given the construction industry feeling as though it is constantly changing it would be interesting to investigate how this ties to the reluctance to change and whether there is such a heavy reliance on old processes to maintain a sense of constancy.

Table 5. Selection of participant quotes on responding to change

P001	"Not enough time to learn/ adopt innovation"
P003	"Lack of early adopter crowd & investors"
P007	"Lack of openness from senior managers to change"
P010	"Very slow to adopting technology/ processes that have been developed/ proven in other industries"
P015	"Not enough time to plan & execute"
P016	"Poorly communicated with high staff turnover", "they're really resistant because its more effort"
P022	"Challenges/ problems come with the implementation - communication of new ways of working"

4.2. Fragmentation and adversary relationships

The UK construction is highly fragmented leading to a culture of adversary relationships, disconnect, contractual pressure and communication issues (see Table 6). The relationship between innovation adoption and fragmentation should be further investigated. Horizontally at a high level, it is fragmented into different sectors, but it also has fragmented workplaces, high levels of siloed working and a fragmented workforce. Vertically, there are fragmented supply chains and manufacturers with "too many subcontract layers" and interfaces (Table 6: P016). This theme came up frequently during the workshop and was consistently rated one of the "top 3" barriers to innovation adoption by workshop participants. Fragmentation can make it harder to access central support functions (Table

6: P016), coordinate and ensure quality across the industry (Table 6: P008) and get widespread innovation adoption, leading to compartmentalised tech (Table 6: P001) and perpetuation of industry fragmentation.

Table 6. Selection of participant quotes on fragmentation and adversary relationships

P001	"Experienced workforce vs new innovation conflict: often received as a personal attack on the experienced skilled workforce", "Compartmentalised tech"
P004	"Competing interests", "Political influence (detrimental)"
P005	"Overcame scepticism by focusing […] more on follow on benefits to the workforce", "Isolated workplaces"
P007	"job security", "Contractual/financial 'race to bottom'"
P008	Use of fragmented teams "leading to challenges with coordination and quality assurance", "little to no cooperation (industry wide)"
P011	"Self-driven interest"
P012	"Complex, stakeholder environment - tension"
P013	"Lack of consensus […] as different players want different things"
P016	"Fragmented industry", "limited access to central support functions", "Confrontational contractual relationships", "Crossrail [has] too many contracts, too many interfaces [and] too many subcontract layers [resulting in] having to identify responsibilities on the fly"
P018	"Race to bottom procurement route"
P019	"Fragmentation: supply chains, supplies, manufacturers"
Group 5	The "fragmented supply chain, reducing the amount of money available at each level"

4.2.1. Industry culture of adversary relationships

The fragmentation of the industry increases tension and the adversary nature of the industry due to the competing interests of all the separate "fragments" (Table 6: P004, P012), the many interfaces and contracts creating a confrontational and transactional environment, and the difficulty in reaching a consensus and lack of cooperation slowing the pace of collaboration (Table 6: P008, P013). The construction industry has a culture of adversary relationships, causing there to be an air of conflict, always assuming the worst of other players, scepticism, resistance to change (Table 3) and self-interest (Table 6: P011). There is little incentive to innovate in this environment due to the likely conflict between the workforce and innovation, the personal attack perceived by the skilled workforce from the innovation and the lack of openness from management or workers to change (Table 6: P001. Table 5: P007). Historically, the adversary nature of relationships has meant that risks have been transferred instead of reduced (Table 4: Group 2) only supporting the culture and mindset prevalent in the industry. The industry culture of adversary relationships can increase certain pressures on the industry (see Table 7): including, legal pressure, commercial pressure and the pressure to expedite work and follow standard procedure; while reducing job security for those in the industry. The "race to the bottom" to win contracts over competitors (Table 6: P007, P018) leads to unrealistic targets (Table 6: P007) which increases the overall pressure. The fragmentation within the industry and multiple contractual interfaces means that there is less money available at each level making innovation harder (Table 6: Group 5) and increasing commercial pressure.

4.2.2. Communication issues due to fragmentation

The high levels of fragmentation in the industry can result in many communication and data flow issues. Observed issues include the poor transfer of lessons learnt between teams and projects (Table 8: P016), gaps in knowledge, and challenges in conveying messages to site teams or getting a consensus across teams (Table 6: P013, Table 8). The fragmentation enables multiple information streams to co-exist and for there to be several (sometimes contradictory) different understandings of information flowing through a project (Table 8: Group 4). The multiple interfaces due to fragmentation can make the construction industry slow on decisions and increase the opportunity for conflict or resistance to arise. Combined with the transiency and changing nature of the construction industry this leads to many issues.

4.3. Regulation in the industry

Regulation in the construction industry comes in varying degrees of absoluteness/rigidity. Some aspects of the industry are regulated by laws, (e.g. health and safety, accounting, environmental) which are absolute and legal requirements to follow. Legal pressure (including pressure to not break contracts) can inhibit the adoption of innovation. Legal regulation can be slow to change inhibiting the adoption of innovation, especially given the potential consequences of illegal actions. Codes and standards (e.g. the British Standards) are not legal requirements, but there is a strong normative pressure that construction in the UK will be to the British Standards (Table 9: P007) and so they are held almost as legal requirements. A third form of regulation in the UK construction industry is the company or government policies. These are not legally binding in any way but there is still an expectation and understanding that these are to be followed and companies/individuals that do not will face societal consequences. Some stakeholders (such as the government, politicians or those in power) will also exert some regulation on the industry through their influence and what they endorse, this is arguably the least absolute of the forms of regulation.

Table 7. Selection of participant quotes on pressures on the construction industry

P001	"Conflict between doing it 'correctly' & hitting program"
P004	"'Complexity' [of] stakeholders", "political influence (detrimental)"
P006	"Shared resource demands (competition)", "Competitive markets - drive economic pressure"
P007	"Unrealistically short timeframes"
P008	"High stress and pressure", "commercial pressure"
P012	"Pressure", "Programme delays"
P016	"Non-guaranteed work forecast"
P018	"High risk/ low [economic] margins", "limited funds to innovate", "legal/ financial risk"
Group 3	"High commercial risk, low profit margin"

Table 8. Selection of participant quotes on communication issues

P009	"Communication issues across workforce"
P010	"Communication difficulties", "Gaps in knowledge"
P016	"Poor lessons learnt transfer", change "poorly communicated with high staff turnover"
P024	"Siloed working - poor communication"
Group 1	"All the players [..] have different systems, different tools [that are] non-compatible: data can't flow"
Group 4	"Trying to convey messages to the site team can be challenging", "We have ambiguity, we have several different understandings of information that flow through a project"

Table 9. Selection of participant quotes on regulation in the construction industry

P003	"Pressure […] to expedite works and follow standard procedures"
P007	"Regulatory environment", "need to stick to codes, standards"
P009	"Heavy regulation"
P011	"Too many regulations"
P024	"Very regulatory", "bureaucracy"
Group 2	"Regulatory approval"
Group 4	"Government policy", "It's not necessarily the regulation itself […] it's just the pace at which you can […] actually get consent or approval"

4.3.1. Regulations as a vehicle to improve and the impact this has had on safety

Regulations can be used to enforce improvement or the adoption of new technology. Laws and legal regulations can be implemented to force improvement of the industry, and one example of this is that the UK construction industry is now seen as a leader in construction safety, due to its heavy legal regulation on safety (Table 10). "Best practice" or the standards can also be re-written/changed to encourage the use of new innovations and improve the industry. However, only because something has been written into regulation does not mean that the desired impacts will be had: the example of BIM as a legal requirement (§1), has not led to an increase in productivity.

Table 10. Selection of participant quotes on safety and regulation

P012	"Increased safety legislation" compared to other countries
P015	"In some areas, UK would be considered leaders - Health and Safety"

4.3.2. Regulations are too restrictive

Due to the many forms of regulation present in the construction industry, and the strong legal, normative or social expectations to follow them, regulations can be seen as too restrictive and as a barrier to improvement, innovation or creativity in the construction industry. The construction industry is so highly regulated and controlled through the different forms of regulation that there is a strong pressure to follow the regulations and laws (Table 9) and it is very risk averse.

Regulations can slow down the rate of innovation adoption due to them being too restrictive and being slow to change and adapt when compared to the pace of change in technology and innovation (Table 9: Group 4). This can be due to the bureaucracy involved in regulation change (Table 9: P024) and the process to gain regulatory approval (Table 9: Group 2). The highly regulated nature of the construction industry means that even when an innovation has been proven in another industry, it still must go through the regulatory approval process of the construction industry (Table 5: P010).

4.3.3. Institutional theory – institutional factors

Institutional theory is a theory on how a company and the way its legitimacy is assessed and is impacted by the social, political and economic systems it operates within (North, 1990). North (1990, pp. 25 & 3) describes institutions as existing "*to reduce the uncertainties involved in human interaction*" and provide a "*structure to everyday life*". Institutions and organisations are separated by North (1990), institutions are the rules to the game and organisations are players. Scott (2008, p. 222) defines institutions as being "*comprised of regulative, normative and cultural-cognitive elements*" that shape an organisations structure and its actions. Institutions govern what is deemed legitimate: the "regulative pillar" stresses both formal and informal rule-setting, monitoring and sanctioning; the "normative pillar" stresses situation-appropriate behaviours; and the "cultural-cognitive pillar" emphasizes "common schemas, frames and other shared symbolic representations that guide behaviour" (Scott, 2008, p. 222). Considering all three pillars in tandem, it is possible to understand the construction industry as an institution and construction firms, regulatory bodies, or clients as organisations.

An institution can shift and change as the organisations and actors within it evolve or there is a disrupter forcing "*discontinuous institutional change*" but the mimetic, coercive and normative pressures in an institution will push an organisation either towards or away from adopting a particular technology to retain its legitimacy (Oliveira and Martins, 2011), something which is evident in the construction industry's approach to innovation. Looking through the lens of institutional theory may provide insight into how the construction industry can be changed and adapted to better suit the needs of today.

5. Next steps

The insights gained from this workshop will be used to shape and guide the direction of the authors' PhD research on exploring and understanding the barriers to innovation adoption in the UK construction industry. This workshop serves as a pilot study for a series of semi-structured interviews with varied industry experts which are currently ongoing, and in turn, will be used to suggest ways to overcome the barriers identified in this paper.

6. Conclusions

This study was an initial exploration into the perceived barriers to innovation adoption in the construction industry. Several key themes were developed and three possible areas for further exploration were identified: the interplay between the experienced transiency of the construction industry and the reluctance to change; how fragmentation hinders the adoption of innovation, and whether an institutional theory lens is beneficial to understand the regulation of the construction industry and how to bring about change within the UK construction industry.

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